

Appendix A  
Site-specific Project/Action  
Environmental Evaluation Checklist

# Merced Irrigation District Water Resources Management Plan Site-specific Project/Action Environmental Evaluation Checklist

The following checklist/analysis approach would be conducted for all Merced Irrigation District (MID) Water Resources Management Plan (WRMP) projects/actions to determine whether a given project/action would require additional environmental documentation beyond the Programmatic Environmental Impact Report (PEIR) and/or to avoid locations (where feasible) that would potentially result in significant environmental impacts. The checklist below provides a standardized approach to site-specific resource evaluations for general project locations that were previously identified as well as those projects that were not sufficiently developed during the PEIR phase to determine the necessity of further site-specific analysis.

The evaluation criteria identified below are based on those developed in the PEIR. If the potential for a significant impact is identified with respect to these criteria, the specific mitigation measure(s) included in the PEIR would be identified, and it would be documented that implementation of such measure(s) would result in impacts being reduced to a less than significant level.

Completion of the checklist would document whether a proposed action:

- **would not** result in significant impacts/would not require additional documentation because either (1) the proposed project/action has no potential to result in a potentially significant impact, or (2) the analysis/mitigation identified in the PEIR addresses the potential impact; or
- **would** result in potentially significant impacts not addressed in the PEIR and would require additional documentation or analysis.

Identification of facility locations would account for potential environmental resources (including the potential for avoidance) that could result in significant impacts. The checklist would be used to document if potential impacts would be considered less than significant; and thus, further analysis and/or mitigation would not be required. If a desired project site location is inflexible (and alternative locations are not feasible) where the potential for impacts on biological resources exists, a qualified biologist would visit such proposed project location(s) as specified in the PEIR during the preparation of this checklist. The intent of these visits would be to determine the occurrence of sensitive habitats, including vernal pools, wetlands, and riparian habitat at proposed facility locations. Site visits would consist of reconnaissance-level surveys in which observations of special-status species would be recorded; and the general potential for special-status species to occur would be assessed depending on the quality, characteristics, and location of the habitat at the project site. Additionally, environmental permits or clearances that are anticipated to potentially be required would also be indicated as such where indicated below.

**Site-specific Project/Action Environmental Evaluation Checklist**  
(to be completed by MID and/or survey staff)

Project/action name and type: \_\_\_\_\_

\_\_\_\_\_

Date(s) of review: \_\_\_\_\_

Name of person or persons who completed the review: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Project/action location (attach map): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Project/action description: \_\_\_\_\_

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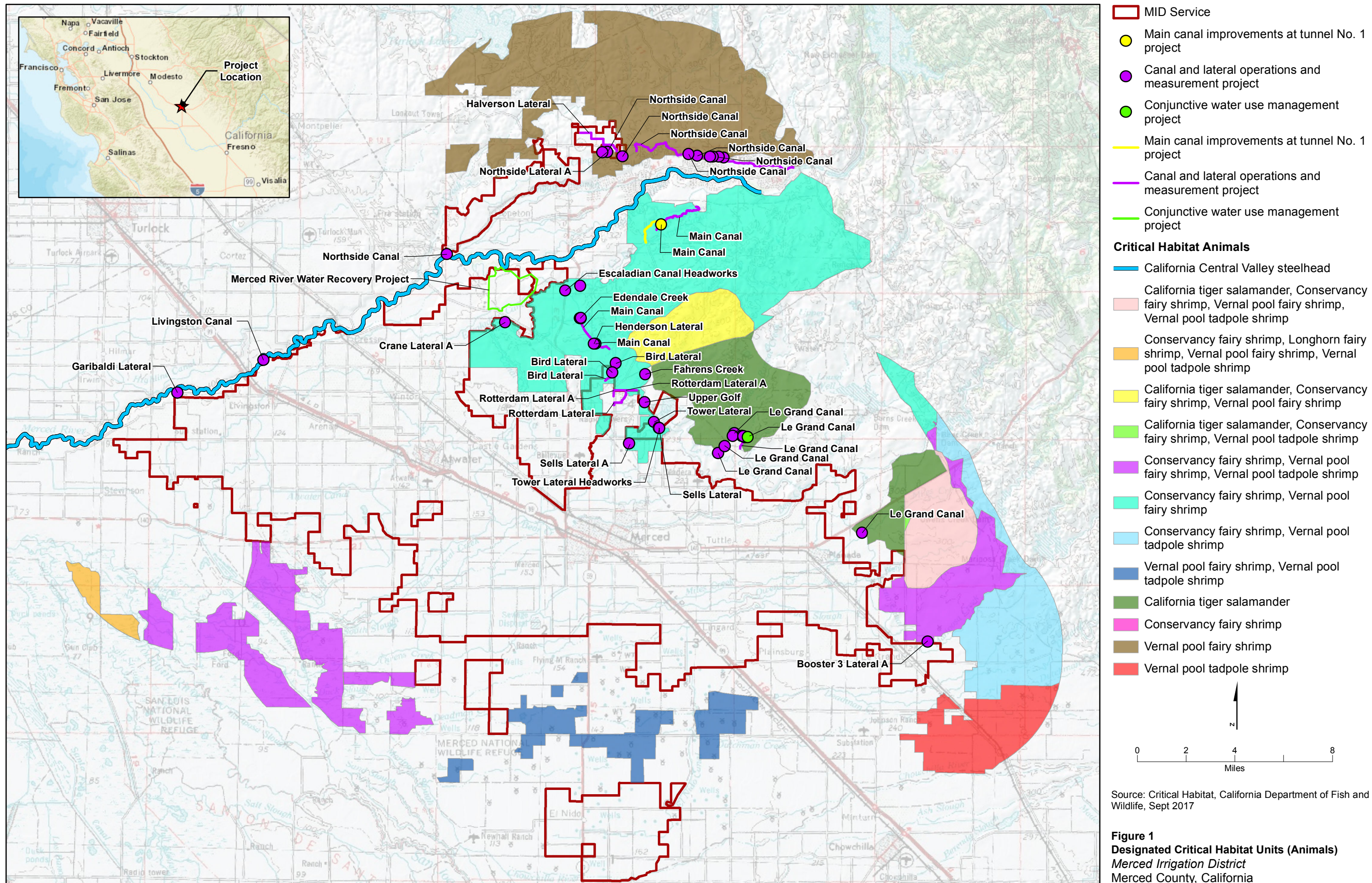
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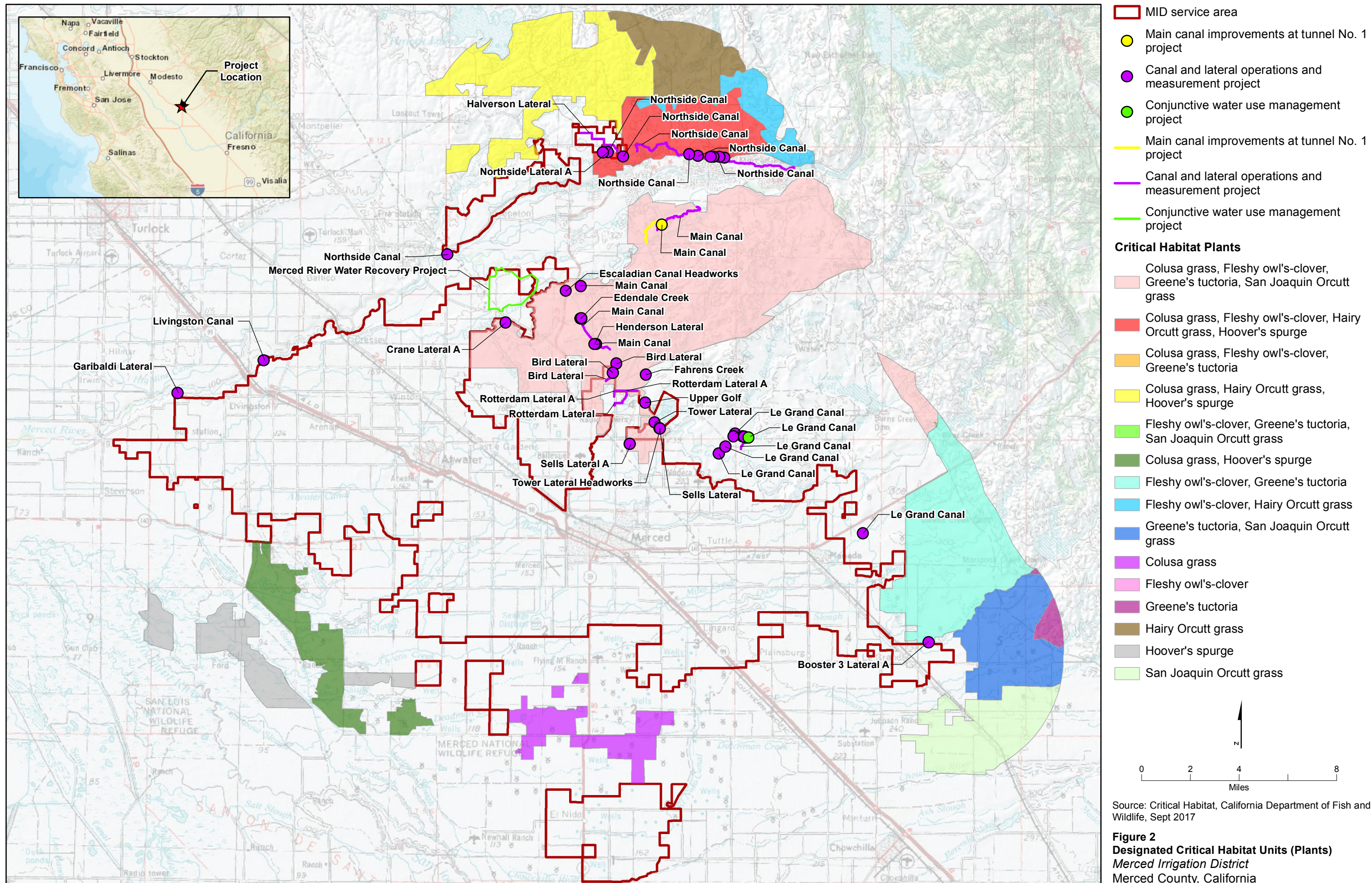
Would the project/action require or result in potentially significant impacts on the following:

Resource	Yes	No
<b>General – All Resources</b>		
Would the project involve a new or larger footprint that was not evaluated in the PEIR?		
Would the project result in new environmental impacts not previously identified in the PEIR?		
Would the project require new mitigation measures not identified in the PEIR?		
Would the project involve construction methods or construction staging that do not meet the proposed project intent described in the PEIR?		
Are there new sensitive receptors (i.e., hospitals, schools, residents, etc.), or have conditions changed that were not present during preparation of the PEIR?		
<b>Aesthetics and Visual Resources</b>		
Are there sensitive receptors nearby (i.e., residents, motorists)?		
Would the project entail aboveground structures that do not meet the proposed project intent described in the PEIR?		
Would the project result in new light sources or glare?		
<b>Agricultural Resources and Land Use</b>		
Has the land use or habitat type changed since preparation of the PEIR?		
<b>Air Quality and Greenhouse Gases</b>		
Would the project require substantial earth movement (i.e., fugitive dust)?		
<b>Biological Resources</b>		
Is there native ground present in or adjacent to the project site?		
Would the project be located in or adjacent to designated critical habitat? (see Figures 1 and 2 – habitat should be evaluated annually to confirm if there are any U.S. Fish and Wildlife Service or National Marine Fisheries Service revisions)		
<b>Cultural, Paleontological, and Tribal Cultural Resources</b>		
Are there any known cultural resources located in the project site?		
<b>Geology and Soils</b>		
Would the project require substantial earth movement (i.e., erosion)?		
<b>Groundwater, and Hydrology and Water Quality</b>		
Would the project significantly change the topography of the site (i.e., stormwater runoff, flooding)?		
<b>Noise</b>		
Would construction use heavy equipment that is substantially different from the equipment described in the PEIR?		
<b>Population and Housing</b>		
Would the project displace people?		
Would the project result in an increase in population growth?		
<b>Public Services and Utilities</b>		
Are there new government facilities (i.e., parks, schools, fire protection, police protection, etc.) that were not present during preparation of the PEIR?		
<b>Traffic and Transportation</b>		
Would the completed project substantially affect or generate traffic conflicts?		

Answering “Yes” to any of the above-listed resource questions does not automatically indicate that the project would have a potentially significant effect on the environment that was not addressed in the PEIR and that additional environmental review is necessary. However, it may indicate that further evaluation and study is warranted.

This site-specific project/action environmental evaluation checklist is not meant to substitute for Appendix G of the California Environmental Quality Act (CEQA) Guidelines. The intent of the checklist is to provide a general evaluation of the potential for proposed projects/actions to result in significant environmental impacts not addressed in the PEIR. Future projects/actions considered to potentially result in a variety of potential impacts should use the full checklist provided in Appendix G of the CEQA Guidelines.





On the basis of this review:

- ☐ The proposed project **would not have a potentially significant effect** on the environment; therefore, no further environmental documentation is required.
- ☐ The proposed project **would have a potentially significant effect** on the environment; however, by following the mitigation measures identified in the PEIR, the impact(s) would be reduced to a less than significant level, and no further documentation or analysis is required.
- ☐ I find that the proposed project **would have a potentially significant effect on the environment that was not addressed in the PEIR**, and additional environmental review is required.

### Potential Project/Action Required Permits or Approvals

- Section 404 Permit – U.S. Army Corps of Engineers* ☐
- Section 10 or 7 Endangered Species Act – U.S. Fish and Wildlife Service/National Marine Fisheries Service* ☐
- Section 1602 Lake or Streambed Alteration Agreement – California Department of Fish and Wildlife (CDFW)* ☐
- Section 2081 Incidental Take Approval – CDFW* ☐
- Section 401 Water Quality Certification – Central Valley Regional Water Quality Control Board (CVRWQCB)* ☐
- National Pollutant Discharge Elimination System (NPDES), General Construction Permit – (CVRWQCB)* ☐
- Encroachment Permit – Merced County Department of Public Works* ☐

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Appendix B  
Notice of Preparation and  
Public Comments

# Notice of Preparation

## Merced Irrigation District

### Water Resources Management Plan

### Programmatic EIR

The Merced Irrigation District (MID or the District), located in eastern Merced County in the northeastern corner of the San Joaquin Valley (Figure 1), has undertaken a public process to develop a Water Resources Management Plan (WRMP) to evaluate the District's water resources, delivery system, and operations. The WRMP will help the District further improve water management, enabling it to serve current and future customer needs. The WRMP is developed as an integrated and forward-looking plan that combines the technical, institutional, financial, and public outreach elements into a cohesive "business plan" for MID. The WRMP has a 30-year planning window and is intended to be updated on a periodic basis. Major elements of the WRMP are anticipated to include the following:

- Full CIP (Capital Improvement Plan) implementation which will include water system modernization
- In-lieu groundwater recharge
- Class II to Class I customer conversion opportunity
- Water transfer(s) to financially support the WRMP
- Potential revisions in District water rates within the existing authority of Proposition 218

Development of the WRMP resulted in a number of recommendations. Because the WRMP includes a number of individual projects and actions that could have environmental impacts, and is proposed to be implemented in phases, a programmatic environmental impact report (PEIR) as referenced in Section 15168 of the California Environmental Quality Act (CEQA) Guidelines (Guidelines) will be prepared. The document will provide an overall review of the overall proposed WRMP, and set the stage for implementing specific projects including those that are not anticipated to require additional environmental review. As per CEQA Guidelines Section 15168(b), the District intends to use the PEIR for the following purposes:

- Provide a vehicle for a more comprehensive consideration of effects and alternatives than would be practical in an EIR on an individual action
- Ensure consideration of cumulative impacts that might be overlooked in a case-by-case analysis
- Avoid duplicative reconsideration of basic policy considerations
- Allow the District to consider broad policy alternatives and program-wide mitigation measures at an early stage of the planning process when the District has greater flexibility to address basic environmental issues or cumulative impacts
- Reduce administrative tasks associated with potential projects contemplated in the WRMP

## Alternatives

The five programmatic alternatives evaluated in the WRMP will be described as part of the PEIR, which will address potential impacts accounting for current New Exchequer reservoir operations as well as

operations per the pending Federal Energy Regulatory Commission hydroelectric license renewal at the Merced River Hydroelectric Project:

- Alternative 1: No Action
- Alternative 2: Low Water Transfer(s)
- Alternative 3: Annexations and Dry Year Water Transfer(s)
- Alternative 4: CIP Only
- Alternative 5: Balanced Approach (Preferred Alternative)

Each alternative is anticipated to include some degree of infrastructure improvement and/or new facilities to improve and modernize water delivery service. Alternatives 2 and 3 were evaluated to address the potential for a variety of different water transfers, and a one-time customer opportunity for Class II to Class I conversion. Alternatives 2 and 4 included customer rate increase components. Alternative 3 involved potential annexations and providing supplemental surface water supplies to lands not currently within the MID district boundaries, e.g., water transfer(s), particularly to lands within the District's sphere of influence. Depending on the nature of the proposed improvements, those that are primarily maintenance-related will be so identified in the PEIR. The potential need for subsequent environmental documentation to the PEIR, including focused EIRs and/or Initial Studies/Negative Declarations for out-of-basin water transfer-related actions will be so indicated in the PEIR.

Other alternatives that may be raised during the scoping process will be evaluated for feasibility and included in the PEIR as determined appropriate or necessary.

## Draft Goals and Objectives

CEQA requires an EIR include a statement of project objectives. These goals and objectives will help MID in developing a reasonable range of alternatives. The PEIR will also aid decision makers in selecting a preferred alternative and determining how best to implement the action.

### Draft Goals and Objectives

MID's study goals in implementing its WRMP include the following:

- Protect and maximize MID's water rights.
- Ensure that MID remains financially sound.
- Provide a reliable and affordable water supply to MID customers.
- Continued focus on MID customer service.
- Promote sustainable management of groundwater resources.
- Support the agricultural economic base of the region.

## Impact Analysis

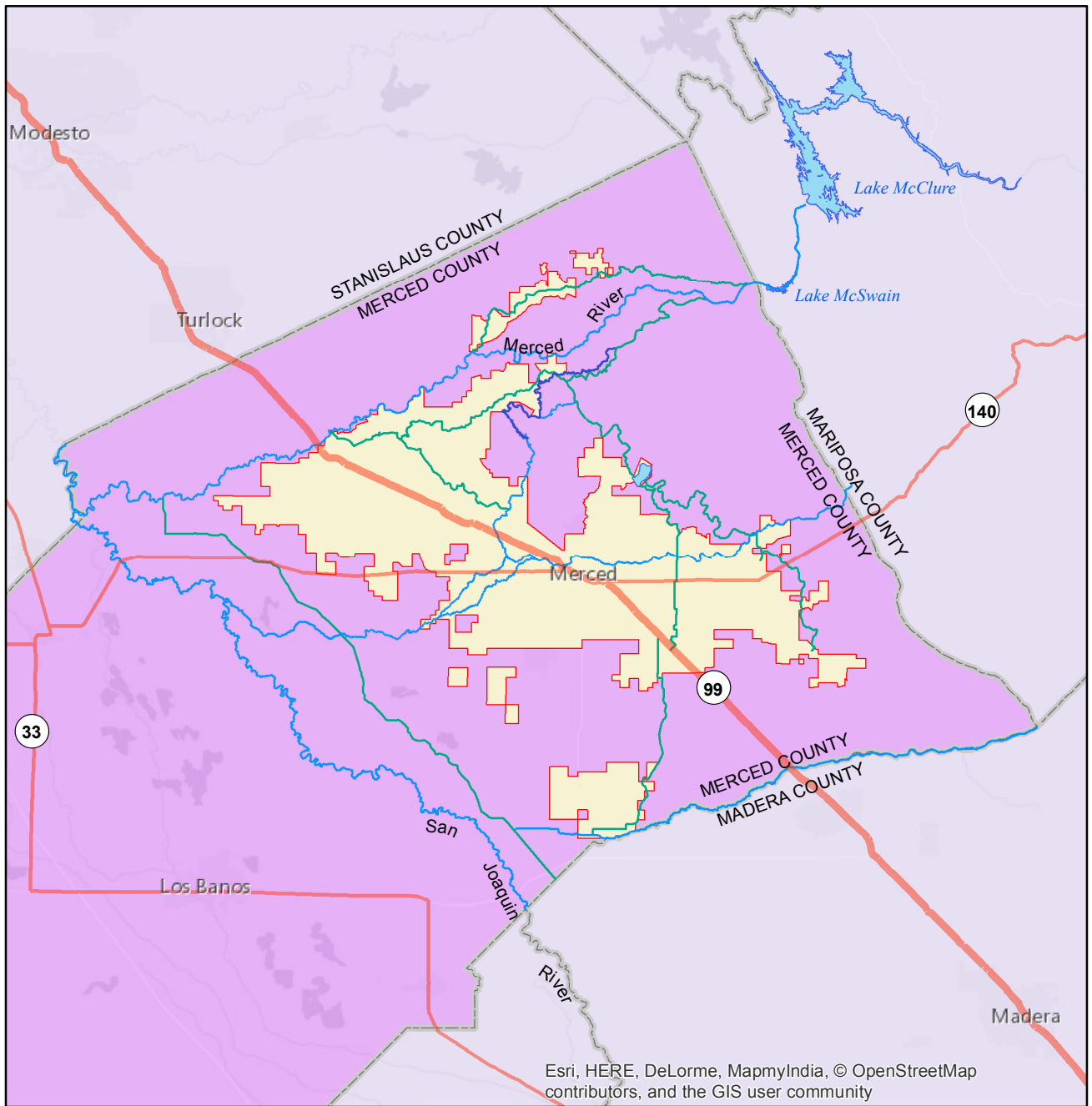
The PEIR will evaluate and disclose the potential impacts associated with the action alternatives identified in the WRMP. Alternatives rejected in the WRMP will be disclosed in the PEIR. The results of the alternatives development and screening process will be included in the CEQA document to fully disclose the overall process and effort. The PEIR will also evaluate the No Project Alternative (the assumptions of which will be based on those presented in the WRMP) and cumulative conditions. Where significant potential impacts are identified, appropriate mitigation measures will be identified in coordination with the District. The PEIR will be prepared to support the preparation of subsequent environmental documents and/or various permit applications as determined necessary in cooperation with the District.

Impacts associated with the implementation of the projects included in the WRMP will be evaluated qualitatively and quantitatively as appropriate. Potential effects, such as temporary and/or permanent impacts to terrestrial wildlife, will be evaluated through field surveys and known presence. Impacts related to in-basin water transfer(s) or groundwater use, if any, will be estimated through the use of existing modeling tools incorporating known operational parameters and aquifer properties, respectively. Where final project locations are not yet known, and will be determined in the future, impact avoidance criteria will be developed and disclosed to support future project/program implementation and minimize potential impacts. For actions, such as out-of-basin water transfer(s), subsequent environmental review documentation will be prepared as required at a later date once the details of each potential water transfer or water transfer program (including participants and quantity of water) are identified.

A public draft PEIR is expected to be completed by Fall 2018.

## Scoping Meeting

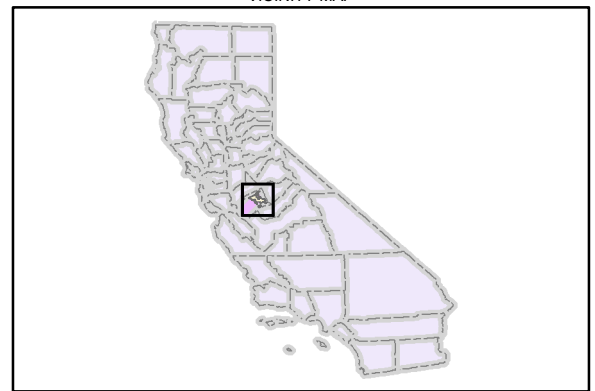
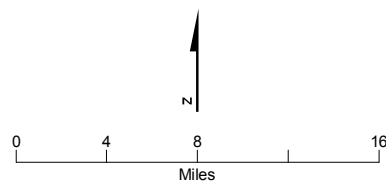
A public scoping meeting on the project and CEQA process, and obtain public input to support the preparation of the PEIR will be held at the Merced Civic Center, Council Chambers, 678 West 18<sup>th</sup> Street, Merced, California 95340 on May 25, 2017 starting at approximately 10:00 am.



VICINITY MAP

#### LEGEND

- Canal
- Creek
- River
- Reservoirs
- Merced Irrigation District Boundary
- Merced County



**FIGURE 1**

#### Project Location

Merced Irrigation District  
Water Resources Management Plan Programmatic EIR  
Merced, California

# Notice of Preparation and Public Comments

No comments were received during the public scoping meeting.



State of California – Natural Resources Agency  
DEPARTMENT OF FISH AND WILDLIFE  
Central Region  
1234 East Shaw Avenue  
Fresno, California 93710  
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor  
CHARLTON H. BONHAM, Director



June 14, 2017

Bryan Kelly  
Merced Irrigation District  
744 West 20<sup>th</sup> Street  
Merced, California 95340

**Subject: Merced Irrigation District Water Resources Management Plan  
Program EIR (Project); SCH#: 2017051054**

Dear Mr. Kelly:

The California Department of Fish and Wildlife (CDFW) received a Notice of Preparation (NOP) from Merced Irrigation District (MID) for the above-referenced Project pursuant to the California Environmental Quality Act (CEQA) and CEQA Guidelines.<sup>1</sup>

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

## **CDFW ROLE**

CDFW is California's **Trustee Agency** for fish and wildlife resources, and holds those resources in trust by statute for all the people of the State. (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a).) CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. (*Id.*, § 1802.) Similarly, for purposes of CEQA, CDFW is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

CDFW is also submitting comments as a **Responsible Agency** under CEQA. (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381.) CDFW expects that it may need to exercise regulatory authority as provided by the Fish and Game Code. As proposed, for example, the Project may be subject to CDFW's lake and streambed

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<sup>1</sup> CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

alteration regulatory authority. (Fish & G. Code, § 1600 *et seq.*) Likewise, to the extent implementation of the Project as proposed may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 *et seq.*), related authorization as provided by the Fish and Game Code will be required.

## **PROJECT DESCRIPTION SUMMARY**

**Proponent:** Merced Irrigation District

**Objective:** MID is developing a Water Resources Management Plan (WRMP) to evaluate the District's water resources, delivery systems and operations. The WRMP is intended to help the District further improve water management, enabling it to serve current and future customer needs. Major elements of the WRMP include full Capital Improvement Plan implementation (including water system modernization), in-lieu groundwater recharge, Class II to Class I customer conversion opportunity, water transfer(s) to financially support the WRMP, and potential revisions in District water rates within the existing authority of Proposition 218. Because the WRMP includes a number of individual projects and actions that could have environmental impacts and is proposed to be implemented in phases, a programmatic environmental impact report (PEIR) will be prepared. The document will provide an overall review of the overall proposed WRMP, analyze five programmatic alternatives and set the stage for implementing specific projects including those not anticipated to require additional environmental review.

**Location:** The Project site includes all of Merced Irrigation District's service area within Merced County.

## **COMMENTS AND RECOMMENDATIONS**

CDFW offers the comments and recommendations below to assist MID in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife (biological) resources. Editorial comments or other suggestions may also be included to improve the document.

### **Swainson's Hawk:**

**Specific impacts:** Swainson's hawk (*Buteo swainsoni*; SWHA), a species listed as threatened pursuant to CESA, are known to nest and forage in Merced County. Potentially significant impacts that may result from ground-disturbing Project-related activities include nest abandonment, loss of nest trees, loss of foraging habitat that would reduce nesting success (loss or reduced health or vigor of eggs or young) and

direct mortality. Any take of SWHA without appropriate take authorization would be a violation of Fish and Game Code.

**SWHA Mitigation Measure 1:** To evaluate potential Project-related impacts, CDFW recommends that a qualified wildlife biologist conduct surveys for nesting SWHA following the survey methods developed by the Swainson's Hawk Technical Advisory Committee (SWHA TAC, 2000) prior to Project implementation. The survey protocol includes early season surveys to assist the Project proponent in identifying active nest sites prior to initiating ground-disturbing activities in order to implement necessary avoidance and minimization measures.

**SWHA Mitigation Measure 2:** If ground-disturbing activities will take place during the SWHA nesting season (March 1 through August 31) and SWHA nests are present, CDFW recommends establishing a minimum no-disturbance buffer of 0.5 miles around active nests until the breeding season has ended or until a qualified biologist has determined that the birds have fledged and are no longer reliant upon the nest or parental care for survival, to avoid nest abandonment and other take of SWHA. If a 0.5-mile no-disturbance buffer is not feasible, consultation with CDFW is warranted to determine if the Project can implement a smaller no-disturbance buffer from active nests and avoid take. If take cannot be avoided, take authorization through the issuance of an Incidental Take Permit (ITP), pursuant to Fish and Game Code § 2081(b) is necessary to comply with CESA. For information regarding ITPs, please see the following link: <https://www.wildlife.ca.gov/Conservation/CESA>.

**SWHA Mitigation Measure 3:** If Swainson's hawk nests occur in the Project vicinity, CDFW recommends compensation for the loss of Swainson's hawk foraging habitat as described in CDFW's Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (DFG, 1994) to reduce impacts to foraging habitat to less than significant. The Staff Report recommends that mitigation for habitat loss occur within a minimum distance of 10 miles from known nest sites. CDFW has the following recommendations based on the Staff Report:

- For projects within 1 mile of an active nest tree, a minimum of one acre of habitat management (HM) land for each acre of development is advised.
- For projects within 5 miles of an active nest but greater than 1 mile, a minimum of 0.75 acres of HM land for each acre of development is advised.
- For projects within 10 miles of an active nest tree but greater than 5 miles from an active nest tree, a minimum of 0.5 acres of HM land for each acre of development is advised.

### **California Tiger Salamander:**

**Specific Impacts:** The State-listed threatened California tiger salamander (*Ambystoma californiense*; CTS) is known to be present in Merced County, and CDFW has jurisdiction over this species under CESA. CDFW believes potential impacts to this species could occur if ground-disturbance such as discing, ripping, or grading were to occur in CTS habitat and the appropriate avoidance, minimization, and mitigation measures are not implemented. Potential impacts include loss of upland refugia or breeding sites and potential take of CTS.

**CTS Mitigation Measure 1:** Prior to any ground-disturbing activities, CDFW requests potential Project-related impacts to this species in and around the Project footprint be evaluated by a qualified biologist using the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* issued by CDFW and the United States Fish and Wildlife Service in 2003. The protocol requires that surveys be conducted during at least two seasons, with sufficient precipitation, to be considered complete.

**CTS Mitigation Measure 2:** If protocol-level surveys show that CTS is present in the Project site, consultation with CDFW is warranted to determine if take of CTS can be avoided. If take cannot be avoided, take authorization would occur through the issuance of an ITP, pursuant to Fish and Game Code § 2081(b) is necessary to comply with CESA. In the absence of protocol surveys, the applicant can assume presence of CTS within the Project area and immediately focus on obtaining an ITP.

### **Tricolored blackbird:**

**Specific impacts:** The tricolored blackbird (*Agelaius tricolor*) was recently petitioned for emergency listing as Endangered under the Endangered Species Act. A State resident, the tricolored blackbird is partly migratory within the Sacramento-San Joaquin drainage system and breeds in the San Joaquin Valley. Important site for nesting colonies include heavy growths of cattails, tules, thistles, willows, blackberries, mustard, nettles, salt cedar, giant cane, and wild rose near fresh water and marshy areas. Flooded lands, grassy fields and margins of ponds are typical foraging grounds (Grinnel and Miller, 1944).

**Tricolor blackbird Mitigation Measure 1:** CDFW recommends the environmental document prepared for this Project address avoidance, mitigation, and minimization measures to offset impacts to this species.

**Tricolor blackbird Mitigation Measure 2:** If tricolored blackbird is identified during surveys within the Project site, consultation with CDFW is warranted to determine if the Project can avoid take. If take cannot be avoided, take authorization would occur

through the issuance of an ITP, pursuant to Fish and Game Code § 2081(b) is necessary to comply with CESA.

### **Special Status Plant Species:**

**Specific impacts:** There is the potential for multiple special status plant species to occur on the Project site.

**Plants Mitigation Measure 1:** CDFW recommends surveys of the Project site for special status plants by a qualified botanist following the "*Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*" (November 24, 2009). This protocol, intended to maximize detectability, includes the identification of reference populations to facilitate the likelihood of field investigations occurring during the appropriate floristic period. In the absence of protocol-level surveys being performed, additional surveys may be necessary.

**Plants Mitigation Measure 2:** CDFW recommends avoidance of special status plant species whenever possible by delineation and observing a no-disturbance buffer of at least 50 feet from the outer edge of the plant population(s) or specific habitat type(s) required by special status plant species. If buffers cannot be maintained, then consultation with CDFW is warranted to determine appropriate minimization and mitigation measures for impacts to special status plant species.

### **ENVIRONMENTAL DATA**

CEQA requires that information developed in environmental impact reports and negative declarations be incorporated into a database that may be used to make subsequent or supplemental environmental determinations. (Pub. Resources Code, § 21003, subd. (e).) Accordingly, please report any special status species and natural communities detected during Project surveys to the California Natural Diversity Database (CNDDB). The CNDDB field survey form can be found at the following link: <https://www.wildlife.ca.gov/Data/CNDDB/Submitting-Data>. The completed form can be mailed electronically to CNDDB at the following email address: [CNDDB@wildlife.ca.gov](mailto:CNDDB@wildlife.ca.gov). The types of information reported to CNDDB can be found at the following link: <https://www.wildlife.ca.gov/Data/CNDDB/Plants-and-Animals>.

### **FILING FEES**

The Project, as proposed, would have an impact on fish and/or wildlife, and assessment of filing fees is necessary. Fees are payable upon filing of the Notice of Determination by the Lead Agency and serve to help defray the cost of environmental review by CDFW. Payment of the fee is required in order for the underlying project approval to be

Bryan Kelly  
Merced Irrigation District  
June 14, 2017  
Page 6

operative, vested, and final. (Cal. Code Regs, tit. 14, § 753.5; Fish & G. Code, § 711.4; Pub. Resources Code, § 21089.)

## **CONCLUSION**

CDFW appreciates the opportunity to comment on the NOP to assist Merced Irrigation District in identifying and mitigating Project impacts on biological resources.

Questions regarding this letter or further coordination should be directed to Jim Vang, Environmental Scientist, at (559)243-4014 extension 254 or [Jim.Vang@wildlife.ca.gov](mailto:Jim.Vang@wildlife.ca.gov).

Sincerely,



Julie A. Vance  
Regional Manager

## REFERENCES

CDFG, 1994. Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (*Buteo Swainsoni*) in the Central Valley of California. California Department of Fish and Game.

CDFG, 2003. *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander*. California Department of Fish and Game. 2003.

CDFG, 2009. *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. California Department of Fish and Game, November 2009.

Grinnel, J., and A. H. Miller. 1944. The Distribution of the Birds of California. Pacific Coast Avifauna 27.

SWHA TAC, 2000. Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley. Swainson's Hawk Technical Advisory Committee, May 31, 2000.

## NATIVE AMERICAN HERITAGE COMMISSION

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June 22, 2017

Bryan Kelly  
Merced Irrigation District  
744 W. 20<sup>th</sup> Street  
Merced, CA 95340

RE: SCH# 2017051054, Merced Irrigation District Water Resources Management Plan Program EIR, Merced County

Dear Mr. Kelly:

The Native American Heritage Commission has received the Notice of Preparation (NOP) for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code § 21000 et seq.), specifically Public Resources Code section 21084.1, states that a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit. 14, § 15064.5 (b) (CEQA Guidelines Section 15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an environmental impact report (EIR) shall be prepared. (Pub. Resources Code § 21080 (d); Cal. Code Regs., tit. 14, § 15064 subd.(a)(1) (CEQA Guidelines § 15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources with the area of project effect (APE).

**CEQA was amended significantly in 2014.** Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code § 21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code § 21084.3 (a)). **AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements.** If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. § 800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments. **Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.**

#### AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or

tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:

- a. A brief description of the project.
- b. The lead agency contact information.
- c. Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code § 21080.3.1 (d)).
- d. A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code § 21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code § 21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or environmental impact report. (Pub. Resources Code § 21080.3.1(b)).
  - a. For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code § 65352.4 (SB 18). (Pub. Resources Code § 21080.3.1 (b)).
3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:
  - a. Alternatives to the project.
  - b. Recommended mitigation measures.
  - c. Significant effects. (Pub. Resources Code § 21080.3.2 (a)).
4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:
  - a. Type of environmental review necessary.
  - b. Significance of the tribal cultural resources.
  - c. Significance of the project's impacts on tribal cultural resources.
  - d. If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code § 21080.3.2 (a)).
5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code sections 6254 (r) and 6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code § 21082.3 (c)(1)).
6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:
  - a. Whether the proposed project has a significant impact on an identified tribal cultural resource.
  - b. Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code section 21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code § 21082.3 (b)).
7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:
  - a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or
  - b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code § 21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code section 21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code section 21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code § 21082.3 (a)).
9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code section 21084.3 (b). (Pub. Resources Code § 21082.3 (e)).
10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:
  - a. Avoidance and preservation of the resources in place, including, but not limited to:
    - i. Planning and construction to avoid the resources and protect the cultural and natural context.
    - ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
  - b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
    - i. Protecting the cultural character and integrity of the resource.
    - ii. Protecting the traditional use of the resource.
    - iii. Protecting the confidentiality of the resource.
  - c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
  - d. Protecting the resource. (Pub. Resource Code § 21084.3 (b)).
  - e. Please note that a federally recognized California Native American tribe or a nonfederally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code § 815.3 (c)).
  - f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code § 5097.991).
11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An environmental impact report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:
  - a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code sections 21080.3.1 and 21080.3.2 and concluded pursuant to Public Resources Code section 21080.3.2.
  - b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
  - c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code section 21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code § 21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: [http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation\\_CalEPAPDF.pdf](http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf)

## SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code § 65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: [https://www.opr.ca.gov/docs/09\\_14\\_05\\_Updated\\_Guidelines\\_922.pdf](https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf)

Some of SB 18's provisions include:

1. **Tribal Consultation:** If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code § 65352.3 (a)(2)).
2. **No Statutory Time Limit on SB 18 Tribal Consultation.** There is no statutory time limit on SB 18 tribal consultation.
3. **Confidentiality:** Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code section 65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code sections 5097.9 and 5097.993 that are within the city's or county's jurisdiction. (Gov. Code § 65352.3 (b)).
4. **Conclusion of SB 18 Tribal Consultation:** Consultation should be concluded at the point in which:
  - a. The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
  - b. Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: <http://nahc.ca.gov/resources/forms/>

#### NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center ([http://ohp.parks.ca.gov/?page\\_id=1068](http://ohp.parks.ca.gov/?page_id=1068)) for an archaeological records search. The records search will determine:
  - a. If part or all of the APE has been previously surveyed for cultural resources.
  - b. If any known cultural resources have been already been recorded on or adjacent to the APE.
  - c. If the probability is low, moderate, or high that cultural resources are located in the APE.
  - d. If a survey is required to determine whether previously unrecorded cultural resources are present.
2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
  - a. The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
  - b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.
3. Contact the NAHC for:
  - a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.

- b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.
- 4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
  - a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, section 15064.5(f) (CEQA Guidelines section 15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
  - b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
  - c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code section 7050.5, Public Resources Code section 5097.98, and Cal. Code Regs., tit. 14, section 15064.5, subdivisions (d) and (e) (CEQA Guidelines section 15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions, please contact me at my email address: [sharaya.souza@nahc.ca.gov](mailto:sharaya.souza@nahc.ca.gov).

Sincerely,



Sharaya Souza  
Staff Services Analyst  
cc: State Clearinghouse

## Appendix C

### Emissions Calculations

Project Schedule and Potential Overlapping in Each Analysis Year

Projects	Total Construction Duration	Max. Construction Months per year	Construction Schedule	Potential Number of Projects In Each Year																																	
				2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050		
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	24	12	2021-2022			1	1																														
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	24	12	2021-2022			1	1																														
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	12	6	2021-2022			1	1																														
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	12	6	2021-2022			1	1																														
Canal rebuilding/relining	6	6	2019 - 2032: 3 projects per year. 2033 - 2040: 5 projects per year.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	5	5	5	5	5	5	5												
Table topping deadend facilities	1	1	2019 - 2033: 2 projects per year. 2034 - 2050: 12 projects per year.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
Canal Automation	6	6	5 projects per year, total 6 years	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
Flow Measurement	2	2	5 projects per year, total 30 years	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
Siphon modifications	4	4	5 projects per year, total 10 years	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
Siphon demolition	2	2	5 projects per year, total 10 years	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
Intertie projects	12	12	1 projects per year, total 11 years	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Reservoirs and Recharge Basins	18	12	2019, 2020, 2022, 2023, 2026, 2028, 2030, 2031: One project each 2024, 2029: 2 projects each	1	1	1	1	1	2	2	1	1	1	2	1	1	1																				
Highlands	4	4	2029, 2030:: 1 project, 2013: 4 projects, 2032: 3 projects											1	1	4	3																				
Owens Creek Diversion Channel	18	12	2030, 2031: 1 project												1	1	1																				
Black Rascal Diversion Channel	6	6	2030: 1 project													1																					
Merced River Water Recovery	12	12	2022				1																														
Le Grand Canal near Black Rascal Automation Project	8	8	2020 or 2021		1	1																															
Northside Canal Flumes	4	4	2022				1																														

Note:  
For project with unkown constructionyears, it was assumed that the construction could occur in any given year.

Analysis Year: 2021  
Construction Emissions Summary

Total Emissions Summary (by Project)		2021													
Onsite Equipment	Number	Maximum Daily Emissions							Annual Emissions						
		ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
		lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	equipment	21.855	226.448	135.995	0.371	9.165	8.434	35139.703	0.935	9.869	5.565	0.015	0.405	0.372	1264.242
	vehicles	0.325	9.590	3.284	0.043	0.514	0.284	4642.521	0.013	0.296	0.282	0.002	0.024	0.012	178.197
	dust	NA	NA	NA	NA	71.603	18.295	NA	NA	NA	NA	NA	5.145	1.211	NA
	Sub Total	22.180	236.038	139.279	0.414	81.282	27.013	39782.224	0.948	10.165	5.847	0.017	5.573	1.595	1442.439
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	equipment	19.611	202.497	124.731	0.341	8.137	7.490	32271.238	1.016	10.558	6.103	0.016	0.436	0.401	1397.930
	vehicles	0.325	9.590	3.284	0.043	0.514	0.284	4642.521	0.006	0.077	0.255	0.001	0.014	0.006	94.509
	dust	NA	NA	NA	NA	59.761	14.357	NA	NA	NA	NA	NA	4.729	1.220	NA
	Sub Total	19.936	212.087	128.015	0.384	68.413	22.131	36913.759	1.023	10.635	6.358	0.017	5.179	1.627	1492.440
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	equipment	19.843	205.845	124.406	0.347	8.176	7.504	32819.098	0.571	5.971	3.411	0.009	0.244	0.224	789.828
	vehicles	0.278	8.024	3.093	0.037	0.445	0.244	3983.603	0.004	0.042	0.145	0.001	0.008	0.004	52.314
	dust	NA	NA	NA	NA	60.926	14.485	NA	NA	NA	NA	NA	2.699	0.665	NA
	Sub Total	20.122	213.870	127.499	0.383	69.547	22.233	36802.701	0.574	6.013	3.555	0.010	2.951	0.893	842.142
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	equipment	8.419	81.705	52.934	0.142	3.543	3.296	13431.018	0.419	4.039	2.609	0.007	0.177	0.165	594.855
	vehicles	0.250	7.085	2.978	0.033	0.404	0.220	3588.252	0.006	0.105	0.152	0.001	0.011	0.005	76.284
	dust	NA	NA	NA	NA	49.717	10.601	NA	NA	NA	NA	NA	2.504	0.565	NA
	Sub Total	8.669	88.789	55.912	0.175	53.665	14.117	17019.271	0.425	4.144	2.761	0.008	2.691	0.735	671.139
Canal rebuilding/relining	equipment	2.060	18.716	17.045	0.043	0.856	0.795	4104.611	0.057	0.509	0.455	0.001	0.023	0.021	101.740
	vehicles	0.095	2.327	1.666	0.013	0.157	0.082	1350.841	0.003	0.077	0.055	0.000	0.005	0.003	40.441
	dust	NA	NA	NA	NA	17.129	1.797	NA	NA	NA	NA	NA	0.566	0.059	NA
	Sub Total	2.154	21.043	18.711	0.056	18.142	2.674	5455.451	0.060	0.586	0.510	0.002	0.594	0.083	142.181
Table topping deadend facilities	equipment	1.912	17.071	14.996	0.041	0.754	0.703	3838.194	0.018	0.155	0.130	0.000	0.007	0.006	32.132
	vehicles	0.095	2.327	1.666	0.013	0.157	0.082	1350.841	0.001	0.026	0.018	0.000	0.002	0.001	13.480
	dust	NA	NA	NA	NA	17.201	1.808	NA	NA	NA	NA	NA	0.189	0.020	NA
	Sub Total	2.007	19.398	16.662	0.053	18.111	2.592	5189.035	0.019	0.181	0.148	0.001	0.198	0.027	45.612
Canal Automation	equipment	1.685	14.924	12.525	0.037	0.632	0.590	3502.821	0.036	0.318	0.276	0.001	0.014	0.013	67.897
	vehicles	0.120	3.787	0.783	0.015	0.181	0.104	1689.403	0.002	0.045	0.020	0.000	0.003	0.001	21.555
	dust	NA	NA	NA	NA	9.364	0.998	NA	NA	NA	NA	NA	0.253	0.027	NA
	Sub Total	1.804	18.711	13.308	0.052	10.177	1.692	5192.224	0.037	0.363	0.296	0.001	0.270	0.041	89.451
Flow Measurement	equipment	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	vehicles	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.000	0.001	0.000	0.000	0.000	0.297
	dust	NA	NA	NA	NA	0.920	0.096	NA	NA	NA	NA	NA	0.010	0.001	NA
	Sub Total	0.002	0.011	0.103	0.000	0.924	0.097	29.803	0.000	0.000	0.001	0.000	0.010	0.001	0.297
Siphon modifications	equipment	1.079	9.661	8.921	0.023	0.438	0.413	2224.319	0.022	0.193	0.178	0.000	0.009	0.008	40.358
	vehicles	0.025	0.655	0.401	0.003	0.044	0.023	371.567	0.000	0.013	0.006	0.000	0.001	0.000	6.336
	dust	NA	NA	NA	NA	4.630	0.486	NA	NA	NA	NA	NA	0.079	0.008	NA
	Sub Total	1.104	10.316	9.322	0.027	5.112	0.921	2595.886	0.022	0.206	0.185	0.001	0.088	0.017	46.694
Siphon demolition	equipment	1.685	14.924	12.525	0.037	0.632	0.590	3502.821	0.036	0.318	0.276	0.001	0.014	0.013	67.897
	vehicles	0.120	3.787	0.783	0.015	0.181	0.104	1689.403	0.001	0.044	0.011	0.000	0.002	0.001	18.433
	dust	NA	NA	NA	NA	9.364	0.998	NA	NA	NA	NA	NA	0.132	0.014	NA
	Sub Total	1.804	18.711	13.308	0.052	10.178	1.692	5192.224	0.037	0.363	0.286	0.001	0.148	0.028	86.330
Intertie projects	equipment	1.685	14.924	12.525	0.037	0.632	0.590	3502.821	0.097	0.862	0.688	0.002	0.035	0.032	187.479
	vehicles	0.149	3.923	2.226	0.020	0.246	0.131	2140.088	0.008	0.221	0.080	0.001	0.012	0.007	99.215
	dust	NA	NA	NA	NA	24.090	2.531	NA	NA	NA	NA	NA	0.971	0.102	NA
	Sub Total	1.834	18.847	14.751	0.057	24.968	3.252	5642.908	0.104	1.082	0.767	0.003	1.019	0.142	286.693
Reservoirs and Recharge Basins	equipment	12.168	117.130	75.181	0.224	4.765	4.397	21234.335	0.405	3.750	2.574	0.008	0.151	0.140	685.808
	vehicles	0.704	22.660	4.007	0.090	1.052	0.607	9898.090	0.029	0.870	0.270	0.004	0.046	0.025	375.441
	dust	NA	NA	NA	NA	62.643	12.040	NA	NA	NA	NA	NA	3.416	0.469	NA
	Sub Total	12.872	139.790	79.188	0.314	68.460	17.044	31132.424	0.434	4.620	2.844	0.012	3.612	0.634	1061.249
Highlands	equipment	2.251	21.584	16.086	0.051	0.872	0.810	4833.915	0.021	0.191	0.156	0.000	0.008	0.008	39.241
	vehicles	0.024	0.652	0.364	0.003	0.042	0.022	358.534	0.001	0.029	0.016	0.000	0.002	0.001	14.312
	dust	NA	NA	NA	NA	4.169	0.438	NA	NA	NA	NA	NA	0.183	0.019	NA
	Sub Total	2.276	22.236	16.450	0.054	5.082	1.270	5192.449	0.022	0.220	0.172	0.001	0.193	0.028	53.553

Analysis Year:

2021

Construction Emissions Summary

Owens Creek Diversion Channel	equipment	18.754	192.133	120.542	0.328	7.757	7.137	31054.761	0.531	5.526	3.240	0.008	0.230	0.212	720.593
	vehicles	0.072	1.950	1.070	0.010	0.127	0.067	1081.162	0.005	0.096	0.122	0.001	0.010	0.005	68.019
	dust	NA	NA	NA	NA	40.051	12.266	NA	NA	NA	NA	NA	2.605	0.671	NA
	Sub Total	18.826	194.082	121.612	0.338	47.935	19.470	32135.923	0.535	5.622	3.362	0.009	2.845	0.888	788.612
Black Rascal Diversion Channel	equipment	18.754	192.133	120.542	0.328	7.757	7.137	31054.761	0.102	1.062	0.629	0.002	0.044	0.041	138.518
	vehicles	0.076	1.968	1.292	0.011	0.140	0.072	1159.359	0.003	0.053	0.076	0.000	0.006	0.003	40.246
	dust	NA	NA	NA	NA	39.099	12.153	NA	NA	NA	NA	NA	1.122	0.194	NA
	Sub Total	18.830	194.100	121.834	0.339	46.995	19.361	32214.120	0.105	1.115	0.705	0.002	1.172	0.237	178.764
Merced River Water Recovery	equipment	5.399	53.528	33.771	0.085	2.429	2.258	8031.124	0.284	2.789	1.723	0.004	0.129	0.120	379.295
	vehicles	0.145	4.443	1.229	0.019	0.229	0.128	2083.299	0.006	0.162	0.109	0.001	0.012	0.006	86.928
	dust	NA	NA	NA	NA	28.551	8.372	NA	NA	NA	NA	NA	2.121	0.579	NA
	Sub Total	5.544	57.971	35.000	0.104	31.209	10.758	10114.423	0.291	2.950	1.832	0.005	2.262	0.704	466.223
Le Grand Canal near Black Rascal Automation Project	equipment	2.864	28.926	16.772	0.044	1.262	1.174	4203.191	0.098	0.893	0.760	0.002	0.040	0.037	177.407
	vehicles	0.103	3.172	0.854	0.014	0.162	0.091	1477.967	0.007	0.223	0.068	0.001	0.012	0.007	96.472
	dust	NA	NA	NA	NA	19.991	4.798	NA	NA	NA	NA	NA	0.861	0.103	NA
	Sub Total	2.967	32.098	17.627	0.058	21.415	6.063	5681.158	0.106	1.116	0.828	0.003	0.913	0.147	273.878
Northside Canal Flumes	equipment	2.671	27.612	15.292	0.041	1.197	1.099	3881.061	0.043	0.396	0.290	0.001	0.016	0.015	78.090
	vehicles	0.084	2.546	0.778	0.011	0.135	0.075	1214.400	0.003	0.099	0.033	0.000	0.005	0.003	43.693
	dust	NA	NA	NA	NA	21.166	4.925	NA	NA	NA	NA	NA	0.432	0.055	NA
	Sub Total	2.755	30.158	16.070	0.052	22.497	6.098	5095.461	0.046	0.496	0.322	0.001	0.454	0.073	121.782

Analysis Year: 2021  
Construction Emissions Summary

Total Emissions of Potential Overlapping Projects		2021																		
		Emissions/year Per Project									Total Emissions with Multiple Projects									
	Number of Projects	ROG	NOx	CO	SO <sub>2</sub>	PM10 Exhaust	PM2.5 Exhaust	Total PM <sub>10</sub>	Total PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM10 Exhaust	PM2.5 Exhaust	Total PM <sub>10</sub>	Total PM <sub>2.5</sub>	CO <sub>2</sub> e	
		ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year	
Main Canal Improvements at Tunnel No.1 Project	1	0.95	10.17	5.85	0.02	0.43	0.38	5.57	1.60	1442.44	0.95	10.17	5.85	0.02	0.43	0.38	5.57	1.60	1442.44	
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment																				
Main Canal Improvements at Tunnel No.1 Project	1	1.02	10.63	6.36	0.02	0.45	0.41	5.18	1.63	1492.44	1.02	10.63	6.36	0.02	0.45	0.41	5.18	1.63	1492.44	
Option 2: Open Channel on New Alignment North of the Existing Alignment																				
Main Canal Improvements at Tunnel No.1 Project	1	0.57	6.01	3.56	0.01	0.25	0.23	2.95	0.89	842.14	0.57	6.01	3.56	0.01	0.25	0.23	2.95	0.89	842.14	
Option 3: Open Channel along Existing Tunnel Alignment																				
Main Canal Improvements at Tunnel No.1 Project	1	0.42	4.14	2.76	0.01	0.19	0.17	2.69	0.74	671.14	0.42	4.14	2.76	0.01	0.19	0.17	2.69	0.74	671.14	
Option 4: Rehabilitation of Existing Tunnel																				
Canal rebuilding/relining	3	0.06	0.59	0.51	0.00	0.03	0.02	0.59	0.08	142.18	0.18	1.76	1.53	0.00	0.08	0.07	1.78	0.25	426.54	
Table topping deadend facilities	2	0.02	0.18	0.15	0.00	0.008	0.007	0.20	0.03	45.61	0.04	0.36	0.30	0.00	0.02	0.01	0.40	0.05	91.22	
Canal Automation	5	0.04	0.36	0.30	0.00	0.017	0.014	0.27	0.04	89.45	0.19	1.82	1.48	0.01	0.08	0.07	1.35	0.20	447.26	
Flow Measurement	5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.30	0.00	0.00	0.01	0.00	0.00	0.00	0.05	0.01	1.49	
Siphon modifications	5	0.02	0.21	0.18	0.00	0.01	0.01	0.09	0.02	46.69	0.11	1.03	0.92	0.00	0.05	0.04	0.44	0.08	233.47	
Siphon demolition	5	0.04	0.36	0.29	0.00	0.02	0.01	0.15	0.03	86.33	0.18	1.81	1.43	0.00	0.08	0.07	0.74	0.14	431.65	
Intertie projects	1	0.10	1.08	0.77	0.00	0.05	0.04	1.02	0.14	286.69	0.10	1.08	0.77	0.00	0.05	0.04	1.02	0.14	286.69	
Reservoirs and Recharge Basins	1	0.43	4.62	2.84	0.01	0.20	0.17	3.61	0.63	1061.25	0.43	4.62	2.84	0.01	0.20	0.17	3.61	0.63	1061.25	
Highlands	0	0.02	0.22	0.17	0.00	0.01	0.01	0.19	0.03	53.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Owens Creek Diversion Channel	0	0.54	5.62	3.36	0.01	0.24	0.22	2.84	0.89	788.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Black Rascal Diversion Channel	0	0.10	1.12	0.70	0.00	0.05	0.04	1.17	0.24	178.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Merced River Water Recovery	0	0.29	2.95	1.83	0.01	0.14	0.13	2.26	0.70	466.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Le Grand Canal near Black Rascal Automation Project	1	0.11	1.12	0.83	0.00	0.05	0.04	0.91	0.15	273.88	0.11	1.12	0.83	0.00	0.05	0.04	0.91	0.15	273.88	
Northside Canal Flumes	0	0.05	0.50	0.32	0.00	0.02	0.02	0.45	0.07	121.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Emissions of Potential Overlapping Projects in Analysis Year											2.36	24.23	16.46	0.05	1.06	0.93	15.87	3.29	4745.89	
SJVAPCD CEQA Thresholds											10	10	100	27	NA	NA	15	15	NA	

Analysis Year: 2021  
Onsite Equipment Emissions

Onsite Equipment Information and Emission Factors 2021																		
Projects	Equipment	Number	Operation Data				Emission Factor Year	CalEEMod Default Load Factor	CalEEMod Emission Factors (100% load)									
			HP per equipment	Days/Project per equipment	Days/Year per equipment	Hour/day per equipment			ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2</sub> e	
									g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New Alignment South of the Existing Alignment	Bulldozers with brush attachments	4	247	250	125	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110	
	Grader	3	187	200	100	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823	
	Backhoe	1	97	75	38	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Loader	2	97	190	95	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Dump Trucks	10	402	130	65	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Scrapers	8	367	180	90	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748	
	Excavator	2	158	100	50	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872	
	Compactor	2	8	180	90	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
	Water truck	1	402	260	130	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Small Crane (5 -10 ton)	1	231	15	8	8	2021	0.29	0.349	4.104	1.678	0.005	0.167	0.153	472.906	0.153	477.190	
	Generator	1	84	15	8	6	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111	
	Concrete Pump	1	84	50	25	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168	
Concrete Pump truck	1	402	50	25	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826		
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	Bulldozers with brush attachments	3	247	360	180	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110	
	Grader	2	187	240	120	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823	
	Backhoe	1	97	60	30	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Loader	1	97	360	180	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Dump Trucks	10	402	160	80	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Scrapers	8	367	180	90	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748	
	Excavator	2	158	100	50	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872	
	Compactor	2	8	180	90	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
	Water truck	1	402	410	205	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Generator	1	84	310	155	6	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111	
	Concrete Pump	1	84	30	15	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168	
	Small Crane (5 -10 ton)	1	231	30	15	6	2021	0.29	0.349	4.104	1.678	0.005	0.167	0.153	472.906	0.153	477.190	
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Bulldozers with brush attachments	3	247	190	95	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110	
	Grader	3	187	130	65	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823	
	Backhoe	1	97	30	15	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Loader	2	97	190	95	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Dump Trucks	10	402	80	40	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Scrapers	8	367	100	50	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748	
	Excavator	2	158	50	25	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872	
	Compactor	2	8	100	50	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
	Water truck	2	402	200	100	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Generator	0	84	150	75	6	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111	
	Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	Bulldozers with brush attachments	2	247	225	113	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110
		Grader	2	187	155	78	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823
Backhoe		1	97	10	5	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
Loader		3	97	230	115	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
Dump Trucks		5	402	183	92	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
Compactor		2	8	290	145	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
Water truck		1	402	260	130	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
Concrete Pump		2	84	190	95	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168	
Generator		2	84	230	115	6	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111	
Canal rebuilding/relining		Backhoe	1	97	60	60	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Loader	2	97	40	40	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Dump Trucks	1	402	60	60	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Excavator	1	158	40	40	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872	
	Water truck	1	402	60	60	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Concrete Pump	1	84	60	60	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168	
Table topping deadend facilities	Loader	2	97	10	10	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Dump Trucks	1	402	22	22	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Excavator	1	158	10	10	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872	
	Compactor	1	8	10	10	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
	Water truck	1	402	22	22	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Concrete Pump	1	84	22	22	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168	
Canal Automation	Backhoe	1	97	60	60	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674	
	Dump Trucks	1	402	20	20	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Excavator	1	158	60	60	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872	
	Water truck	1	402	60	60	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826	
	Concrete Pump	1	84	40	40	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168	

Analysis Year: 2021  
Onsite Equipment Emissions

Flow Measurement	N/A	0	0	0	0	0	2021	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Siphon modifications	Backhoe	1	97	40	40	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Excavator	1	158	40	40	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Water truck	1	402	40	40	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Concrete Pump	1	84	40	40	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168
Siphon demolition	Backhoe	1	97	60	60	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	1	402	20	20	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Excavator	1	158	60	60	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Water truck	1	402	60	60	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
Intertie projects	Concrete Pump	1	84	40	40	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168
	Backhoe	1	97	130	130	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	1	402	130	130	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Excavator	1	158	130	130	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
Reservoirs and Recharge Basins	Water truck	1	402	130	130	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Concrete Pump	1	84	40	40	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168
	Bulldozers with brush attachments	2	247	60	40	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110
	Grader	1	187	60	40	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823
	Backhoe	1	97	60	40	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Loader	1	97	60	40	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	10	402	100	67	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Scrapers	2	367	60	40	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748
	Excavator	1	158	60	40	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Compactor	2	8	60	40	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951
	Water truck	1	402	420	280	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Generator	1	84	180	120	8	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111
	Concrete Pump	1	84	180	120	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168
	25-ton crane	0	231	0	0	6	2021	0.29	0.349	4.104	1.678	0.005	0.167	0.153	472.906	0.153	477.190
Highlands	Power Screed	0	172	0	0	2	2021	0.42	0.330	3.438	3.183	0.005	0.180	0.165	469.764	0.152	474.020
	Backhoe	1	97	25	25	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	1	402	25	25	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Excavator	1	158	2	2	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Water truck	1	402	25	25	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Concrete Pump	1	84	25	25	6	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168
	Small Crane (5 -10 ton)	1	231	3	3	6	2021	0.29	0.349	4.104	1.678	0.005	0.167	0.153	472.906	0.153	477.190
Owens Creek Diversion Channel	Drill Rig	1	221	10	10	8	2021	0.5	0.132	1.551	1.064	0.005	0.047	0.043	467.992	0.151	472.220
	Bulldozers with brush attachments	3	247	148	99	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110
	Grader	1	187	95	63	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823
	Backhoe	1	97	15	10	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Loader	1	97	148	99	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	10	402	55	37	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Scrapers	8	367	80	53	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748
	Excavator	2	158	50	33	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Compactor	2	8	80	53	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951
	Water truck	1	402	148	99	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Generator	1	84	130	87	6	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111
Black Rascal Diversion Channel	Concrete Pump	1	84	10	7	4	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168
	Bulldozers with brush attachments	3	247	19	19	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110
	Grader	1	187	12	12	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823
	Backhoe	1	97	8	8	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Loader	1	97	19	19	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	10	402	7	7	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Scrapers	8	367	10	10	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748
	Excavator	2	158	6	6	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Compactor	2	8	10	10	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951
	Water truck	1	402	19	19	6	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Generator	1	84	16	16	6	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111
Merced River Water Recovery	Concrete Pump	1	84	10	10	4	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168
	Bulldozers with brush attachments	2	247	133	133	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110
	Grader	1	187	12	12	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823
	Backhoe	1	97	21	21	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Loader	2	97	145	145	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	1	402	40	40	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Scrapers	0	367	0	0	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748
	Excavator	2	158	165	165	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Compactor	1	8	5	5	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951
	Water truck	1	402	165	165	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Generator	1	84	71	71	8	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111
	Concrete Pump	1	84	71	71	8	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168

Analysis Year:

2021

Onsite Equipment Emissions

Le Grand Canal near Black Rascal Automation Project	Bulldozers with brush attachments	1	247	9	9	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110
	Grader	1	187	9	9	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823
	Backhoe	0	97	0	0	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Loader	1	97	147	147	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	0	402	0	0	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Scrapers	0	367	0	0	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748
	Excavator	1	158	147	147	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Compactor	1	8	10	10	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951
	Water truck	1	402	147	147	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Generator	0	84	0	0	8	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111
	Concrete Pump	1	84	116	116	8	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168
Northside Canal Flumes	Bulldozers with brush attachments	1	247	7	7	8	2021	0.4	0.600	6.296	2.317	0.005	0.306	0.281	474.798	0.154	479.110
	Grader	1	187	7	7	8	2021	0.41	0.335	4.381	1.307	0.005	0.139	0.128	474.539	0.153	478.823
	Backhoe	1	97	8	8	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Loader	1	97	60	60	8	2021	0.37	0.296	2.995	3.571	0.005	0.177	0.162	475.362	0.154	479.674
	Dump Trucks	0	402	0	0	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Scrapers	0	367	0	0	8	2021	0.48	0.299	3.445	2.255	0.005	0.134	0.123	472.464	0.153	476.748
	Excavator	1	158	60	60	8	2021	0.38	0.143	1.332	1.088	0.005	0.045	0.041	469.616	0.152	473.872
	Compactor	1	8	10	10	8	2021	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951
	Water truck	1	402	87	87	8	2021	0.38	0.225	1.954	1.338	0.005	0.072	0.066	474.542	0.153	478.826
	Generator	0	84	0	0	8	2021	0.74	0.326	2.888	3.361	0.006	0.153	0.153	568.299	0.029	569.111
	Concrete Pump	1	84	87	87	8	2021	0.74	0.347	2.928	3.412	0.006	0.162	0.162	568.300	0.031	569.168

Assumptions:

- CO2e were calculated using the following global warming potential (GWP, 100-year GWP from IPCC Fifth Assessment Report , 2014)

CO2 1

CH4 28

N2O 265
- Load factor and emission factors are from CalEEMod Appendix D: Table 3.4 Offroad Equipment Emission Factors (g/hp-hr) and Table 3.3 OFFROAD Default Horsepower and Load Factors (October 2017)

Analysis Year: 2021  
Onsite Equipment Emissions

Onsite Equipment Emissions																
Projects	Onsite Equipment	Daily Emissions							Annual Emissions							
		ROG lb/day	NOx lb/day	CO lb/day	SO <sub>2</sub> lb/day	PM <sub>10</sub> lb/day	PM <sub>2.5</sub> lb/day	CO <sub>2</sub> e lb/day	ROG ton/year	NOx ton/year	CO ton/year	SO <sub>2</sub> ton/year	PM <sub>10</sub> ton/year	PM <sub>2.5</sub> ton/year	CO <sub>2</sub> e MT/year	
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New Alignment South of the Existing Alignment	Bulldozers with brush attachments	4.18	43.88	16.15	0.03	2.13	1.96	3309.35	0.261	2.743	1.009	0.002	0.133	0.122	187.640	
	Grader	1.36	17.77	5.30	0.02	0.56	0.52	1925.02	0.068	0.889	0.265	0.001	0.028	0.026	87.319	
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.004	0.036	0.043	0.000	0.002	0.002	5.186	
	Loader	0.37	3.79	4.52	0.01	0.22	0.21	601.79	0.018	0.180	0.215	0.000	0.011	0.010	25.932	
	Dump Trucks	6.06	52.63	36.04	0.13	1.94	1.78	12785.02	0.197	1.711	1.171	0.004	0.063	0.058	376.953	
	Scrapers	7.43	85.62	56.04	0.12	3.33	3.06	11743.10	0.334	3.853	2.522	0.006	0.150	0.138	479.400	
	Excavator	0.30	2.82	2.30	0.01	0.10	0.09	994.56	0.008	0.071	0.058	0.000	0.002	0.002	22.557	
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.004	0.023	0.019	0.000	0.001	0.001	2.815	
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.030	0.257	0.176	0.001	0.009	0.009	56.543	
	Small Crane (5 -10 ton)	0.41	4.85	1.98	0.01	0.20	0.18	558.73	0.002	0.019	0.008	0.000	0.001	0.001	2.028	
	Generator	0.27	2.37	2.76	0.00	0.13	0.13	467.27	0.001	0.009	0.011	0.000	0.001	0.001	1.696	
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.004	0.030	0.035	0.000	0.002	0.002	5.299	
Concrete Pump truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.006	0.049	0.034	0.000	0.002	0.002	10.874		
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	Bulldozers with brush attachments	3.14	32.91	12.11	0.03	1.60	1.47	2482.01	0.282	2.962	1.090	0.002	0.144	0.132	202.652	
	Grader	0.91	11.85	3.53	0.01	0.38	0.35	1283.35	0.054	0.711	0.212	0.001	0.023	0.021	69.855	
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.003	0.028	0.034	0.000	0.002	0.002	4.095	
	Loader	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.017	0.171	0.203	0.000	0.010	0.009	24.567	
	Dump Trucks	6.06	52.63	36.04	0.13	1.94	1.78	12785.02	0.242	2.105	1.442	0.005	0.078	0.071	463.943	
	Scrapers	7.43	85.62	56.04	0.12	3.33	3.06	11743.10	0.334	3.853	2.522	0.006	0.150	0.138	479.400	
	Excavator	0.30	2.82	2.30	0.01	0.10	0.09	994.56	0.008	0.071	0.058	0.000	0.002	0.002	22.557	
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.004	0.023	0.019	0.000	0.001	0.001	2.815	
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.047	0.405	0.277	0.001	0.015	0.014	89.164	
	Generator	0.27	2.37	2.76	0.00	0.13	0.13	467.27	0.021	0.184	0.214	0.000	0.010	0.010	32.853	
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.002	0.018	0.021	0.000	0.001	0.001	3.179	
	Small Crane (5 -10 ton)	0.31	3.64	1.49	0.00	0.15	0.14	419.05	0.002	0.027	0.011	0.000	0.001	0.001	2.851	
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Bulldozers with brush attachments	3.14	32.91	12.11	0.03	1.60	1.47	2482.01	0.149	1.563	0.575	0.001	0.076	0.070	106.955	
	Grader	1.36	17.77	5.30	0.02	0.56	0.52	1925.02	0.044	0.578	0.172	0.001	0.018	0.017	56.757	
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.001	0.014	0.017	0.000	0.001	0.001	2.047	
	Loader	0.37	3.79	4.52	0.01	0.22	0.21	601.79	0.018	0.180	0.215	0.000	0.011	0.010	25.932	
	Dump Trucks	6.06	52.63	36.04	0.13	1.94	1.78	12785.02	0.121	1.053	0.721	0.003	0.039	0.036	231.971	
	Scrapers	7.43	85.62	56.04	0.12	3.33	3.06	11743.10	0.186	2.141	1.401	0.003	0.083	0.076	266.333	
	Excavator	0.30	2.82	2.30	0.01	0.10	0.09	994.56	0.004	0.035	0.029	0.000	0.001	0.001	11.278	
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.002	0.013	0.011	0.000	0.000	0.000	1.564	
	Water truck	0.91	7.89	5.41	0.02	0.29	0.27	1917.75	0.045	0.395	0.270	0.001	0.015	0.013	86.989	
	Generator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	Bulldozers with brush attachments	2.09	21.94	8.08	0.02	1.07	0.98	1654.68	0.118	1.240	0.456	0.001	0.060	0.055	84.813	
	Grader	0.91	11.85	3.53	0.01	0.38	0.35	1283.35	0.035	0.462	0.138	0.001	0.015	0.014	45.406	
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.000	0.005	0.006	0.000	0.000	0.000	0.682	
	Loader	0.56	5.69	6.78	0.01	0.34	0.31	902.68	0.032	0.327	0.390	0.001	0.019	0.018	47.088	
	Dump Trucks	3.03	26.32	18.02	0.07	0.97	0.89	6392.51	0.139	1.211	0.829	0.003	0.045	0.041	266.767	
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.006	0.036	0.031	0.000	0.001	0.001	4.535	
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.030	0.257	0.176	0.001	0.009	0.009	56.543	
	Concrete Pump	0.57	4.81	5.61	0.01	0.27	0.27	934.54	0.027	0.229	0.267	0.000	0.013	0.013	40.271	
Generator	0.54	4.75	5.53	0.01	0.25	0.25	934.54	0.031	0.273	0.318	0.001	0.014	0.014	48.749		
Canal rebuilding/relining	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.006	0.057	0.068	0.000	0.003	0.003	8.189	
	Loader	0.37	3.79	4.52	0.01	0.22	0.21	601.79	0.007	0.076	0.090	0.000	0.004	0.004	10.919	
	Dump Trucks	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.018	0.158	0.108	0.000	0.006	0.005	34.796	
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.003	0.028	0.023	0.000	0.001	0.001	9.023	
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.014	0.118	0.081	0.000	0.004	0.004	26.097	
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.009	0.072	0.084	0.000	0.004	0.004	12.717	
Table topping deadend facilities	Loader	0.37	3.79	4.52	0.01	0.22	0.21	601.79	0.002	0.019	0.023	0.000	0.001	0.001	2.730	
	Dump Trucks	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.007	0.058	0.040	0.000	0.002	0.002	12.758	
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.001	0.007	0.006	0.000	0.000	0.000	2.256	
	Compactor	0.04	0.25	0.21	0.00	0.01	0.01	34.48	0.000	0.001	0.001	0.000	0.000	0.000	0.156	
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.005	0.043	0.030	0.000	0.002	0.001	9.569	
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.003	0.026	0.031	0.000	0.001	0.001	4.663	
Canal Automation	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.006	0.057	0.068	0.000	0.003	0.003	8.189	
	Dump Trucks	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.006	0.053	0.036	0.000	0.002	0.002	11.599	
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.005	0.042	0.035	0.000	0.001	0.001	13.534	
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.014	0.118	0.081	0.000	0.004	0.004	26.097	
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.006	0.048	0.056	0.000	0.003	0.003	8.478	

Analysis Year:

2021

Onsite Equipment Emissions

Flow Measurement	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Siphon modifications	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.004	0.038	0.045	0.000	0.002	0.002	5.459
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.003	0.028	0.023	0.000	0.001	0.001	9.023
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.009	0.079	0.054	0.000	0.003	0.003	17.398
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.006	0.048	0.056	0.000	0.003	0.003	8.478
Siphon demolition	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.006	0.057	0.068	0.000	0.003	0.003	8.189
	Dump Trucks	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.006	0.053	0.036	0.000	0.002	0.002	11.599
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.005	0.042	0.035	0.000	0.001	0.001	13.534
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.014	0.118	0.081	0.000	0.004	0.004	26.097
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.006	0.048	0.056	0.000	0.003	0.003	8.478
Intertie projects	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.012	0.123	0.147	0.000	0.007	0.007	17.743
	Dump Trucks	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.039	0.342	0.234	0.001	0.013	0.012	75.391
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.010	0.092	0.075	0.000	0.003	0.003	29.324
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.030	0.257	0.176	0.001	0.009	0.009	56.543
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.006	0.048	0.056	0.000	0.003	0.003	8.478
Reservoirs and Recharge Basins	Bulldozers with brush attachments	2.09	21.94	8.08	0.02	1.07	0.98	1654.68	0.042	0.439	0.162	0.000	0.021	0.020	30.022
	Grader	0.45	5.92	1.77	0.01	0.19	0.17	641.67	0.009	0.118	0.035	0.000	0.004	0.003	11.643
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.004	0.038	0.045	0.000	0.002	0.002	5.459
	Loader	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.004	0.038	0.045	0.000	0.002	0.002	5.459
	Dump Trucks	6.06	52.63	36.04	0.13	1.94	1.78	12785.02	0.203	1.763	1.207	0.005	0.065	0.060	388.552
	Scrapers	1.86	21.41	14.01	0.03	0.83	0.76	2935.77	0.037	0.428	0.280	0.001	0.017	0.015	53.267
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.003	0.028	0.023	0.000	0.001	0.001	9.023
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.002	0.010	0.008	0.000	0.000	0.000	1.251
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.064	0.553	0.378	0.001	0.020	0.019	121.785
	Generator	0.36	3.17	3.68	0.01	0.17	0.17	623.02	0.021	0.190	0.221	0.000	0.010	0.010	33.912
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.017	0.144	0.168	0.000	0.008	0.008	25.434
	25-ton crane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Power Screed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Highlands	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.002	0.024	0.028	0.000	0.001	0.001	3.412
	Dump Trucks	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.008	0.066	0.045	0.000	0.002	0.002	14.498
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.000	0.001	0.001	0.000	0.000	0.000	0.451
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.006	0.049	0.034	0.000	0.002	0.002	10.874
	Concrete Pump	0.29	2.41	2.81	0.00	0.13	0.13	467.27	0.004	0.030	0.035	0.000	0.002	0.002	5.299
	Small Crane (5 -10 ton)	0.31	3.64	1.49	0.00	0.15	0.14	419.05	0.000	0.005	0.002	0.000	0.000	0.000	0.570
	Drill Rig	0.26	3.02	2.07	0.01	0.09	0.08	912.05	0.001	0.015	0.010	0.000	0.000	0.000	4.137
Owens Creek Diversion Channel	Bulldozers with brush attachments	3.14	32.91	12.11	0.03	1.60	1.47	2482.01	0.155	1.629	0.600	0.001	0.079	0.073	111.458
	Grader	0.45	5.92	1.77	0.01	0.19	0.17	641.67	0.014	0.187	0.056	0.000	0.006	0.005	18.337
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.001	0.009	0.011	0.000	0.001	0.001	1.365
	Loader	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.009	0.094	0.112	0.000	0.006	0.005	13.512
	Dump Trucks	6.06	52.63	36.04	0.13	1.94	1.78	12785.02	0.112	0.974	0.667	0.002	0.036	0.033	214.573
	Scrapers	7.43	85.62	56.04	0.12	3.33	3.06	11743.10	0.197	2.269	1.485	0.003	0.088	0.081	282.313
	Excavator	0.30	2.82	2.30	0.01	0.10	0.09	994.56	0.005	0.047	0.038	0.000	0.002	0.001	14.887
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.002	0.013	0.011	0.000	0.001	0.001	1.658
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.023	0.195	0.134	0.001	0.007	0.007	43.060
	Generator	0.27	2.37	2.76	0.00	0.13	0.13	467.27	0.012	0.103	0.120	0.000	0.005	0.005	18.440
	Concrete Pump	0.19	1.60	1.87	0.00	0.09	0.09	311.51	0.001	0.006	0.007	0.000	0.000	0.000	0.989
Black Rascal Diversion Channel	Bulldozers with brush attachments	3.14	32.91	12.11	0.03	1.60	1.47	2482.01	0.030	0.313	0.115	0.000	0.015	0.014	21.391
	Grader	0.45	5.92	1.77	0.01	0.19	0.17	641.67	0.003	0.036	0.011	0.000	0.001	0.001	3.493
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.001	0.008	0.009	0.000	0.000	0.000	1.092
	Loader	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.002	0.018	0.021	0.000	0.001	0.001	2.593
	Dump Trucks	6.06	52.63	36.04	0.13	1.94	1.78	12785.02	0.021	0.184	0.126	0.000	0.007	0.006	40.595
	Scrapers	7.43	85.62	56.04	0.12	3.33	3.06	11743.10	0.037	0.428	0.280	0.001	0.017	0.015	53.267
	Excavator	0.30	2.82	2.30	0.01	0.10	0.09	994.56	0.001	0.008	0.007	0.000	0.000	0.000	2.707
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.000	0.003	0.002	0.000	0.000	0.000	0.313
	Water truck	0.45	3.95	2.70	0.01	0.15	0.13	958.88	0.004	0.038	0.026	0.000	0.001	0.001	8.264
	Generator	0.27	2.37	2.76	0.00	0.13	0.13	467.27	0.002	0.019	0.022	0.000	0.001	0.001	3.391
	Concrete Pump	0.19	1.60	1.87	0.00	0.09	0.09	311.51	0.001	0.008	0.009	0.000	0.000	0.000	1.413
Merced River Water Recovery	Bulldozers with brush attachments	2.09	21.94	8.08	0.02	1.07	0.98	1654.68	0.139	1.459	0.537	0.001	0.071	0.065	99.825
	Grader	0.45	5.92	1.77	0.01	0.19	0.17	641.67	0.003	0.036	0.011	0.000	0.001	0.001	3.493
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.002	0.020	0.024	0.000	0.001	0.001	2.866
	Loader	0.37	3.79	4.52	0.01	0.22	0.21	601.79	0.027	0.275	0.328	0.000	0.016	0.015	39.581
	Dump Trucks	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.012	0.105	0.072	0.000	0.004	0.004	23.197
	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Excavator	0.30	2.82	2.30	0.01	0.10	0.09	994.56	0.025	0.233	0.190	0.001	0.008	0.007	74.437
	Compactor	0.04	0.25	0.21	0.00	0.01	0.01	34.48	0.000	0.001	0.001	0.000	0.000	0.000	0.078
	Water truck	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.050	0.434	0.297	0.001	0.016	0.015	95.688
	Generator	0.36	3.17	3.68	0.01	0.17	0.17	623.02	0.013	0.112	0.131	0.000	0.006	0.006	20.065
	Concrete Pump	0.38	3.21	3.74	0.01	0.18	0.18	623.03	0.014	0.114	0.133	0.000	0.006	0.006	20.065

Analysis Year:

2021

Onsite Equipment Emissions

Le Grand Canal near Black Rascal Automation Project	Bulldozers with brush attachments	1.05	10.97	4.04	0.01	0.53	0.49	827.34	0.005	0.049	0.018	0.000	0.002	0.002	3.378
	Grader	0.45	5.92	1.77	0.01	0.19	0.17	641.67	0.002	0.027	0.008	0.000	0.001	0.001	2.620
	Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Loader	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.014	0.139	0.166	0.000	0.008	0.008	20.063
	Dump Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.011	0.104	0.085	0.000	0.004	0.003	33.158
	Compactor	0.04	0.25	0.21	0.00	0.01	0.01	34.48	0.000	0.001	0.001	0.000	0.000	0.000	0.156
	Water truck	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.045	0.387	0.265	0.001	0.014	0.013	85.249
	Generator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Concrete Pump	0.38	3.21	3.74	0.01	0.18	0.18	623.03	0.022	0.186	0.217	0.000	0.010	0.010	32.782
Northside Canal Flumes	Bulldozers with brush attachments	1.05	10.97	4.04	0.01	0.53	0.49	827.34	0.004	0.038	0.014	0.000	0.002	0.002	2.627
	Grader	0.45	5.92	1.77	0.01	0.19	0.17	641.67	0.002	0.021	0.006	0.000	0.001	0.001	2.037
	Backhoe	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.001	0.008	0.009	0.000	0.000	0.000	1.092
	Loader	0.19	1.90	2.26	0.00	0.11	0.10	300.89	0.006	0.057	0.068	0.000	0.003	0.003	8.189
	Dump Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Excavator	0.15	1.41	1.15	0.01	0.05	0.04	497.28	0.005	0.042	0.035	0.000	0.001	0.001	13.534
	Compactor	0.04	0.25	0.21	0.00	0.01	0.01	34.48	0.000	0.001	0.001	0.000	0.000	0.000	0.156
	Water truck	0.61	5.26	3.60	0.01	0.19	0.18	1278.50	0.026	0.229	0.157	0.001	0.008	0.008	50.454
	Generator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Concrete Pump	0.38	3.21	3.74	0.01	0.18	0.18	623.03	0.017	0.140	0.163	0.000	0.008	0.008	24.587

Total Equipment Emissions per Project

2021

Projects	Daily Emissions							Annual Emissions						
	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year
Main Canal Improvements at Tunnel No.1 Project														
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	21.85	226.45	136.00	0.37	9.17	8.43	35139.70	0.93	9.87	5.57	0.01	0.40	0.37	1264.24
Main Canal Improvements at Tunnel No.1 Project														
Option 2: Open Channel on New Alignment North of the Existing Alignment	19.61	202.50	124.73	0.34	8.14	7.49	32271.24	1.02	10.56	6.10	0.02	0.44	0.40	1397.93
Main Canal Improvements at Tunnel No.1 Project														
Option 3: Open Channel along Existing Tunnel Alignment	19.84	205.85	124.41	0.35	8.18	7.50	32819.10	0.57	5.97	3.41	0.01	0.24	0.22	789.83
Main Canal Improvements at Tunnel No.1 Project														
Option 4: Rehabilitation of Existing Tunnel	8.42	81.70	52.93	0.14	3.54	3.30	13431.02	0.42	4.04	2.61	0.01	0.18	0.16	594.86
Canal rebuilding/relining	2.06	18.72	17.05	0.04	0.86	0.80	4104.61	0.06	0.51	0.45	0.00	0.02	0.02	101.74
Table topping deadend facilities	1.91	17.07	15.00	0.04	0.75	0.70	3838.19	0.02	0.16	0.13	0.00	0.01	0.01	32.13
Canal Automation	1.68	14.92	12.52	0.04	0.63	0.59	3502.82	0.04	0.32	0.28	0.00	0.01	0.01	67.90
Flow Measurement	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siphon modifications	1.08	9.66	8.92	0.02	0.44	0.41	2224.32	0.02	0.19	0.18	0.00	0.01	0.01	40.36
Siphon demolition	1.68	14.92	12.52	0.04	0.63	0.59	3502.82	0.04	0.32	0.28	0.00	0.01	0.01	67.90
Intertie projects	1.68	14.92	12.52	0.04	0.63	0.59	3502.82	0.10	0.86	0.69	0.00	0.04	0.03	187.48
Reservoirs and Recharge Basins	12.17	117.13	75.18	0.22	4.76	4.40	21234.33	0.41	3.75	2.57	0.01	0.15	0.14	685.81
Highlands	2.25	21.58	16.09	0.05	0.87	0.81	4833.91	0.02	0.19	0.16	0.00	0.01	0.01	39.24
Owens Creek Diversion Channel	18.75	192.13	120.54	0.33	7.76	7.14	31054.76	0.53	5.53	3.24	0.01	0.23	0.21	720.59
Black Rascal Diversion Channel	18.75	192.13	120.54	0.33	7.76	7.14	31054.76	0.10	1.06	0.63	0.00	0.04	0.04	138.52
Merced River Water Recovery	5.40	53.53	33.77	0.08	2.43	2.26	8031.12	0.28	2.79	1.72	0.00	0.13	0.12	379.29
Le Grand Canal near Black Rascal Automation Project	2.86	28.93	16.77	0.04	1.26	1.17	4203.19	0.10	0.89	0.76	0.00	0.04	0.04	177.41
Northside Canal Flumes	2.67	27.61	15.29	0.04	1.20	1.10	3881.06	0.04	0.40	0.29	0.00	0.02	0.01	78.09

Analysis Year:

2021

Vehicle Emissions

Vehicle Emission Factors (EMFAC2014)

2021

	Year	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
		g/mile	g/mile	g/mile	g/mile	g/mile	g/mile	g/mile
Worker Commute	2021	0.015	0.068	0.837	0.003	0.046	0.019	295.585
Haul Trucks, Ready Mix Trucks	2021	0.107	3.551	0.434	0.014	0.156	0.092	1494.426
pickup	2021	0.025	0.119	1.167	0.003	0.045	0.019	337.963

Note:

Vehicle emission factors were obtained from EMFAC2014:

Region: SJVAPCD

Speed and model year: aggregated

EMFACT2014 does not provide emissions of N2O and CH4 from vehicles. CO2e emissions were assumed to be the same as CO2.

Worker commute vehicles include auto and light duty trucks.

Haul trucks and ready mix trucks include heavy heavy duty diesel trucks.

Vehicle Emissions

2021

Projects	Vehicle Types	Round Trips/day	miles/round trip	days/year	Daily Emissions							Annual Emissions						
					ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
					lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	Worker Commute	30	20	264	0.020	0.090	1.107	0.004	0.061	0.025	390.986	0.003	0.012	0.146	0.001	0.008	0.003	46.821
	Haul Truck	20	40	80	0.189	6.263	0.765	0.024	0.275	0.162	2635.672	0.008	0.251	0.031	0.001	0.011	0.006	95.643
	Ready Mix Trucks	10	40	15	0.094	3.132	0.383	0.012	0.138	0.081	1317.836	0.001	0.023	0.003	0.000	0.001	0.001	8.967
	pickup	20	20	198	0.022	0.105	1.029	0.003	0.040	0.017	298.027	0.002	0.010	0.102	0.000	0.004	0.002	26.767
	Worker Commute	30	20	264	0.020	0.090	1.107	0.004	0.061	0.025	390.986	0.003	0.012	0.146	0.001	0.008	0.003	46.821
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	Haul Truck	20	40	5	0.189	6.263	0.765	0.024	0.275	0.162	2635.672	0.000	0.016	0.002	0.000	0.001	0.000	5.978
	Ready Mix Trucks	10	40	25	0.094	3.132	0.383	0.012	0.138	0.081	1317.836	0.001	0.039	0.005	0.000	0.002	0.001	14.944
	pickup	20	20	198	0.022	0.105	1.029	0.003	0.040	0.017	298.027	0.002	0.010	0.102	0.000	0.004	0.002	26.767
	Worker Commute	30	20	132	0.020	0.090	1.107	0.004	0.061	0.025	390.986	0.001	0.006	0.073	0.000	0.004	0.002	23.410
	Haul Truck	20	40	8	0.189	6.263	0.765	0.024	0.275	0.162	2635.672	0.001	0.025	0.003	0.000	0.001	0.001	9.564
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Ready Mix Trucks	5	40	5	0.047	1.566	0.191	0.006	0.069	0.040	658.918	0.000	0.004	0.000	0.000	0.000	0.000	1.494
	pickup	20	20	132	0.022	0.105	1.029	0.003	0.040	0.017	298.027	0.001	0.007	0.068	0.000	0.003	0.001	17.844
	Worker Commute	30	20	132	0.020	0.090	1.107	0.004	0.061	0.025	390.986	0.001	0.006	0.073	0.000	0.004	0.002	23.410
	Haul Truck	20	40	23	0.189	6.263	0.765	0.024	0.275	0.162	2635.672	0.002	0.072	0.009	0.000	0.003	0.002	27.497
	Ready Mix Trucks	2	40	63	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.001	0.020	0.002	0.000	0.001	0.001	7.532
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	pickup	20	20	132	0.022	0.105	1.029	0.003	0.040	0.017	298.027	0.001	0.007	0.068	0.000	0.003	0.001	17.844
	Worker Commute	10	20	66	0.007	0.030	0.369	0.001	0.020	0.008	130.329	0.000	0.001	0.012	0.000	0.001	0.000	3.902
	Haul Truck	5	40	66	0.047	1.566	0.191	0.006	0.069	0.040	658.918	0.002	0.052	0.006	0.000	0.002	0.001	19.726
	Ready Mix Trucks	2	40	66	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.001	0.021	0.003	0.000	0.001	0.001	7.891
	pickup	20	20	66	0.022	0.105	1.029	0.003	0.040	0.017	298.027	0.001	0.003	0.034	0.000	0.001	0.001	8.922
Table topping deadend facilities	Worker Commute	10	20	22	0.007	0.030	0.369	0.001	0.020	0.008	130.329	0.000	0.000	0.004	0.000	0.000	0.000	1.301
	Haul Truck	5	40	22	0.047	1.566	0.191	0.006	0.069	0.040	658.918	0.001	0.017	0.002	0.000	0.001	0.000	6.575
	Ready Mix Trucks	2	40	22	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.000	0.007	0.001	0.000	0.000	0.000	2.630
	pickup	20	20	22	0.022	0.105	1.029	0.003	0.040	0.017	298.027	0.000	0.001	0.011	0.000	0.000	0.000	2.974
	Worker Commute	6	20	132	0.004	0.018	0.221	0.001	0.012	0.005	78.197	0.000	0.001	0.015	0.000	0.001	0.000	4.682
Canal Automation	Haul Truck	10	40	20	0.094	3.132	0.383	0.012	0.138	0.081	1317.836	0.001	0.031	0.004	0.000	0.001	0.001	11.955
	Ready Mix Trucks	2	40	40	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.000	0.013	0.002	0.000	0.001	0.000	4.782
	pickup	2	20	10	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.000	0.001	0.000	0.000	0.000	0.135
	Worker Commute	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Haul Truck	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flow Measurement	Ready Mix Trucks	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	pickup	2	20	22	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.000	0.001	0.000	0.000	0.000	0.297
	Worker Commute	6	20	40	0.004	0.018	0.221	0.001	0.012	0.005	78.197	0.000	0.000	0.004	0.000	0.000	0.000	1.419
	Haul Truck	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Ready Mix Trucks	2	40	40	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.000	0.013	0.002	0.000	0.001	0.000	4.782
Siphon modifications	pickup	2	20	10	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.000	0.001	0.000	0.000	0.000	0.135
	Worker Commute	6	20	44	0.004	0.018	0.221	0.001	0.012	0.005	78.197	0.000	0.000	0.005	0.000	0.000	0.000	1.561
	Haul Truck	10	40	20	0.094	3.132	0.383	0.012	0.138	0.081	1317.836	0.001	0.031	0.004	0.000	0.001	0.001	11.955
	Ready Mix Trucks	2	40	40	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.000	0.013	0.002	0.000	0.001	0.000	4.782
	pickup	2	20	10	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.000	0.001	0.000	0.000	0.000	0.135
Siphon demolition	Worker Commute	6	20	44	0.004	0.018	0.221	0.001	0.012	0.005	78.197	0.000	0.000	0.005	0.000	0.000	0.000	1.561
	Haul Truck	10	40	20	0.094	3.132	0.383	0.012	0.138	0.081	1317.836	0.001	0.031	0.004	0.000	0.001	0.001	11.955
	Ready Mix Trucks	2	40	40	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.000	0.013	0.002	0.000	0.001	0.000	4.782
	pickup	2	20	10	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.000	0.001	0.000	0.000	0.000	0.135
	Worker Commute	20	20	130	0.014	0.060	0.738	0.003	0.041	0.017	260.657	0.001	0.004	0.048	0.000	0.003	0.001	15.370
Intertie projects	Haul Truck	10	40	130	0.094	3.132	0.383	0.012	0.138	0.081	1317.836	0.006	0.204	0.025	0.001	0.009	0.005	77.710
	Ready Mix Trucks	2	40	40	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.000	0.013	0.002	0.000	0.001	0.000	4.782
	pickup	20	20	10	0.022	0.105	1.029	0.003	0.040	0.017	298.027	0.000	0.001	0.005	0.000	0.000	0.000	1.352
	Worker Commute	20	20	264	0.014	0.060	0.738	0.003	0.041	0.017	260.657	0.002	0.008	0.097	0.000	0.005	0.002	31.214
	Haul Truck	60	40	67	0.566	18.790	2.295	0.072	0.826	0.485	7907.016	0.019	0.629	0.077	0.002	0.028	0.016	240.304
Reservoirs and Recharge Basins	Ready Mix Trucks	12	40	120	0.113	3.758	0.459	0.014	0.165	0.097	1581.403	0.007	0.225	0.028	0.001	0.010	0.006	86.079
	pickup	10	20	264	0.011	0.053	0.515	0.001	0.020	0.008	149.014	0.001	0.007	0.068	0.000	0.003	0.001	17.844
	Worker Commute	5	20	88	0.003	0.015	0.185	0.001	0.010	0.004	65.164	0.000	0.001	0.008	0.000	0.000	0.000	2.601
	Haul Truck	2	40	88	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.001	0.028	0.003	0.000	0.001	0.001	10.521
	Ready Mix Trucks	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Highlands	pickup	2	20	88	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.000	0.005	0.000	0.000	0.000	1.190

Analysis Year:

2021

Vehicle Emissions

Owens Creek Diversion Channel	Worker Commute	20	20	264	0.014	0.060	0.738	0.003	0.041	0.017	260.657	0.002	0.008	0.097	0.000	0.005	0.002	31.214
	Haul Truck	2	40	264	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.002	0.083	0.010	0.000	0.004	0.002	31.562
	Ready Mix Trucks	4	40	7	0.038	1.253	0.153	0.005	0.055	0.032	527.134	0.000	0.004	0.001	0.000	0.000	0.000	1.674
	pickup	2	20	264	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.001	0.014	0.000	0.001	0.000	3.569
Black Rascal Diversion Channel	Worker Commute	26	20	132	0.018	0.078	0.959	0.003	0.053	0.022	338.855	0.001	0.005	0.063	0.000	0.004	0.001	20.289
	Haul Truck	2	40	132	0.019	0.626	0.077	0.002	0.028	0.016	263.567	0.001	0.041	0.005	0.000	0.002	0.001	15.781
	Ready Mix Trucks	4	40	10	0.038	1.253	0.153	0.005	0.055	0.032	527.134	0.000	0.006	0.001	0.000	0.000	0.000	2.391
	pickup	2	20	132	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.001	0.007	0.000	0.000	0.000	1.784
Merced River Water Recovery	Worker Commute	16	20	260	0.011	0.048	0.590	0.002	0.033	0.014	208.526	0.001	0.006	0.077	0.000	0.004	0.002	24.593
	Haul Truck	10	40	70	0.094	3.132	0.383	0.012	0.138	0.081	1317.836	0.003	0.110	0.013	0.000	0.005	0.003	41.844
	Ready Mix Trucks	4	40	71	0.038	1.253	0.153	0.005	0.055	0.032	527.134	0.001	0.044	0.005	0.000	0.002	0.001	16.977
	pickup	2	20	260	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.001	0.013	0.000	0.001	0.000	3.515
Le Grand Canal near Black Rascal Automation Project	Worker Commute	10	20	176	0.007	0.030	0.369	0.001	0.020	0.008	130.329	0.001	0.003	0.032	0.000	0.002	0.001	10.405
	Haul Truck	6	40	156	0.057	1.879	0.230	0.007	0.083	0.048	790.702	0.004	0.147	0.018	0.001	0.006	0.004	55.951
	Ready Mix Trucks	4	40	116	0.038	1.253	0.153	0.005	0.055	0.032	527.134	0.002	0.073	0.009	0.000	0.003	0.002	27.737
	pickup	2	20	176	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.001	0.009	0.000	0.000	0.000	2.379
Northside Canal Flumes	Worker Commute	10	20	88	0.007	0.030	0.369	0.001	0.020	0.008	130.329	0.000	0.001	0.016	0.000	0.001	0.000	5.202
	Haul Truck	4	40	69	0.038	1.253	0.153	0.005	0.055	0.032	527.134	0.001	0.043	0.005	0.000	0.002	0.001	16.498
	Ready Mix Trucks	4	40	87	0.038	1.253	0.153	0.005	0.055	0.032	527.134	0.002	0.054	0.007	0.000	0.002	0.001	20.802
	pickup	2	20	88	0.002	0.011	0.103	0.000	0.004	0.002	29.803	0.000	0.000	0.005	0.000	0.000	0.000	1.190

Analysis Year: 2021  
Vehicle Emissions

Total Vehicle Emissions		2021													
Projects		Daily Emissions							Annual Emissions						
		ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
		lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year
Main Canal Improvements at Tunnel No.1 Project															
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment		0.33	9.59	3.28	0.04	0.51	0.28	4642.52	0.01	0.30	0.28	0.00	0.02	0.01	178.20
Main Canal Improvements at Tunnel No.1 Project															
Option 2: Open Channel on New Alignment North of the Existing Alignment		0.33	9.59	3.28	0.04	0.51	0.28	4642.52	0.01	0.08	0.25	0.00	0.01	0.01	94.51
Main Canal Improvements at Tunnel No.1 Project															
Option 3: Open Channel along Existing Tunnel Alignment		0.28	8.02	3.09	0.04	0.45	0.24	3983.60	0.00	0.04	0.14	0.00	0.01	0.00	52.31
Main Canal Improvements at Tunnel No.1 Project															
Option 4: Rehabilitation of Existing Tunnel		0.25	7.08	2.98	0.03	0.40	0.22	3588.25	0.01	0.10	0.15	0.00	0.01	0.01	76.28
Canal rebuilding/relining		0.09	2.33	1.67	0.01	0.16	0.08	1350.84	0.00	0.08	0.05	0.00	0.01	0.00	40.44
Table topping deadend facilities		0.09	2.33	1.67	0.01	0.16	0.08	1350.84	0.00	0.03	0.02	0.00	0.00	0.00	13.48
Canal Automation		0.12	3.79	0.78	0.02	0.18	0.10	1689.40	0.00	0.05	0.02	0.00	0.00	0.00	21.55
Flow Measurement		0.00	0.01	0.10	0.00	0.00	0.00	29.80	0.00	0.00	0.00	0.00	0.00	0.00	0.30
Siphon modifications		0.03	0.65	0.40	0.00	0.04	0.02	371.57	0.00	0.01	0.01	0.00	0.00	0.00	6.34
Siphon demolition		0.12	3.79	0.78	0.02	0.18	0.10	1689.40	0.00	0.04	0.01	0.00	0.00	0.00	18.43
Intertie projects		0.15	3.92	2.23	0.02	0.25	0.13	2140.09	0.01	0.22	0.08	0.00	0.01	0.01	99.21
Reservoirs and Recharge Basins		0.70	22.66	4.01	0.09	1.05	0.61	9898.09	0.03	0.87	0.27	0.00	0.05	0.03	375.44
Highlands		0.02	0.65	0.36	0.00	0.04	0.02	358.53	0.00	0.03	0.02	0.00	0.00	0.00	14.31
Owens Creek Diversion Channel		0.07	1.95	1.07	0.01	0.13	0.07	1081.16	0.00	0.10	0.12	0.00	0.01	0.00	68.02
Black Rascal Diversion Channel		0.08	1.97	1.29	0.01	0.14	0.07	1159.36	0.00	0.05	0.08	0.00	0.01	0.00	40.25
Merced River Water Recovery		0.15	4.44	1.23	0.02	0.23	0.13	2083.30	0.01	0.16	0.11	0.00	0.01	0.01	86.93
Le Grand Canal near Black Rascal Automation Project		0.10	3.17	0.85	0.01	0.16	0.09	1477.97	0.01	0.22	0.07	0.00	0.01	0.01	96.47
Northside Canal Flumes		0.08	2.55	0.78	0.01	0.13	0.07	1214.40	0.00	0.10	0.03	0.00	0.01	0.00	43.69

VMT on Paved and Unpaved Roads		2021						
Onsite Equipment	Number	Total VMT/day	Total VMT/year	Unpaved road%	Unpaved VMT/day	Unpaved VMT/Year	Paved VMT/day	Paved VMT/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	Worker Commute	600	158400	5%	30	7,920	570	150,480
	Haul Truck	800	64000	2.5%	20	1,600	780	62,400
	Ready Mix Truck	400	6000	2.5%	10	150	390	5,850
	pickup	400	79200	5%	20	3,960	380	75,240
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	Worker Commute	600	158400	5%	30	7,920	570	150,480
	Haul Truck	800	4000	2.5%	20	100	780	3,900
	Ready Mix Truck	400	10000	2.5%	10	250	390	9,750
	pickup	400	79200	5%	20	3,960	380	75,240
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Worker Commute	600	79200	5%	30	3,960	570	75,240
	Haul Truck	800	6400	2.5%	20	160	780	6,240
	Ready Mix Truck	200	1000	2.5%	5	25	195	975
	pickup	400	52800	5%	20	2,640	380	50,160
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	Worker Commute	600	79200	5%	30	3,960	570	75,240
	Haul Truck	800	18400	2.5%	20	460	780	17,940
	Ready Mix Truck	80	5040	2.5%	2	126	78	4,914
	pickup	400	52800	5%	20	2,640	380	50,160
Canal rebuilding/relining	Worker Commute	200	13200	5%	10	660	190	12,540
	Haul Truck	200	13200	2.5%	5	330	195	12,870
	Ready Mix Truck	80	5280	2.5%	2	132	78	5,148
	pickup	400	26400	5%	20	1,320	380	25,080
Table topping deadend facilities	Worker Commute	200	4400	5%	10	220	190	4,180
	Haul Truck	200	4400	2.5%	5	110	195	4,290
	Ready Mix Truck	80	1760	2.5%	2	44	78	1,716
	pickup	400	8800	5%	20	440	380	8,360
Canal Automation	Worker Commute	120	15840	5%	6	792	114	15,048
	Haul Truck	400	8000	2.5%	10	200	390	7,800
	Ready Mix Truck	80	3200	2.5%	2	80	78	3,120
	pickup	40	400	5%	2	20	38	380
Flow Measurement	Worker Commute	0	0	5%	0	0	0	0
	Haul Truck	0	0	2.5%	0	0	0	0
	Ready Mix Truck	0	0	2.5%	0	0	0	0
	pickup	40	880	5%	2	44	38	836
Siphon modifications	Worker Commute	120	4800	5%	6	240	114	4,560
	Haul Truck	0	0	2.5%	0	0	0	0
	Ready Mix Truck	80	3200	2.5%	2	80	78	3,120
	pickup	40	400	5%	2	20	38	380
Siphon demolition	Worker Commute	120	5280	5%	6	264	114	5,016
	Haul Truck	400	8000	2.5%	10	200	390	7,800
	Ready Mix Truck	80	3200	2.5%	2	80	78	3,120
	pickup	40	400	5%	2	20	38	380
Intertie projects	Worker Commute	400	52000	5%	20	2,600	380	49,400
	Haul Truck	400	52000	2.5%	10	1,300	390	50,700
	Ready Mix Truck	80	3200	2.5%	2	80	78	3,120
	pickup	400	4000	5%	20	200	380	3,800

Analysis Year:		2021							
Vehicle Emissions									
Reservoirs and Recharge Basins	Worker Commute	400	105600	5%	20	5,280	380	100,320	
	Haul Truck	2400	160800	2.5%	60	4,020	2,340	156,780	
	Ready Mix Truck	480	57600	2.5%	12	1,440	468	56,160	
	pickup	200	52800	5%	10	2,640	190	50,160	
Highlands	Worker Commute	100	8800	5%	5	440	95	8,360	
	Haul Truck	80	7040	2.5%	2	176	78	6,864	
	Ready Mix Truck	0	0	2.5%	0	0	0	0	
	pickup	40	3520	5%	2	176	38	3,344	
Owens Creek Diversion Channel	Worker Commute	400	105600	5%	20	5,280	380	100,320	
	Haul Truck	80	21120	2.5%	2	528	78	20,592	
	Ready Mix Truck	160	1120	2.5%	4	28	156	1,092	
	pickup	40	10560	5%	2	528	38	10,032	
Black Rascal Diversion Channel	Worker Commute	520	68640	5%	26	3,432	494	65,208	
	Haul Truck	80	10560	2.5%	2	264	78	10,296	
	Ready Mix Truck	160	1600	2.5%	4	40	156	1,560	
	pickup	40	5280	5%	2	264	38	5,016	
Merced River Water Recovery	Worker Commute	320	83200	5%	16	4,160	304	79,040	
	Haul Truck	400	28000	2.5%	10	700	390	27,300	
	Ready Mix Truck	160	11360	2.5%	4	284	156	11,076	
	pickup	40	10400	5%	2	520	38	9,880	
Le Grand Canal near Black Rascal Automation Project	Worker Commute	200	35200	5%	10	1,760	190	33,440	
	Haul Truck	240	37440	2.5%	6	936	234	36,504	
	Ready Mix Truck	160	18560	2.5%	4	464	156	18,096	
	pickup	40	7040	5%	2	352	38	6,688	
Northside Canal Flumes	Worker Commute	200	17600	5%	10	880	190	16,720	
	Haul Truck	160	11040	2.5%	4	276	156	10,764	
	Ready Mix Truck	160	13920	2.5%	4	348	156	13,572	
	pickup	40	3520	5%	2	176	38	3,344	

Analysis Year  
Fugitive Dust Emissions Northern Commute Scenario

2021

A) Bulldozing - Demolition  
Fugitive dust emissions from bulldozing

2021

Activity	Number of Equipment	Maximum daily hours	Days	Emission Factor		Daily Emissions		Annual Emissions	
				PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
				lb/hr	lb/hr	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	4	8	125	0.753	0.414	24.09	13.24	1.51	0.83
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	3	8	180	0.753	0.414	18.07	9.93	1.63	0.89
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	3	8	95	0.753	0.414	18.07	9.93	0.86	0.47
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	2	8	113	0.753	0.414	12.04	6.62	0.68	0.37
Canal rebuilding/relining	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Table topping deadend facilities	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Canal Automation	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Flow Measurement	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Siphon modifications	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Siphon demolition	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Intertie projects	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Reservoirs and Recharge Basins	2	8	40	0.753	0.414	12.04	6.62	0.24	0.13
Highlands	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Owens Creek Diversion Channel	3	8	99	0.753	0.414	18.07	9.93	0.89	0.49
Black Rascal Diversion Channel	3	8	19	0.753	0.414	18.07	9.93	0.17	0.09
Merced River Water Recovery	2	8	133	0.753	0.414	12.04	6.62	0.80	0.44
Le Grand Canal near Black Rascal Automation Project	1	8	9	0.753	0.414	6.02	3.31	0.03	0.01
Northside Canal Flumes	1	8	7	0.753	0.414	6.02	3.31	0.02	0.01

Note:

PM emissions were calculated using the following equation and parameters (CalEEMod Appendix A):

Emission Factor (lb/hr)= k x (s)<sup>1.5</sup> / (M)<sup>1.4</sup> For PM10 and k x 5.7 x (s)<sup>1.2</sup> / (M)<sup>1.3</sup> for PM2.5

k = Scaling Constant (0.75 for PM10 and 0.105 for PM2.5)

s = Silt Content (assumed to be 6.9% - CalEEMod default for overburden)

M = Moisture Content = 7.9% (CalEEMod default)

B) Grading  
Fugitive dust emissions from grading

2021

Activity		Number of Grading Equipment	# acres/equipme nt	Acreage Graded/Da y	Number of Days/Year	Grader VMT		Emission Factors		Daily Emissions		Annual Emissions	
								PM10	PM2.5	PM10	PM2.5	PM10	PM2.5
				acres		miles/day	miles/year	lb/VMT	lb/VMT	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	Grader	3	0.5	1.5	100	1.03	103.13	1.54	0.167	1.59	0.17	0.08	0.01
	Scaper	8	1	8	90	5.50	495.00	1.54	0.167	8.48	0.92	0.38	0.04
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	Grader	2	0.5	1	120	0.69	82.50	1.54	0.167	1.06	0.11	0.06	0.01
	Scaper	2	1.5	3	120	2.06	247.50	1.54	0.167	3.18	0.34	0.19	0.02
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Grader	3	0.5	1.5	65	1.03	67.03	1.54	0.167	1.59	0.17	0.05	0.01
	Scaper	8	1	8	50	5.50	275.00	1.54	0.167	8.48	0.92	0.21	0.02
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	Grader	2	2	4	78	2.75	214.50	1.54	0.167	4.24	0.46	0.17	0.02
Canal rebuilding/relining	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Table topping deadend facilities	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Canal Automation	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Flow Measurement	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Siphon modifications	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Siphon demolition	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Intertie projects	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Reservoirs and Recharge Basins	Grader	1	0.5	0.5	40	0.34	13.75	1.54	0.167	0.53	0.06	0.01	0.00
	Scaper	2	1	2	40	1.38	55.00	1.54	0.167	2.12	0.23	0.04	0.00
Highlands	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Owens Creek Diversion Channel	Grader	1	0.5	0.5	63	0.34	21.66	1.54	0.167	0.53	0.06	0.02	0.00
	Scaper	8	1	8	53	5.50	291.50	1.54	0.167	8.48	0.92	0.22	0.02
Black Rascal Diversion Channel	Grader	1	1	1	12	0.69	8.25	1.54	0.167	1.06	0.11	0.01	0.00
	Scaper	8	0.5	4	10	2.75	27.50	1.54	0.167	4.24	0.46	0.02	0.00
Merced River Water Recovery	Grader	1	1.5	1.5	12	1.03	12.38	1.54	0.167	1.59	0.17	0.01	0.00
	Scaper	0	2.5	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Le Grand Canal near Black Rascal Automation Project	Grader	1	3.5	3.5	9	2.41	21.66	1.54	0.167	3.71	0.40	0.02	0.00
	Scaper	0	4.5	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Northside Canal Flumes	Grader	1	5.5	5.5	7	3.78	26.47	1.54	0.167	5.83	0.63	0.02	0.00
	Scaper	0	6.5	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00

Analysis Year  
Fugitive Dust Emissions Northern Commute Scenario  
Grading Emission Summary

2021

	Daily Emissions		Annual Emissions	
	PM10	PM2.5	PM10	PM2.5
	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project				
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	10.07	1.09	0.46	0.05
Main Canal Improvements at Tunnel No.1 Project				
Option 2: Open Channel on New Alignment North of the Existing Alignment	4.24	0.46	0.25	0.03
Main Canal Improvements at Tunnel No.1 Project				
Option 3: Open Channel along Existing Tunnel Alignment	10.07	1.09	0.26	0.03
Main Canal Improvements at Tunnel No.1 Project				
Option 4: Rehabilitation of Existing Tunnel	4.24	0.46	0.17	0.02
Canal rebuilding/relining	0.00	0.00	0.00	0.00
Table topping deadend facilities	0.00	0.00	0.00	0.00
Canal Automation	0.00	0.00	0.00	0.00
Flow Measurement	0.00	0.00	0.00	0.00
Siphon modifications	0.00	0.00	0.00	0.00
Siphon demolition	0.00	0.00	0.00	0.00
Intertie projects	0.00	0.00	0.00	0.00
Reservoirs and Recharge Basins	2.65	0.29	0.05	0.01
Highlands	0.00	0.00	0.00	0.00
Owens Creek Diversion Channel	9.01	0.97	0.24	0.03
Black Rascal Diversion Channel	5.30	0.57	0.03	0.00
Merced River Water Recovery	1.59	0.17	0.01	0.00
Le Grand Canal near Black Rascal Automation Project	3.71	0.40	0.02	0.00
Northside Canal Flumes	5.83	0.63	0.02	0.00

Note:

PM emissions were calculated using the following equation and parameters:

Emission factor (lb/VMT) = k x 0.051 x (S)<sup>2.0</sup> for PM10 and k x 0.040 x (S)<sup>2.5</sup> for PM2.5

k = Scaling Constant (0.60 for PM10 and 0.031 for PM2.5)

S = Mean Vehicle Speed, CalEEMod default = 7.1 miles/hour

VMT = As / Wb X 43,560 (sqft/acre) /5280 (ft/mile)

VMT: vehicle miles traveled

As: the acreage of the grading site (0.5 acres per grader, 1 acre for scapter, CalEEMod defaults)

Wb: blade width of the grader. CalEEMod default Wb = 12 ft.

C). Earth Material Loading/Handling

Dust from demolition and soil loading

Projects	Total Amount Handled  cy	Material Amount  cy/day      cy/year		Material Amount  ton/day      ton/year		Emission Factors		Daily Emissions		Annual Emissions	
						PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
						lb/ton	lb/ton	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	850100	1610.0	425,050	2035.4	537333.8	0.00011	0.000017	0.23	0.034	0.0298	0.0045
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	900100	1704.7	450,050	2155.1	568938.0	0.00011	0.000017	0.24	0.036	0.0316	0.0048
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	575100	2178.4	287,550	2753.9	363511.0	0.00011	0.000017	0.31	0.046	0.0202	0.0031
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	9000	34.1	4,500	43.1	5688.7	0.00011	0.000017	0.00	0.001	0.0003	0.0000
Canal rebuilding/relining	8000	60.6	8,000	76.6	10113.3	0.00011	0.000017	0.01	0.001	0.0006	0.0001
Table topping deadend facilities	12600	572.7	12,600	724.0	15928.5	0.00011	0.000017	0.08	0.012	0.0009	0.0001
Canal Automation	550	4.2	550	5.3	695.3	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Flow Measurement	0	0.0	0	0.0	0.0	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Siphon modifications	800	9.1	800	11.5	1011.3	0.00011	0.000017	0.00	0.000	0.0001	0.0000
Siphon demolition	250	5.7	250	7.2	316.0	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Intertie projects	1020	3.9	1,020	4.9	1289.4	0.00011	0.000017	0.00	0.000	0.0001	0.0000
Reservoirs and Recharge Basins	150250	379.4	100,167	479.6	126627.3	0.00011	0.000017	0.05	0.008	0.0070	0.0011
Highlands	120	1.4	120	1.7	151.7	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Owens Creek Diversion Channel	14050	35.5	9,367	44.9	11841.0	0.00011	0.000017	0.00	0.001	0.0007	0.0001
Black Rascal Diversion Channel	3250	24.6	3,250	31.1	4108.5	0.00011	0.000017	0.00	0.001	0.0002	0.0000
Merced River Water Recovery	7506	28.4	7,506	35.9	9488.8	0.00011	0.000017	0.00	0.001	0.0005	0.0001
Le Grand Canal near Black Rascal Automation Project	0	0.0	0	0.0	0.0	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Northside Canal Flumes	500	5.7	500	7.2	632.1	0.00011	0.000017	0.001	0.000	0.000	0.000

Note:

Fugitive dust from materials unloading from trains and/or trucks are calculated using the following equations and parameters:

Emission factor (lb/ton) = (k)(0.0032)[(U/5)<sup>1-3</sup>]/[(M/2)<sup>1-4</sup>]

k = Particle Size Constant (0.35 for PM10 and 0.053 for PM2.5)

U = average wind speed = 2.6 m/s (5.816 mph) for MDAQMD (CalEEMod default)

M = moisture content = 12% (CalEEMod Default)

Material density (CalEEMod default)

1.264 ton/CY

C) Vehicle Fugitive Dust Emissions on Paved Roads

Emission factor (g/VMT) = k X (sL)^0.91 X W^1.02

		PM10	PM2.5
k		1.0	0.25
sL	g/m2	0.10	0.10
W	tons	2.4	2.4
EF	(g/VMT)	0.300	0.075

Equation from: AP-42 13.2.1

sL and W (silt loading and vehicle weight) are CalEEMod default values

Projects	Maximum Daily Emissions			Annual Emissions		
	Trip miles	PM10	PM2.5	Trip miles	PM10	PM2.5
	VMT/day	lb/day	lb/day	VMT/year	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	2,120	1.40	0.35	293,970	0.097	0.024
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	2,120	1.40	0.35	239,370	0.079	0.020
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	1,730	1.15	0.29	131,640	0.044	0.011
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	1,808	1.20	0.30	148,254	0.049	0.012
Canal rebuilding/relining	843	0.56	0.14	55,638	0.018	0.005
Table topping deadend facilities	843	0.56	0.14	18,546	0.006	0.002
Canal Automation	620	0.41	0.10	26,348	0.009	0.002
Flow Measurement	38	0.03	0.01	836	0.000	0.000
Siphon modifications	230	0.15	0.04	8,060	0.003	0.001
Siphon demolition	620	0.41	0.10	16,316	0.005	0.001
Intertie projects	1,228	0.81	0.20	107,020	0.035	0.009
Reservoirs and Recharge Basins	3,378	2.24	0.56	363,420	0.120	0.030
Highlands	211	0.14	0.03	18,568	0.006	0.002
Owens Creek Diversion Channel	652	0.43	0.11	132,036	0.044	0.011
Black Rascal Diversion Channel	766	0.51	0.13	82,080	0.027	0.007
Merced River Water Recovery	888	0.59	0.15	127,296	0.042	0.011
Le Grand Canal near Black Rascal Automation Project	618	0.41	0.10	94,728	0.031	0.008
Northside Canal Flumes	540	0.36	0.09	44,400	0.015	0.004

D) Vehicle Fugitive Dust Emissions on Unpaved Roads

Uncontrolled Emission Factors and Emissions

	Emission Factors (lb/VMT)	
	PM10	PM2.5
Unpaved Road (uncontrolled)	0.86	0.09
Unpaved Road (with watering unpaved road twice a day)	0.45	0.04

Emission factor (lb/VMT) = (k)[(s/12)<sup>0.5</sup>][[(W/3)<sup>0.45</sup>]\*(1-P/365) (EPA AP-42, 13.2.2, for industrial sites)

k = constant (lb/VMT) = 1.5 lb/VMT for PM10 and 0.15 lb/VMT for PM2.5

s = Silt Content (8.5%, construction sites, AP-42, Table 13.2.2.1)

W = avg. vehicle weight (tons) = 2.4 ton

P = number of days in a year with at least 0.1 inch of precipitation, 49 days for Merced County (CalEEMod)

Control efficiency of watering the unpaved road twice a day 55% (data from SCAQMD CEQA Handbook, TABLE XI-D, MITIGATION MEASURE EXAMPLES: FUGITIVE DUST FROM UNPAVED ROADS, 2007)

Emissions from Unpaved Roads

Projects	Maximum Daily Emissions			Annual Emissions		
	Total Trip miles	PM10	PM2.5	Total Trip miles	PM10	PM2.5
	VMT/day	lb/day	lb/day	VMT/year	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project						
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	80	35.81	3.58	13,630	3.051	0.305
Main Canal Improvements at Tunnel No.1 Project						
Option 2: Open Channel on New Alignment North of the Existing Alignment	80	35.81	3.58	12,230	2.737	0.274
Main Canal Improvements at Tunnel No.1 Project						
Option 3: Open Channel along Existing Tunnel Alignment	70	31.33	3.13	6,760	1.513	0.151
Main Canal Improvements at Tunnel No.1 Project						
Option 4: Rehabilitation of Existing Tunnel	72	32.23	3.22	7,186	1.608	0.161
Canal rebuilding/relining	37	16.56	1.66	2,442	0.547	0.055
Table topping deadend facilities	37	16.56	1.66	814	0.182	0.018
Canal Automation	20	8.95	0.90	1,092	0.244	0.024
Flow Measurement	2	0.90	0.09	44	0.010	0.001
Siphon modifications	10	4.48	0.45	340	0.076	0.008
Siphon demolition	20	8.95	0.90	564	0.126	0.013
Intertie projects	52	23.28	2.33	4,180	0.936	0.094
Reservoirs and Recharge Basins	102	45.66	4.57	13,380	2.995	0.299
Highlands	9	4.03	0.40	792	0.177	0.018
Owens Creek Diversion Channel	28	12.53	1.25	6,364	1.424	0.142
Black Rascal Diversion Channel	34	15.22	1.52	4,000	0.895	0.090
Merced River Water Recovery	32	14.32	1.43	5,664	1.268	0.127
Le Grand Canal near Black Rascal Automation Project	22	9.85	0.98	3,512	0.786	0.079
Northside Canal Flumes	20	8.95	0.90	1,680	0.376	0.038

Summary of Fugitive Dust Emissions

Projects	Maximum Daily Emissions		Annual Emissions	
	PM10	PM2.5	PM10	PM2.5
	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project				
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	71.60	18.29	5.14	1.21
Main Canal Improvements at Tunnel No.1 Project				
Option 2: Open Channel on New Alignment North of the Existing Alignment	59.76	14.36	4.73	1.22
Main Canal Improvements at Tunnel No.1 Project				
Option 3: Open Channel along Existing Tunnel Alignment	60.93	14.48	2.70	0.67
Main Canal Improvements at Tunnel No.1 Project				
Option 4: Rehabilitation of Existing Tunnel	49.72	10.60	2.50	0.57
Canal rebuilding/relining	17.13	1.80	0.57	0.06
Table topping deadend facilities	17.20	1.81	0.19	0.02
Canal Automation	9.36	1.00	0.25	0.03
Flow Measurement	0.92	0.10	0.01	0.00
Siphon modifications	4.63	0.49	0.08	0.01
Siphon demolition	9.36	1.00	0.13	0.01
Intertie projects	24.09	2.53	0.97	0.10
Reservoirs and Recharge Basins	62.64	12.04	3.42	0.47
Highlands	4.17	0.44	0.18	0.02
Owens Creek Diversion Channel	40.05	12.27	2.60	0.67
Black Rascal Diversion Channel	39.10	12.15	1.12	0.19
Merced River Water Recovery	28.55	8.37	2.12	0.58
Le Grand Canal near Black Rascal Automation Project	19.99	4.80	0.86	0.10
Northside Canal Flumes	21.17	4.92	0.43	0.06

Analysis Year: 2023  
Construction Emissions Summary

Total Emissions Summary (by Project)		2023													
Onsite Equipment	Number	Maximum Daily Emissions							Annual Emissions						
		ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
		lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	equipment	17.592	164.681	121.136	0.371	6.498	5.977	35171.937	0.738	7.123	4.882	0.015	0.283	0.260	1265.331
	vehicles	0.088	6.437	2.276	0.040	0.428	0.202	4324.650	0.005	0.200	0.217	0.002	0.022	0.010	165.936
	dust	NA	NA	NA	NA	71.603	18.295	NA	NA	NA	NA	NA	5.145	1.211	NA
	Sub Total	17.680	171.119	123.412	0.411	78.528	24.474	39496.587	0.743	7.323	5.099	0.016	5.449	1.481	1431.268
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	equipment	15.906	147.736	111.181	0.341	5.814	5.348	32302.932	0.802	7.592	5.373	0.016	0.303	0.279	1399.147
	vehicles	0.088	6.437	2.276	0.040	0.428	0.202	4324.650	0.004	0.053	0.204	0.001	0.014	0.006	87.939
	dust	NA	NA	NA	NA	59.761	14.357	NA	NA	NA	NA	NA	4.729	1.220	NA
	Sub Total	15.995	154.173	113.457	0.381	66.003	19.907	36627.582	0.806	7.645	5.577	0.017	5.046	1.504	1487.086
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	equipment	16.081	149.637	110.650	0.347	5.820	5.338	32851.604	0.452	4.301	3.006	0.009	0.170	0.156	790.522
	vehicles	0.079	5.388	2.184	0.034	0.374	0.176	3710.540	0.002	0.029	0.116	0.001	0.008	0.003	48.626
	dust	NA	NA	NA	NA	60.926	14.485	NA	NA	NA	NA	NA	2.699	0.665	NA
	Sub Total	16.160	155.026	112.833	0.381	67.119	19.999	36562.144	0.454	4.330	3.122	0.010	2.876	0.825	839.148
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	equipment	6.670	58.923	48.944	0.142	2.403	2.242	13439.213	0.330	2.898	2.403	0.007	0.119	0.111	595.213
	vehicles	0.073	4.759	2.129	0.031	0.341	0.160	3342.074	0.003	0.071	0.119	0.001	0.010	0.004	70.967
	dust	NA	NA	NA	NA	49.717	10.601	NA	NA	NA	NA	NA	2.504	0.565	NA
	Sub Total	6.743	63.682	51.073	0.173	52.461	13.003	16781.287	0.332	2.969	2.522	0.008	2.633	0.681	666.180
Canal rebuilding/relining	equipment	1.711	13.861	16.355	0.043	0.587	0.547	4109.318	0.047	0.376	0.435	0.001	0.016	0.015	101.854
	vehicles	0.034	1.567	1.247	0.012	0.136	0.062	1255.665	0.001	0.052	0.041	0.000	0.004	0.002	37.592
	dust	NA	NA	NA	NA	17.129	1.797	NA	NA	NA	NA	NA	0.566	0.059	NA
	Sub Total	1.745	15.428	17.602	0.055	17.852	2.406	5364.983	0.048	0.427	0.476	0.002	0.586	0.076	139.445
Table topping deadend facilities	equipment	1.599	12.577	14.335	0.041	0.521	0.487	3842.226	0.015	0.113	0.123	0.000	0.005	0.004	32.163
	vehicles	0.034	1.567	1.247	0.012	0.136	0.062	1255.665	0.000	0.017	0.014	0.000	0.001	0.001	12.531
	dust	NA	NA	NA	NA	17.201	1.808	NA	NA	NA	NA	NA	0.189	0.020	NA
	Sub Total	1.634	14.144	15.581	0.052	17.858	2.357	5097.890	0.015	0.130	0.137	0.001	0.195	0.025	44.694
Canal Automation	equipment	1.408	10.790	11.893	0.037	0.435	0.408	3506.175	0.030	0.232	0.263	0.001	0.009	0.009	67.963
	vehicles	0.028	2.539	0.484	0.014	0.147	0.071	1574.475	0.000	0.030	0.015	0.000	0.002	0.001	20.108
	dust	NA	NA	NA	NA	9.364	0.998	NA	NA	NA	NA	NA	0.253	0.027	NA
	Sub Total	1.436	13.328	12.377	0.051	9.946	1.477	5080.650	0.030	0.262	0.278	0.001	0.265	0.037	88.071
Flow Measurement	equipment	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	vehicles	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.000	0.001	0.000	0.000	0.000	0.273
	dust	NA	NA	NA	NA	0.920	0.096	NA	NA	NA	NA	NA	0.010	0.001	NA
	Sub Total	0.002	0.008	0.081	0.000	0.924	0.097	27.387	0.000	0.000	0.001	0.000	0.010	0.001	0.273
Siphon modifications	equipment	0.904	7.222	8.604	0.023	0.306	0.289	2226.308	0.018	0.144	0.172	0.000	0.006	0.006	40.394
	vehicles	0.008	0.441	0.300	0.003	0.038	0.017	346.255	0.000	0.009	0.005	0.000	0.001	0.000	5.910
	dust	NA	NA	NA	NA	4.630	0.486	NA	NA	NA	NA	NA	0.079	0.008	NA
	Sub Total	0.913	7.662	8.905	0.027	4.974	0.793	2572.563	0.018	0.153	0.177	0.001	0.086	0.014	46.304
Siphon demolition	equipment	1.408	10.790	11.893	0.037	0.435	0.408	3506.175	0.030	0.232	0.263	0.001	0.009	0.009	67.963
	vehicles	0.028	2.539	0.484	0.014	0.147	0.071	1574.475	0.000	0.030	0.007	0.000	0.002	0.001	17.185
	dust	NA	NA	NA	NA	9.364	0.998	NA	NA	NA	NA	NA	0.132	0.014	NA
	Sub Total	1.436	13.328	12.377	0.051	9.946	1.477	5080.650	0.030	0.261	0.270	0.001	0.143	0.024	85.148
Intertie projects	equipment	1.408	10.790	11.893	0.037	0.435	0.408	3506.175	0.080	0.608	0.647	0.002	0.024	0.022	187.676
	vehicles	0.049	2.639	1.642	0.018	0.211	0.097	1991.814	0.002	0.148	0.056	0.001	0.010	0.005	92.518
	dust	NA	NA	NA	NA	24.090	2.531	NA	NA	NA	NA	NA	0.971	0.102	NA
	Sub Total	1.457	13.428	13.535	0.055	24.736	3.036	5497.990	0.083	0.756	0.703	0.003	1.005	0.129	280.194
Reservoirs and Recharge Basins	equipment	9.805	83.128	67.989	0.224	3.267	3.017	21253.557	0.332	2.657	2.358	0.008	0.104	0.096	686.435
	vehicles	0.157	15.189	2.337	0.084	0.847	0.411	9224.197	0.008	0.584	0.184	0.004	0.038	0.018	349.814
	dust	NA	NA	NA	NA	62.643	12.040	NA	NA	NA	NA	NA	3.416	0.469	NA
	Sub Total	9.962	98.317	70.326	0.308	66.757	15.468	30477.754	0.339	3.240	2.542	0.012	3.557	0.583	1036.250
Highlands	equipment	1.886	15.691	15.301	0.051	0.621	0.578	4840.671	0.018	0.138	0.148	0.000	0.006	0.005	39.292
	vehicles	0.008	0.438	0.270	0.003	0.036	0.017	334.051	0.000	0.019	0.012	0.000	0.002	0.001	13.334
	dust	NA	NA	NA	NA	4.169	0.438	NA	NA	NA	NA	NA	0.183	0.019	NA
	Sub Total	1.893	16.129	15.571	0.054	4.826	1.033	5174.721	0.018	0.158	0.160	0.001	0.191	0.025	52.626

Analysis Year:

2023

Construction Emissions Summary

Owens Creek Diversion Channel	equipment	15.177	139.533	107.181	0.328	5.511	5.065	31087.224	0.418	3.975	2.842	0.008	0.160	0.147	721.266
	vehicles	0.023	1.311	0.798	0.009	0.110	0.051	1008.399	0.002	0.065	0.096	0.001	0.009	0.004	63.484
	dust	NA	NA	NA	NA	40.051	12.266	NA	NA	NA	NA	NA	2.605	0.671	NA
	Sub Total	15.200	140.844	107.980	0.337	45.672	17.382	32095.623	0.420	4.040	2.938	0.009	2.774	0.822	784.750
Black Rascal Diversion Channel	equipment	15.177	139.533	107.181	0.328	5.511	5.065	31087.224	0.080	0.765	0.553	0.002	0.031	0.028	138.647
	vehicles	0.026	1.324	0.980	0.010	0.122	0.056	1081.623	0.001	0.036	0.060	0.000	0.005	0.002	37.575
	dust	NA	NA	NA	NA	39.099	12.153	NA	NA	NA	NA	NA	1.122	0.194	NA
	Sub Total	15.203	140.857	108.162	0.338	44.732	17.273	32168.847	0.082	0.801	0.613	0.002	1.158	0.225	176.222
Merced River Water Recovery	equipment	4.147	38.261	31.007	0.085	1.614	1.506	8034.931	0.212	1.931	1.554	0.004	0.083	0.077	379.513
	vehicles	0.036	2.981	0.824	0.018	0.190	0.090	1942.158	0.002	0.109	0.083	0.001	0.010	0.005	81.079
	dust	NA	NA	NA	NA	28.551	8.372	NA	NA	NA	NA	NA	2.121	0.579	NA
	Sub Total	4.184	41.241	31.831	0.103	30.355	9.969	9977.089	0.215	2.040	1.637	0.005	2.214	0.661	460.593
Le Grand Canal near Black Rascal Automation Project	equipment	2.221	20.833	15.367	0.044	0.852	0.796	4204.341	0.082	0.659	0.726	0.002	0.027	0.026	177.557
	vehicles	0.026	2.128	0.569	0.013	0.134	0.064	1377.647	0.002	0.149	0.047	0.001	0.010	0.005	89.926
	dust	NA	NA	NA	NA	19.991	4.798	NA	NA	NA	NA	NA	0.861	0.103	NA
	Sub Total	2.247	22.961	15.936	0.057	20.977	5.658	5581.988	0.084	0.808	0.773	0.003	0.898	0.134	267.483
Northside Canal Flumes	equipment	2.044	19.616	13.873	0.041	0.793	0.731	3882.888	0.035	0.278	0.270	0.001	0.011	0.010	78.168
	vehicles	0.022	1.708	0.532	0.010	0.112	0.053	1132.003	0.001	0.067	0.023	0.000	0.004	0.002	40.729
	dust	NA	NA	NA	NA	21.166	4.925	NA	NA	NA	NA	NA	0.432	0.055	NA
	Sub Total	2.066	21.325	14.405	0.051	22.071	5.709	5014.891	0.036	0.345	0.293	0.001	0.448	0.067	118.897

Analysis Year: 2023  
Construction Emissions Summary

Total Emissions of Potential Overlapping Projects		2023																		
		Emissions/year Per Project									Total Emissions with Multiple Projects									
	Number of Projects	ROG	NOx	CO	SO <sub>2</sub>	PM10 Exhaust	PM2.5 Exhaust	Total PM <sub>10</sub>	Total PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM10 Exhaust	PM2.5 Exhaust	Total PM <sub>10</sub>	Total PM <sub>2.5</sub>	CO <sub>2</sub> e	
		ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year	
Main Canal Improvements at Tunnel No.1 Project	0	0.74	7.32	5.10	0.02	0.30	0.27	5.45	1.48	1431.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment																				
Main Canal Improvements at Tunnel No.1 Project	0	0.81	7.65	5.58	0.02	0.32	0.28	5.05	1.50	1487.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 2: Open Channel on New Alignment North of the Existing Alignment																				
Main Canal Improvements at Tunnel No.1 Project	0	0.45	4.33	3.12	0.01	0.18	0.16	2.88	0.82	839.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 3: Open Channel along Existing Tunnel Alignment																				
Main Canal Improvements at Tunnel No.1 Project	0	0.33	2.97	2.52	0.01	0.13	0.12	2.63	0.68	666.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Option 4: Rehabilitation of Existing Tunnel																				
Canal rebuilding/relining	3	0.05	0.43	0.48	0.00	0.02	0.02	0.59	0.08	139.45	0.14	1.28	1.43	0.00	0.06	0.05	1.76	0.23	418.34	
Table topping deadend facilities	2	0.02	0.13	0.14	0.00	0.006	0.005	0.20	0.02	44.69	0.03	0.26	0.27	0.00	0.01	0.01	0.39	0.05	89.39	
Canal Automation	5	0.03	0.26	0.28	0.00	0.012	0.010	0.26	0.04	88.07	0.15	1.31	1.39	0.00	0.06	0.05	1.32	0.18	440.36	
Flow Measurement	5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	1.37	
Siphon modifications	5	0.02	0.15	0.18	0.00	0.01	0.01	0.09	0.01	46.30	0.09	0.77	0.88	0.00	0.03	0.03	0.43	0.07	231.52	
Siphon demolition	5	0.03	0.26	0.27	0.00	0.01	0.01	0.14	0.02	85.15	0.15	1.31	1.35	0.00	0.06	0.05	0.71	0.12	425.74	
Intertie projects	1	0.08	0.76	0.70	0.00	0.03	0.03	1.01	0.13	280.19	0.08	0.76	0.70	0.00	0.03	0.03	1.01	0.13	280.19	
Reservoirs and Recharge Basins	1	0.34	3.24	2.54	0.01	0.14	0.11	3.56	0.58	1036.25	0.34	3.24	2.54	0.01	0.14	0.11	3.56	0.58	1036.25	
Highlands	0	0.02	0.16	0.16	0.00	0.01	0.01	0.19	0.03	52.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Owens Creek Diversion Channel	0	0.42	4.04	2.94	0.01	0.17	0.15	2.77	0.82	784.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Black Rascal Diversion Channel	0	0.08	0.80	0.61	0.00	0.04	0.03	1.16	0.22	176.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Merced River Water Recovery	0	0.21	2.04	1.64	0.01	0.09	0.08	2.21	0.66	460.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Le Grand Canal near Black Rascal Automation Project	0	0.08	0.81	0.77	0.00	0.04	0.03	0.90	0.13	267.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Northside Canal Flumes	0	0.04	0.35	0.29	0.00	0.02	0.01	0.45	0.07	118.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Emissions of Potential Overlapping Projects in Analysis Year											0.99	8.92	8.58	0.03	0.40	0.33	9.23	1.37	2923.15	
SJVAPCD CEQA Thresholds											10	10	100	27	NA	NA	15	15	NA	

Analysis Year: 2023  
Onsite Equipment Emissions

Onsite Equipment Information and Emission Factors 2023																		
Projects	Equipment	Operation Data		Days/Project per equipment	Days/Year per equipment	Hour/day per equipment	Emission Factor Year	CalEEMod Default Load Factor	CalEEMod Emission Factors (100% load)									
		Number	HP per equipment						ROG g/hp-hr	NOx g/hp-hr	CO g/hp-hr	SO <sub>2</sub> g/hp-hr	PM <sub>10</sub> g/hp-hr	PM <sub>2.5</sub> g/hp-hr	CO <sub>2</sub> g/hp-hr	CH <sub>4</sub> g/hp-hr	CO <sub>2</sub> e g/hp-hr	
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New Alignment South of the Existing Alignment	Bulldozers with brush attachments	4	247	250	125	8	2023	0.4	0.393	4.090	1.783	0.005	0.184	0.169	474.597	0.153	478.881	
	Grader	3	187	200	100	8	2023	0.41	0.284	3.441	1.252	0.005	0.111	0.103	473.926	0.153	478.210	
	Backhoe	1	97	75	38	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Loader	2	97	190	95	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Dump Trucks	10	402	130	65	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Scrapers	8	367	180	90	8	2023	0.48	0.253	2.666	1.975	0.005	0.105	0.096	473.177	0.153	477.461	
	Excavator	2	158	100	50	8	2023	0.38	0.122	0.893	1.051	0.005	0.030	0.028	469.889	0.152	474.145	
	Compactor	2	8	180	90	8	2023	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
	Water truck	1	402	260	130	6	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Small Crane (5 -10 ton)	1	231	15	8	8	2023	0.29	0.297	3.229	1.553	0.005	0.135	0.124	472.974	0.153	477.258	
	Generator	1	84	15	8	6	2023	0.74	0.279	2.477	3.347	0.006	0.117	0.117	568.299	0.025	568.999	
	Concrete Pump	1	84	50	25	6	2023	0.74	0.299	2.511	3.398	0.006	0.123	0.123	568.299	0.026	569.027	
	Concrete Pump truck	1	402	50	25	6	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	Bulldozers with brush attachments	3	247	360	180	8	2023	0.4	0.393	4.090	1.783	0.005	0.184	0.169	474.597	0.153	478.881	
	Grader	2	187	240	120	8	2023	0.41	0.284	3.441	1.252	0.005	0.111	0.103	473.926	0.153	478.210	
	Backhoe	1	97	60	30	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Loader	1	97	360	180	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Dump Trucks	10	402	160	80	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Scrapers	8	367	180	90	8	2023	0.48	0.253	2.666	1.975	0.005	0.105	0.096	473.177	0.153	477.461	
	Excavator	2	158	100	50	8	2023	0.38	0.122	0.893	1.051	0.005	0.030	0.028	469.889	0.152	474.145	
	Compactor	2	8	180	90	8	2023	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
	Water truck	1	402	410	205	6	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Generator	1	84	310	155	6	2023	0.74	0.279	2.477	3.347	0.006	0.117	0.117	568.299	0.025	568.999	
	Concrete Pump	1	84	30	15	6	2023	0.74	0.299	2.511	3.398	0.006	0.123	0.123	568.299	0.026	569.027	
	Small Crane (5 -10 ton)	1	231	30	15	6	2023	0.29	0.297	3.229	1.553	0.005	0.135	0.124	472.974	0.153	477.258	
	Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Bulldozers with brush attachments	3	247	190	95	8	2023	0.4	0.393	4.090	1.783	0.005	0.184	0.169	474.597	0.153	478.881
Grader		3	187	130	65	8	2023	0.41	0.284	3.441	1.252	0.005	0.111	0.103	473.926	0.153	478.210	
Backhoe		1	97	30	15	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
Loader		2	97	190	95	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
Dump Trucks		10	402	80	40	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
Scrapers		8	367	100	50	8	2023	0.48	0.253	2.666	1.975	0.005	0.105	0.096	473.177	0.153	477.461	
Excavator		2	158	50	25	8	2023	0.38	0.122	0.893	1.051	0.005	0.030	0.028	469.889	0.152	474.145	
Compactor		2	8	100	50	8	2023	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
Water truck		2	402	200	100	6	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
Generator		0	84	150	75	6	2023	0.74	0.279	2.477	3.347	0.006	0.117	0.117	568.299	0.025	568.999	
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	Bulldozers with brush attachments	2	247	225	113	8	2023	0.4	0.393	4.090	1.783	0.005	0.184	0.169	474.597	0.153	478.881	
	Grader	2	187	155	78	8	2023	0.41	0.284	3.441	1.252	0.005	0.111	0.103	473.926	0.153	478.210	
	Backhoe	1	97	10	5	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Loader	3	97	230	115	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Dump Trucks	5	402	183	92	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Compactor	2	8	290	145	8	2023	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
	Water truck	1	402	260	130	6	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Concrete Pump	2	84	190	95	6	2023	0.74	0.299	2.511	3.398	0.006	0.123	0.123	568.299	0.026	569.027	
	Generator	2	84	230	115	6	2023	0.74	0.279	2.477	3.347	0.006	0.117	0.117	568.299	0.025	568.999	
Canal rebuilding/relining	Backhoe	1	97	60	60	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Loader	2	97	40	40	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Dump Trucks	1	402	60	60	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Excavator	1	158	40	40	8	2023	0.38	0.122	0.893	1.051	0.005	0.030	0.028	469.889	0.152	474.145	
	Water truck	1	402	60	60	6	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Concrete Pump	1	84	60	60	6	2023	0.74	0.299	2.511	3.398	0.006	0.123	0.123	568.299	0.026	569.027	
Table topping deadend facilities	Loader	2	97	10	10	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Dump Trucks	1	402	22	22	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Excavator	1	158	10	10	8	2023	0.38	0.122	0.893	1.051	0.005	0.030	0.028	469.889	0.152	474.145	
	Compactor	1	8	10	10	8	2023	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951	
	Water truck	1	402	22	22	6	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Concrete Pump	1	84	22	22	6	2023	0.74	0.299	2.511	3.398	0.006	0.123	0.123	568.299	0.026	569.027	
Canal Automation	Backhoe	1	97	60	60	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743	
	Dump Trucks	1	402	20	20	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Excavator	1	158	60	60	8	2023	0.38	0.122	0.893	1.051	0.005	0.030	0.028	469.889	0.152	474.145	
	Water truck	1	402	60	60	6	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361	
	Concrete Pump	1	84	40	40	6	2023	0.74	0.299	2.511	3.398	0.006	0.123	0.123	568.299	0.026	569.027	



Analysis Year:

2023

Onsite Equipment Emissions

Le Grand Canal near Black Rascal Automation Project	Bulldozers with brush attachments	1	247	9	9	8	2023	0.4	0.393	4.090	1.783	0.005	0.184	0.169	474.597	0.153	478.881
	Grader	1	187	9	9	8	2023	0.41	0.284	3.441	1.252	0.005	0.111	0.103	473.926	0.153	478.210
	Backhoe	0	97	0	0	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743
	Loader	1	97	147	147	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743
	Dump Trucks	0	402	0	0	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361
	Scrapers	0	367	0	0	8	2023	0.48	0.253	2.666	1.975	0.005	0.105	0.096	473.177	0.153	477.461
	Excavator	1	158	147	147	8	2023	0.38	0.122	0.893	1.051	0.005	0.030	0.028	469.889	0.152	474.145
	Compactor	1	8	10	10	8	2023	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951
	Water truck	1	402	147	147	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361
	Generator	0	84	0	0	8	2023	0.74	0.279	2.477	3.347	0.006	0.117	0.117	568.299	0.025	568.999
	Concrete Pump	1	84	116	116	8	2023	0.74	0.299	2.511	3.398	0.006	0.123	0.123	568.299	0.026	569.027
Northside Canal Flumes	Bulldozers with brush attachments	1	247	7	7	8	2023	0.4	0.393	4.090	1.783	0.005	0.184	0.169	474.597	0.153	478.881
	Grader	1	187	7	7	8	2023	0.41	0.284	3.441	1.252	0.005	0.111	0.103	473.926	0.153	478.210
	Backhoe	1	97	8	8	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743
	Loader	1	97	60	60	8	2023	0.37	0.239	2.426	3.525	0.005	0.120	0.110	476.431	0.154	480.743
	Dump Trucks	0	402	0	0	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361
	Scrapers	0	367	0	0	8	2023	0.48	0.253	2.666	1.975	0.005	0.105	0.096	473.177	0.153	477.461
	Excavator	1	158	60	60	8	2023	0.38	0.122	0.893	1.051	0.005	0.030	0.028	469.889	0.152	474.145
	Compactor	1	8	10	10	8	2023	0.43	0.661	4.142	3.469	0.008	0.161	0.161	568.299	0.059	569.951
	Water truck	1	402	87	87	8	2023	0.38	0.187	1.324	1.221	0.005	0.048	0.044	475.049	0.154	479.361
	Generator	0	84	0	0	8	2023	0.74	0.279	2.477	3.347	0.006	0.117	0.117	568.299	0.025	568.999
	Concrete Pump	1	84	87	87	8	2023	0.74	0.299	2.511	3.398	0.006	0.123	0.123	568.299	0.026	569.027

Assumptions:

- CO2e were calculated using the following global warming potential (GWP, 100-year GWP from IPCC Fifth Assessment Report , 2014)

CO2 1

CH4 28

N2O 265
- Load factor and emission factors are from CalEEMod Appendix D: Table 3.4 Offroad Equipment Emission Factors (g/hp-hr) and Table 3.3 OFFROAD Default Horsepower and Load Factors (October 2017)

Analysis Year: 2023  
Onsite Equipment Emissions

Onsite Equipment Emissions																
Projects	Onsite Equipment	Daily Emissions							Annual Emissions							
		ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	
		lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year	
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New Alignment South of the Existing Alignment	Bulldozers with brush attachments	2.74	28.51	12.43	0.03	1.28	1.18	3307.95	0.171	1.782	0.777	0.002	0.080	0.074	187.561	
	Grader	1.15	13.96	5.08	0.02	0.45	0.42	1922.53	0.058	0.698	0.254	0.001	0.023	0.021	87.206	
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.003	0.029	0.042	0.000	0.001	0.001	5.198	
	Loader	0.30	3.07	4.46	0.01	0.15	0.14	603.14	0.014	0.146	0.212	0.000	0.007	0.007	25.991	
	Dump Trucks	5.04	35.68	32.88	0.13	1.29	1.19	12798.67	0.164	1.160	1.069	0.004	0.042	0.039	377.356	
	Scrapers	6.29	66.27	49.10	0.12	2.61	2.39	11760.83	0.283	2.982	2.209	0.006	0.117	0.107	480.124	
	Excavator	0.26	1.89	2.23	0.01	0.06	0.06	995.14	0.006	0.047	0.056	0.000	0.002	0.001	22.570	
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.004	0.023	0.019	0.000	0.001	0.001	2.815	
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.025	0.174	0.160	0.001	0.006	0.006	56.603	
	Small Crane (5 -10 ton)	0.35	3.82	1.83	0.01	0.16	0.15	558.81	0.001	0.015	0.007	0.000	0.001	0.001	2.028	
	Generator	0.23	2.04	2.75	0.00	0.10	0.10	467.27	0.001	0.008	0.011	0.000	0.000	0.000	1.696	
	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.003	0.026	0.035	0.000	0.001	0.001	5.299	
	Concrete Pump truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.005	0.033	0.031	0.000	0.001	0.001	10.885	
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	Bulldozers with brush attachments	2.05	21.38	9.32	0.03	0.96	0.88	2480.96	0.185	1.924	0.839	0.002	0.087	0.080	202.565	
	Grader	0.77	9.31	3.39	0.01	0.30	0.28	1281.69	0.046	0.558	0.203	0.001	0.018	0.017	69.765	
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.002	0.023	0.033	0.000	0.001	0.001	4.104	
	Loader	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.014	0.138	0.201	0.000	0.007	0.006	24.623	
	Dump Trucks	5.04	35.68	32.88	0.13	1.29	1.19	12798.67	0.202	1.427	1.315	0.005	0.052	0.047	464.438	
	Scrapers	6.29	66.27	49.10	0.12	2.61	2.39	11760.83	0.283	2.982	2.209	0.006	0.117	0.107	480.124	
	Excavator	0.26	1.89	2.23	0.01	0.06	0.06	995.14	0.006	0.047	0.056	0.000	0.002	0.001	22.570	
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.004	0.023	0.019	0.000	0.001	0.001	2.815	
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.039	0.274	0.253	0.001	0.010	0.009	89.259	
	Generator	0.23	2.04	2.75	0.00	0.10	0.10	467.27	0.018	0.158	0.213	0.000	0.007	0.007	32.853	
	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.002	0.015	0.021	0.000	0.001	0.001	3.179	
	Small Crane (5 -10 ton)	0.26	2.86	1.38	0.00	0.12	0.11	419.11	0.002	0.021	0.010	0.000	0.001	0.001	2.852	
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Bulldozers with brush attachments	2.05	21.38	9.32	0.03	0.96	0.88	2480.96	0.098	1.016	0.443	0.001	0.046	0.042	106.910	
	Grader	1.15	13.96	5.08	0.02	0.45	0.42	1922.53	0.037	0.454	0.165	0.001	0.015	0.014	56.684	
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.001	0.012	0.017	0.000	0.001	0.001	2.052	
	Loader	0.30	3.07	4.46	0.01	0.15	0.14	603.14	0.014	0.146	0.212	0.000	0.007	0.007	25.991	
	Dump Trucks	5.04	35.68	32.88	0.13	1.29	1.19	12798.67	0.101	0.714	0.658	0.003	0.026	0.024	232.219	
	Scrapers	6.29	66.27	49.10	0.12	2.61	2.39	11760.83	0.157	1.657	1.227	0.003	0.065	0.060	266.736	
	Excavator	0.26	1.89	2.23	0.01	0.06	0.06	995.14	0.003	0.024	0.028	0.000	0.001	0.001	11.285	
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.002	0.013	0.011	0.000	0.000	0.000	1.564	
	Water truck	0.76	5.35	4.93	0.02	0.19	0.18	1919.80	0.038	0.268	0.247	0.001	0.010	0.009	87.082	
	Generator															
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	Bulldozers with brush attachments	1.37	14.25	6.21	0.02	0.64	0.59	1653.97	0.077	0.805	0.351	0.001	0.036	0.033	84.777	
	Grader	0.77	9.31	3.39	0.01	0.30	0.28	1281.69	0.030	0.363	0.132	0.001	0.012	0.011	45.347	
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.000	0.004	0.006	0.000	0.000	0.000	0.684	
	Loader	0.45	4.61	6.69	0.01	0.23	0.21	904.71	0.026	0.265	0.385	0.001	0.013	0.012	47.194	
	Dump Trucks	2.52	17.84	16.44	0.07	0.65	0.59	6399.33	0.116	0.821	0.756	0.003	0.030	0.027	267.052	
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.006	0.036	0.031	0.000	0.001	0.001	4.535	
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.025	0.174	0.160	0.001	0.006	0.006	56.603	
	Concrete Pump	0.49	4.13	5.59	0.01	0.20	0.20	934.54	0.023	0.196	0.265	0.000	0.010	0.010	40.271	
Canal rebuilding/relining	Generator	0.46	4.07	5.50	0.01	0.19	0.19	934.54	0.026	0.234	0.316	0.001	0.011	0.011	48.749	
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.005	0.046	0.067	0.000	0.002	0.002	8.208	
	Loader	0.30	3.07	4.46	0.01	0.15	0.14	603.14	0.006	0.061	0.089	0.000	0.003	0.003	10.943	
	Dump Trucks	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.015	0.107	0.099	0.000	0.004	0.004	34.833	
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.003	0.019	0.022	0.000	0.001	0.001	9.028	
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.011	0.080	0.074	0.000	0.003	0.003	26.125	
	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.007	0.062	0.084	0.000	0.003	0.003	12.717	
Table topping deadend facilities	Loader	0.30	3.07	4.46	0.01	0.15	0.14	603.14	0.002	0.015	0.022	0.000	0.001	0.001	2.736	
	Dump Trucks	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.006	0.039	0.036	0.000	0.001	0.001	12.772	
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.001	0.005	0.006	0.000	0.000	0.000	2.257	
	Compactor	0.04	0.25	0.21	0.00	0.01	0.01	34.48	0.000	0.001	0.001	0.000	0.000	0.000	0.156	
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.004	0.029	0.027	0.000	0.001	0.001	9.579	
Canal Automation	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.003	0.023	0.031	0.000	0.001	0.001	4.663	
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.005	0.046	0.067	0.000	0.002	0.002	8.208	
	Dump Trucks	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.005	0.036	0.033	0.000	0.001	0.001	11.611	
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.004	0.028	0.033	0.000	0.001	0.001	13.542	
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.011	0.080	0.074	0.000	0.003	0.003	26.125	
	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.005	0.041	0.056	0.000	0.002	0.002	8.478	

Analysis Year: 2023  
Onsite Equipment Emissions

Flow Measurement	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Siphon modifications	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.003	0.031	0.045	0.000	0.002	0.001	5.472
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.003	0.019	0.022	0.000	0.001	0.001	9.028
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.008	0.054	0.049	0.000	0.002	0.002	17.416
	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.005	0.041	0.056	0.000	0.002	0.002	8.478
Siphon demolition	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.005	0.046	0.067	0.000	0.002	0.002	8.208
	Dump Trucks	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.005	0.036	0.033	0.000	0.001	0.001	11.611
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.004	0.028	0.033	0.000	0.001	0.001	13.542
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.011	0.080	0.074	0.000	0.003	0.003	26.125
	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.005	0.041	0.056	0.000	0.002	0.002	8.478
Intertie projects	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.010	0.100	0.145	0.000	0.005	0.005	17.783
	Dump Trucks	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.033	0.232	0.214	0.001	0.008	0.008	75.471
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.008	0.061	0.072	0.000	0.002	0.002	29.341
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.025	0.174	0.160	0.001	0.006	0.006	56.603
Reservoirs and Recharge Basins	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.005	0.041	0.056	0.000	0.002	0.002	8.478
	Bulldozers with brush attachments	1.37	14.25	6.21	0.02	0.64	0.59	1653.97	0.027	0.285	0.124	0.000	0.013	0.012	30.010
	Grader	0.38	4.65	1.69	0.01	0.15	0.14	640.84	0.008	0.093	0.034	0.000	0.003	0.003	11.627
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.003	0.031	0.045	0.000	0.002	0.001	5.472
	Loader	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.003	0.031	0.045	0.000	0.002	0.001	5.472
	Dump Trucks	5.04	35.68	32.88	0.13	1.29	1.19	12798.67	0.169	1.195	1.102	0.005	0.043	0.040	388.967
	Scrapers	1.57	16.57	12.27	0.03	0.65	0.60	2940.21	0.031	0.331	0.245	0.001	0.013	0.012	53.347
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.003	0.019	0.022	0.000	0.001	0.001	9.028
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.002	0.010	0.008	0.000	0.000	0.000	1.251
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.053	0.375	0.345	0.001	0.014	0.012	121.915
	Generator	0.31	2.72	3.67	0.01	0.13	0.13	623.02	0.018	0.163	0.220	0.000	0.008	0.008	33.912
	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.015	0.124	0.168	0.000	0.006	0.006	25.434
	25-ton crane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Power Screed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Highlands	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.002	0.019	0.028	0.000	0.001	0.001	3.420
	Dump Trucks	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.006	0.045	0.041	0.000	0.002	0.001	14.514
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.000	0.001	0.001	0.000	0.000	0.000	0.451
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.005	0.033	0.031	0.000	0.001	0.001	10.885
	Concrete Pump	0.25	2.06	2.79	0.00	0.10	0.10	467.27	0.003	0.026	0.035	0.000	0.001	0.001	5.299
	Small Crane (5 -10 ton)	0.26	2.86	1.38	0.00	0.12	0.11	419.11	0.000	0.004	0.002	0.000	0.000	0.000	0.570
	Drill Rig	0.21	2.04	2.03	0.01	0.07	0.06	915.39	0.001	0.010	0.010	0.000	0.000	0.000	4.152
Owens Creek Diversion Channel	Bulldozers with brush attachments	2.05	21.38	9.32	0.03	0.96	0.88	2480.96	0.102	1.058	0.461	0.001	0.048	0.044	111.411
	Grader	0.38	4.65	1.69	0.01	0.15	0.14	640.84	0.012	0.147	0.053	0.000	0.005	0.004	18.313
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.001	0.008	0.011	0.000	0.000	0.000	1.368
	Loader	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.007	0.076	0.110	0.000	0.004	0.003	13.542
	Dump Trucks	5.04	35.68	32.88	0.13	1.29	1.19	12798.67	0.093	0.660	0.608	0.002	0.024	0.022	214.803
	Scrapers	6.29	66.27	49.10	0.12	2.61	2.39	11760.83	0.167	1.756	1.301	0.003	0.069	0.063	282.740
	Excavator	0.26	1.89	2.23	0.01	0.06	0.06	995.14	0.004	0.031	0.037	0.000	0.001	0.001	14.896
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.002	0.013	0.011	0.000	0.001	0.001	1.658
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.019	0.132	0.122	0.001	0.005	0.004	43.106
	Generator	0.23	2.04	2.75	0.00	0.10	0.10	467.27	0.010	0.089	0.120	0.000	0.004	0.004	18.440
	Concrete Pump	0.16	1.38	1.86	0.00	0.07	0.07	311.51	0.001	0.005	0.007	0.000	0.000	0.000	0.989
Black Rascal Diversion Channel	Bulldozers with brush attachments	2.05	21.38	9.32	0.03	0.96	0.88	2480.96	0.020	0.203	0.089	0.000	0.009	0.008	21.382
	Grader	0.38	4.65	1.69	0.01	0.15	0.14	640.84	0.002	0.028	0.010	0.000	0.001	0.001	3.488
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.001	0.006	0.009	0.000	0.000	0.000	1.094
	Loader	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.001	0.015	0.021	0.000	0.001	0.001	2.599
	Dump Trucks	5.04	35.68	32.88	0.13	1.29	1.19	12798.67	0.018	0.125	0.115	0.000	0.005	0.004	40.638
	Scrapers	6.29	66.27	49.10	0.12	2.61	2.39	11760.83	0.031	0.331	0.245	0.001	0.013	0.012	53.347
	Excavator	0.26	1.89	2.23	0.01	0.06	0.06	995.14	0.001	0.006	0.007	0.000	0.000	0.000	2.708
	Compactor	0.08	0.50	0.42	0.00	0.02	0.02	68.96	0.000	0.003	0.002	0.000	0.000	0.000	0.313
	Water truck	0.38	2.68	2.47	0.01	0.10	0.09	959.90	0.004	0.025	0.023	0.000	0.001	0.001	8.273
	Generator	0.23	2.04	2.75	0.00	0.10	0.10	467.27	0.002	0.016	0.022	0.000	0.001	0.001	3.391
	Concrete Pump	0.16	1.38	1.86	0.00	0.07	0.07	311.51	0.001	0.007	0.009	0.000	0.000	0.000	1.413
Merced River Water Recovery	Bulldozers with brush attachments	1.37	14.25	6.21	0.02	0.64	0.59	1653.97	0.091	0.948	0.413	0.001	0.043	0.039	99.782
	Grader	0.38	4.65	1.69	0.01	0.15	0.14	640.84	0.002	0.028	0.010	0.000	0.001	0.001	3.488
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.002	0.016	0.023	0.000	0.001	0.001	2.873
	Loader	0.30	3.07	4.46	0.01	0.15	0.14	603.14	0.022	0.223	0.324	0.000	0.011	0.010	39.670
	Dump Trucks	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.010	0.071	0.066	0.000	0.003	0.002	23.222
	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Excavator	0.26	1.89	2.23	0.01	0.06	0.06	995.14	0.021	0.156	0.184	0.001	0.005	0.005	74.480
	Compactor	0.04	0.25	0.21	0.00	0.01	0.01	34.48	0.000	0.001	0.001	0.000	0.000	0.000	0.078
	Water truck	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.042	0.294	0.271	0.001	0.011	0.010	95.790
	Generator	0.31	2.72	3.67	0.01	0.13	0.13	623.02	0.011	0.096	0.130	0.000	0.005	0.005	20.065
	Concrete Pump	0.33	2.75	3.73	0.01	0.13	0.13	623.02	0.012	0.098	0.132	0.000	0.005	0.005	20.065

Analysis Year:

2023

Onsite Equipment Emissions

Le Grand Canal near Black Rascal Automation Project	Bulldozers with brush attachments	0.68	7.13	3.11	0.01	0.32	0.29	826.99	0.003	0.032	0.014	0.000	0.001	0.001	3.376
	Grader	0.38	4.65	1.69	0.01	0.15	0.14	640.84	0.002	0.021	0.008	0.000	0.001	0.001	2.616
	Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Loader	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.011	0.113	0.164	0.000	0.006	0.005	20.109
	Dump Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.009	0.070	0.082	0.000	0.002	0.002	33.177
	Compactor	0.04	0.25	0.21	0.00	0.01	0.01	34.48	0.000	0.001	0.001	0.000	0.000	0.000	0.156
	Water truck	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.037	0.262	0.242	0.001	0.010	0.009	85.341
	Generator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Concrete Pump	0.33	2.75	3.73	0.01	0.13	0.13	623.02	0.019	0.160	0.216	0.000	0.008	0.008	32.782
Northside Canal Flumes	Bulldozers with brush attachments	0.68	7.13	3.11	0.01	0.32	0.29	826.99	0.002	0.025	0.011	0.000	0.001	0.001	2.626
	Grader	0.38	4.65	1.69	0.01	0.15	0.14	640.84	0.001	0.016	0.006	0.000	0.001	0.000	2.035
	Backhoe	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.001	0.006	0.009	0.000	0.000	0.000	1.094
	Loader	0.15	1.54	2.23	0.00	0.08	0.07	301.57	0.005	0.046	0.067	0.000	0.002	0.002	8.208
	Dump Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Excavator	0.13	0.95	1.11	0.01	0.03	0.03	497.57	0.004	0.028	0.033	0.000	0.001	0.001	13.542
	Compactor	0.04	0.25	0.21	0.00	0.01	0.01	34.48	0.000	0.001	0.001	0.000	0.000	0.000	0.156
	Water truck	0.50	3.57	3.29	0.01	0.13	0.12	1279.87	0.022	0.155	0.143	0.001	0.006	0.005	50.508
	Generator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Concrete Pump	0.33	2.75	3.73	0.01	0.13	0.13	623.02	0.014	0.120	0.162	0.000	0.006	0.006	24.587

Total Equipment Emissions per Project

2023

Projects	Daily Emissions							Annual Emissions						
	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year
Main Canal Improvements at Tunnel No.1 Project														
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	17.59	164.68	121.14	0.37	6.50	5.98	35171.94	0.74	7.12	4.88	0.01	0.28	0.26	1265.33
Main Canal Improvements at Tunnel No.1 Project														
Option 2: Open Channel on New Alignment North of the Existing Alignment	15.91	147.74	111.18	0.34	5.81	5.35	32302.93	0.80	7.59	5.37	0.02	0.30	0.28	1399.15
Main Canal Improvements at Tunnel No.1 Project														
Option 3: Open Channel along Existing Tunnel Alignment	16.08	149.64	110.65	0.35	5.82	5.34	32851.60	0.45	4.30	3.01	0.01	0.17	0.16	790.52
Main Canal Improvements at Tunnel No.1 Project														
Option 4: Rehabilitation of Existing Tunnel	6.67	58.92	48.94	0.14	2.40	2.24	13439.21	0.33	2.90	2.40	0.01	0.12	0.11	595.21
Canal rebuilding/relining	1.71	13.86	16.36	0.04	0.59	0.55	4109.32	0.05	0.38	0.43	0.00	0.02	0.01	101.85
Table topping deadend facilities	1.60	12.58	14.33	0.04	0.52	0.49	3842.23	0.01	0.11	0.12	0.00	0.00	0.00	32.16
Canal Automation	1.41	10.79	11.89	0.04	0.44	0.41	3506.18	0.03	0.23	0.26	0.00	0.01	0.01	67.96
Flow Measurement	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siphon modifications	0.90	7.22	8.60	0.02	0.31	0.29	2226.31	0.02	0.14	0.17	0.00	0.01	0.01	40.39
Siphon demolition	1.41	10.79	11.89	0.04	0.44	0.41	3506.18	0.03	0.23	0.26	0.00	0.01	0.01	67.96
Intertie projects	1.41	10.79	11.89	0.04	0.44	0.41	3506.18	0.08	0.61	0.65	0.00	0.02	0.02	187.68
Reservoirs and Recharge Basins	9.81	83.13	67.99	0.22	3.27	3.02	21253.56	0.33	2.66	2.36	0.01	0.10	0.10	686.44
Highlands	1.89	15.69	15.30	0.05	0.62	0.58	4840.67	0.02	0.14	0.15	0.00	0.01	0.01	39.29
Owens Creek Diversion Channel	15.18	139.53	107.18	0.33	5.51	5.06	31087.22	0.42	3.98	2.84	0.01	0.16	0.15	721.27
Black Rascal Diversion Channel	15.18	139.53	107.18	0.33	5.51	5.06	31087.22	0.08	0.76	0.55	0.00	0.03	0.03	138.65
Merced River Water Recovery	4.15	38.26	31.01	0.08	1.61	1.51	8034.93	0.21	1.93	1.55	0.00	0.08	0.08	379.51
Le Grand Canal near Black Rascal Automation Project	2.22	20.83	15.37	0.04	0.85	0.80	4204.34	0.08	0.66	0.73	0.00	0.03	0.03	177.56
Northside Canal Flumes	2.04	19.62	13.87	0.04	0.79	0.73	3882.89	0.03	0.28	0.27	0.00	0.01	0.01	78.17

Analysis Year: 2023  
Vehicle Emissions

Vehicle Emission Factors (EMFAC2014)		2023						
	Year	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
		g/mile	g/mile	g/mile	g/mile	g/mile	g/mile	g/mile
Worker Commute	2023	0.011	0.050	0.688	0.003	0.046	0.019	276.786
Haul Trucks, Ready Mix Trucks	2023	0.022	2.379	0.208	0.013	0.124	0.061	1392.801
pickup	2023	0.018	0.087	0.924	0.003	0.044	0.018	310.570

Note:  
Vehicle emission factors were obtained from EMFAC2014:  
Region: SJVAPCD  
Speed and model year: aggregated  
EMFACT2014 does not provide emissions of N2O and CH4 from vehicles. CO2e emissions were assumed to be the same as CO2.  
Worker commute vehicles include auto and light duty trucks.  
Haul trucks and ready mix trucks include heavy heavy duty diesel trucks.

Vehicle Emissions		2023																
Projects	Vehicle Types	Round Trips/day	miles/round trip	days/year	Daily Emissions							Annual Emissions						
					ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
					lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	Worker Commute	30	20	264	0.015	0.067	0.910	0.004	0.061	0.025	366.120	0.002	0.009	0.120	0.000	0.008	0.003	43.843
	Haul Truck	20	40	80	0.039	4.196	0.368	0.022	0.219	0.107	2456.439	0.002	0.168	0.015	0.001	0.009	0.004	89.139
	Ready Mix Trucks	10	40	15	0.019	2.098	0.184	0.011	0.109	0.054	1228.220	0.000	0.016	0.001	0.000	0.001	0.000	8.357
	pickup	20	20	198	0.016	0.076	0.815	0.003	0.039	0.016	273.871	0.002	0.008	0.081	0.000	0.004	0.002	24.597
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New AlignmentNorth of the Existing Alignment	Worker Commute	30	20	264	0.015	0.067	0.910	0.004	0.061	0.025	366.120	0.002	0.009	0.120	0.000	0.008	0.003	43.843
	Haul Truck	20	40	5	0.039	4.196	0.368	0.022	0.219	0.107	2456.439	0.000	0.010	0.001	0.000	0.001	0.000	5.571
	Ready Mix Trucks	10	40	25	0.019	2.098	0.184	0.011	0.109	0.054	1228.220	0.000	0.026	0.002	0.000	0.001	0.001	13.928
	pickup	20	20	198	0.016	0.076	0.815	0.003	0.039	0.016	273.871	0.002	0.008	0.081	0.000	0.004	0.002	24.597
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Worker Commute	30	20	132	0.015	0.067	0.910	0.004	0.061	0.025	366.120	0.001	0.004	0.060	0.000	0.004	0.002	21.921
	Haul Truck	20	40	8	0.039	4.196	0.368	0.022	0.219	0.107	2456.439	0.000	0.017	0.001	0.000	0.001	0.000	8.914
	Ready Mix Trucks	5	40	5	0.010	1.049	0.092	0.006	0.055	0.027	614.110	0.000	0.003	0.000	0.000	0.000	0.000	1.393
	pickup	20	20	132	0.016	0.076	0.815	0.003	0.039	0.016	273.871	0.001	0.005	0.054	0.000	0.003	0.001	16.398
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	Worker Commute	30	20	132	0.015	0.067	0.910	0.004	0.061	0.025	366.120	0.001	0.004	0.060	0.000	0.004	0.002	21.921
	Haul Truck	20	40	23	0.039	4.196	0.368	0.022	0.219	0.107	2456.439	0.000	0.048	0.004	0.000	0.003	0.001	25.628
	Ready Mix Trucks	2	40	63	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.013	0.001	0.000	0.001	0.000	7.020
	pickup	20	20	132	0.016	0.076	0.815	0.003	0.039	0.016	273.871	0.001	0.005	0.054	0.000	0.003	0.001	16.398
Canal rebuilding/relining	Worker Commute	10	20	66	0.005	0.022	0.303	0.001	0.020	0.008	122.040	0.000	0.001	0.010	0.000	0.001	0.000	3.654
	Haul Truck	5	40	66	0.010	1.049	0.092	0.006	0.055	0.027	614.110	0.000	0.035	0.003	0.000	0.002	0.001	18.385
	Ready Mix Trucks	2	40	66	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.014	0.001	0.000	0.001	0.000	7.354
	pickup	20	20	66	0.016	0.076	0.815	0.003	0.039	0.016	273.871	0.001	0.003	0.027	0.000	0.001	0.001	8.199
Table topping deadend facilities	Worker Commute	10	20	22	0.005	0.022	0.303	0.001	0.020	0.008	122.040	0.000	0.000	0.003	0.000	0.000	0.000	1.218
	Haul Truck	5	40	22	0.010	1.049	0.092	0.006	0.055	0.027	614.110	0.000	0.012	0.001	0.000	0.001	0.000	6.128
	Ready Mix Trucks	2	40	22	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.005	0.000	0.000	0.000	0.000	2.451
	pickup	20	20	22	0.016	0.076	0.815	0.003	0.039	0.016	273.871	0.000	0.001	0.009	0.000	0.000	0.000	2.733
Canal Automation	Worker Commute	6	20	132	0.003	0.013	0.182	0.001	0.012	0.005	73.224	0.000	0.001	0.012	0.000	0.001	0.000	4.384
	Haul Truck	10	40	20	0.019	2.098	0.184	0.011	0.109	0.054	1228.220	0.000	0.021	0.002	0.000	0.001	0.001	11.142
	Ready Mix Trucks	2	40	40	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.008	0.001	0.000	0.000	0.000	4.457
	pickup	2	20	10	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.000	0.000	0.000	0.000	0.000	0.124
Flow Measurement	Worker Commute	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Haul Truck	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Ready Mix Trucks	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	pickup	2	20	22	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.000	0.001	0.000	0.000	0.000	0.273
Siphon modifications	Worker Commute	6	20	40	0.003	0.013	0.182	0.001	0.012	0.005	73.224	0.000	0.000	0.004	0.000	0.000	0.000	1.329
	Haul Truck	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Ready Mix Trucks	2	40	40	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.008	0.001	0.000	0.000	0.000	4.457
	pickup	2	20	10	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.000	0.000	0.000	0.000	0.000	0.124
Siphon demolition	Worker Commute	6	20	44	0.003	0.013	0.182	0.001	0.012	0.005	73.224	0.000	0.000	0.004	0.000	0.000	0.000	1.461
	Haul Truck	10	40	20	0.019	2.098	0.184	0.011	0.109	0.054	1228.220	0.000	0.021	0.002	0.000	0.001	0.001	11.142
	Ready Mix Trucks	2	40	40	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.008	0.001	0.000	0.000	0.000	4.457
	pickup	2	20	10	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.000	0.000	0.000	0.000	0.000	0.124
Intertie projects	Worker Commute	20	20	130	0.010	0.044	0.607	0.002	0.041	0.017	244.080	0.001	0.003	0.039	0.000	0.003	0.001	14.393
	Haul Truck	10	40	130	0.019	2.098	0.184	0.011	0.109	0.054	1228.220	0.001	0.136	0.012	0.001	0.007	0.003	72.426
	Ready Mix Trucks	2	40	40	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.008	0.001	0.000	0.000	0.000	4.457
	pickup	20	20	10	0.016	0.076	0.815	0.003	0.039	0.016	273.871	0.000	0.000	0.004	0.000	0.000	0.000	1.242
Reservoirs and Recharge Basins	Worker Commute	20	20	264	0.010	0.044	0.607	0.002	0.041	0.017	244.080	0.001	0.006	0.080	0.000	0.005	0.002	29.229
	Haul Truck	60	40	67	0.116	12.589	1.103	0.067	0.656	0.322	7369.318	0.004	0.422	0.037	0.002	0.022	0.011	223.962
	Ready Mix Trucks	12	40	120	0.023	2.518	0.221	0.013	0.131	0.064	1473.864	0.001	0.151	0.013	0.001	0.008	0.004	80.225
	pickup	10	20	264	0.008	0.038	0.407	0.001	0.020	0.008	136.936	0.001	0.005	0.054	0.000	0.003	0.001	16.398
Highlands	Worker Commute	5	20	88	0.002	0.011	0.152	0.001	0.010	0.004	61.020	0.000	0.000	0.007	0.000	0.000	0.000	2.436
	Haul Truck	2	40	88	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.018	0.002	0.000	0.001	0.000	9.805
	Ready Mix Trucks	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	pickup	2	20	88	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.000	0.004	0.000	0.000	0.000	1.093

Analysis Year:

2023

Vehicle Emissions

Owens Creek Diversion Channel	Worker Commute	20	20	264	0.010	0.044	0.607	0.002	0.041	0.017	244.080	0.001	0.006	0.080	0.000	0.005	0.002	29.229
	Haul Truck	2	40	264	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.001	0.055	0.005	0.000	0.003	0.001	29.416
	Ready Mix Trucks	4	40	7	0.008	0.839	0.074	0.004	0.044	0.021	491.288	0.000	0.003	0.000	0.000	0.000	0.000	1.560
	pickup	2	20	264	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.001	0.011	0.000	0.001	0.000	3.280
Black Rascal Diversion Channel	Worker Commute	26	20	132	0.013	0.058	0.789	0.003	0.053	0.022	317.304	0.001	0.004	0.052	0.000	0.003	0.001	18.999
	Haul Truck	2	40	132	0.004	0.420	0.037	0.002	0.022	0.011	245.644	0.000	0.028	0.002	0.000	0.001	0.001	14.708
	Ready Mix Trucks	4	40	10	0.008	0.839	0.074	0.004	0.044	0.021	491.288	0.000	0.004	0.000	0.000	0.000	0.000	2.228
	pickup	2	20	132	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.001	0.005	0.000	0.000	0.000	1.640
Merced River Water Recovery	Worker Commute	16	20	260	0.008	0.036	0.485	0.002	0.033	0.013	195.264	0.001	0.005	0.063	0.000	0.004	0.002	23.029
	Haul Truck	10	40	70	0.019	2.098	0.184	0.011	0.109	0.054	1228.220	0.001	0.073	0.006	0.000	0.004	0.002	38.998
	Ready Mix Trucks	4	40	71	0.008	0.839	0.074	0.004	0.044	0.021	491.288	0.000	0.030	0.003	0.000	0.002	0.001	15.822
	pickup	2	20	260	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.001	0.011	0.000	0.001	0.000	3.230
Le Grand Canal near Black Rascal Automation Project	Worker Commute	10	20	176	0.005	0.022	0.303	0.001	0.020	0.008	122.040	0.000	0.002	0.027	0.000	0.002	0.001	9.743
	Haul Truck	6	40	156	0.012	1.259	0.110	0.007	0.066	0.032	736.932	0.001	0.098	0.009	0.001	0.005	0.003	52.146
	Ready Mix Trucks	4	40	116	0.008	0.839	0.074	0.004	0.044	0.021	491.288	0.000	0.049	0.004	0.000	0.003	0.001	25.850
	pickup	2	20	176	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.001	0.007	0.000	0.000	0.000	2.186
Northside Canal Flumes	Worker Commute	10	20	88	0.005	0.022	0.303	0.001	0.020	0.008	122.040	0.000	0.001	0.013	0.000	0.001	0.000	4.871
	Haul Truck	4	40	69	0.008	0.839	0.074	0.004	0.044	0.021	491.288	0.000	0.029	0.003	0.000	0.002	0.001	15.377
	Ready Mix Trucks	4	40	87	0.008	0.839	0.074	0.004	0.044	0.021	491.288	0.000	0.037	0.003	0.000	0.002	0.001	19.388
	pickup	2	20	88	0.002	0.008	0.081	0.000	0.004	0.002	27.387	0.000	0.000	0.004	0.000	0.000	0.000	1.093

Analysis Year: 2023  
Vehicle Emissions

Total Vehicle Emissions		2023													
Projects	Daily Emissions							Annual Emissions							
	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	ROG	NOx	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e	
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year	MT/year	
Main Canal Improvements at Tunnel No.1 Project															
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	0.09	6.44	2.28	0.04	0.43	0.20	4324.65	0.01	0.20	0.22	0.00	0.02	0.01	165.94	
Main Canal Improvements at Tunnel No.1 Project															
Option 2: Open Channel on New Alignment North of the Existing Alignment	0.09	6.44	2.28	0.04	0.43	0.20	4324.65	0.00	0.05	0.20	0.00	0.01	0.01	87.94	
Main Canal Improvements at Tunnel No.1 Project															
Option 3: Open Channel along Existing Tunnel Alignment	0.08	5.39	2.18	0.03	0.37	0.18	3710.54	0.00	0.03	0.12	0.00	0.01	0.00	48.63	
Main Canal Improvements at Tunnel No.1 Project															
Option 4: Rehabilitation of Existing Tunnel	0.07	4.76	2.13	0.03	0.34	0.16	3342.07	0.00	0.07	0.12	0.00	0.01	0.00	70.97	
Canal rebuilding/relining	0.03	1.57	1.25	0.01	0.14	0.06	1255.66	0.00	0.05	0.04	0.00	0.00	0.00	37.59	
Table topping deadend facilities	0.03	1.57	1.25	0.01	0.14	0.06	1255.66	0.00	0.02	0.01	0.00	0.00	0.00	12.53	
Canal Automation	0.03	2.54	0.48	0.01	0.15	0.07	1574.47	0.00	0.03	0.01	0.00	0.00	0.00	20.11	
Flow Measurement	0.00	0.01	0.08	0.00	0.00	0.00	27.39	0.00	0.00	0.00	0.00	0.00	0.00	0.27	
Siphon modifications	0.01	0.44	0.30	0.00	0.04	0.02	346.25	0.00	0.01	0.00	0.00	0.00	0.00	5.91	
Siphon demolition	0.03	2.54	0.48	0.01	0.15	0.07	1574.47	0.00	0.03	0.01	0.00	0.00	0.00	17.19	
Intertie projects	0.05	2.64	1.64	0.02	0.21	0.10	1991.81	0.00	0.15	0.06	0.00	0.01	0.00	92.52	
Reservoirs and Recharge Basins	0.16	15.19	2.34	0.08	0.85	0.41	9224.20	0.01	0.58	0.18	0.00	0.04	0.02	349.81	
Highlands	0.01	0.44	0.27	0.00	0.04	0.02	334.05	0.00	0.02	0.01	0.00	0.00	0.00	13.33	
Owens Creek Diversion Channel	0.02	1.31	0.80	0.01	0.11	0.05	1008.40	0.00	0.07	0.10	0.00	0.01	0.00	63.48	
Black Rascal Diversion Channel	0.03	1.32	0.98	0.01	0.12	0.06	1081.62	0.00	0.04	0.06	0.00	0.01	0.00	37.57	
Merced River Water Recovery	0.04	2.98	0.82	0.02	0.19	0.09	1942.16	0.00	0.11	0.08	0.00	0.01	0.00	81.08	
Le Grand Canal near Black Rascal Automation Project	0.03	2.13	0.57	0.01	0.13	0.06	1377.65	0.00	0.15	0.05	0.00	0.01	0.00	89.93	
Northside Canal Flumes	0.02	1.71	0.53	0.01	0.11	0.05	1132.00	0.00	0.07	0.02	0.00	0.00	0.00	40.73	

VMT on Paved and Unpaved Roads		2023						
Onsite Equipment	Number	Total VMT/day	Total VMT/year	Unpaved road%	Unpaved VMT/day	Unpaved VMT/Year	Paved VMT/day	Paved VMT/year
Main Canal Improvements at Tunnel No.1 Project	Worker Commute	600	158400	5%	30	7,920	570	150,480
	Haul Truck	800	64000	2.5%	20	1,600	780	62,400
	Ready Mix Truck	400	6000	2.5%	10	150	390	5,850
	pickup	400	79200	5%	20	3,960	380	75,240
Main Canal Improvements at Tunnel No.1 Project	Worker Commute	600	158400	5%	30	7,920	570	150,480
	Haul Truck	800	4000	2.5%	20	100	780	3,900
	Ready Mix Truck	400	10000	2.5%	10	250	390	9,750
	pickup	400	79200	5%	20	3,960	380	75,240
Main Canal Improvements at Tunnel No.1 Project	Worker Commute	600	79200	5%	30	3,960	570	75,240
	Haul Truck	800	6400	2.5%	20	160	780	6,240
	Ready Mix Truck	200	1000	2.5%	5	25	195	975
	pickup	400	52800	5%	20	2,640	380	50,160
Main Canal Improvements at Tunnel No.1 Project	Worker Commute	600	79200	5%	30	3,960	570	75,240
	Haul Truck	800	18400	2.5%	20	460	780	17,940
	Ready Mix Truck	80	5040	2.5%	2	126	78	4,914
	pickup	400	52800	5%	20	2,640	380	50,160
Canal rebuilding/relining	Worker Commute	200	13200	5%	10	660	190	12,540
	Haul Truck	200	13200	2.5%	5	330	195	12,870
	Ready Mix Truck	80	5280	2.5%	2	132	78	5,148
	pickup	400	26400	5%	20	1,320	380	25,080
Table topping deadend facilities	Worker Commute	200	4400	5%	10	220	190	4,180
	Haul Truck	200	4400	2.5%	5	110	195	4,290
	Ready Mix Truck	80	1760	2.5%	2	44	78	1,716
	pickup	400	8800	5%	20	440	380	8,360
Canal Automation	Worker Commute	120	15840	5%	6	792	114	15,048
	Haul Truck	400	8000	2.5%	10	200	390	7,800
	Ready Mix Truck	80	3200	2.5%	2	80	78	3,120
	pickup	40	400	5%	2	20	38	380
Flow Measurement	Worker Commute	0	0	5%	0	0	0	0
	Haul Truck	0	0	2.5%	0	0	0	0
	Ready Mix Truck	0	0	2.5%	0	0	0	0
	pickup	40	880	5%	2	44	38	836
Siphon modifications	Worker Commute	120	4800	5%	6	240	114	4,560
	Haul Truck	0	0	2.5%	0	0	0	0
	Ready Mix Truck	80	3200	2.5%	2	80	78	3,120
	pickup	40	400	5%	2	20	38	380
Siphon demolition	Worker Commute	120	5280	5%	6	264	114	5,016
	Haul Truck	400	8000	2.5%	10	200	390	7,800
	Ready Mix Truck	80	3200	2.5%	2	80	78	3,120
	pickup	40	400	5%	2	20	38	380
Intertie projects	Worker Commute	400	52000	5%	20	2,600	380	49,400
	Haul Truck	400	52000	2.5%	10	1,300	390	50,700
	Ready Mix Truck	80	3200	2.5%	2	80	78	3,120
	pickup	400	4000	5%	20	200	380	3,800

Analysis Year:

2023

Vehicle Emissions

Reservoirs and Recharge Basins	Worker Commute	400	105600	5%	20	5,280	380	100,320
	Haul Truck	2400	160800	2.5%	60	4,020	2,340	156,780
	Ready Mix Truck	480	57600	2.5%	12	1,440	468	56,160
	pickup	200	52800	5%	10	2,640	190	50,160
Highlands	Worker Commute	100	8800	5%	5	440	95	8,360
	Haul Truck	80	7040	2.5%	2	176	78	6,864
	Ready Mix Truck	0	0	2.5%	0	0	0	0
	pickup	40	3520	5%	2	176	38	3,344
Owens Creek Diversion Channel	Worker Commute	400	105600	5%	20	5,280	380	100,320
	Haul Truck	80	21120	2.5%	2	528	78	20,592
	Ready Mix Truck	160	1120	2.5%	4	28	156	1,092
	pickup	40	10560	5%	2	528	38	10,032
Black Rascal Diversion Channel	Worker Commute	520	68640	5%	26	3,432	494	65,208
	Haul Truck	80	10560	2.5%	2	264	78	10,296
	Ready Mix Truck	160	1600	2.5%	4	40	156	1,560
	pickup	40	5280	5%	2	264	38	5,016
Merced River Water Recovery	Worker Commute	320	83200	5%	16	4,160	304	79,040
	Haul Truck	400	28000	2.5%	10	700	390	27,300
	Ready Mix Truck	160	11360	2.5%	4	284	156	11,076
	pickup	40	10400	5%	2	520	38	9,880
Le Grand Canal near Black Rascal Automation Project	Worker Commute	200	35200	5%	10	1,760	190	33,440
	Haul Truck	240	37440	2.5%	6	936	234	36,504
	Ready Mix Truck	160	18560	2.5%	4	464	156	18,096
	pickup	40	7040	5%	2	352	38	6,688
Northside Canal Flumes	Worker Commute	200	17600	5%	10	880	190	16,720
	Haul Truck	160	11040	2.5%	4	276	156	10,764
	Ready Mix Truck	160	13920	2.5%	4	348	156	13,572
	pickup	40	3520	5%	2	176	38	3,344

Analysis Year  
Fugitive Dust Emissions Northern Commute Scenario

2023

A) Bulldozing - Demolition  
Fugitive dust emissions from bulldozing

2023

Activity	Number of Equipment	Maximum daily hours	Days	Emission Factor		Daily Emissions		Annual Emissions	
				PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
				lb/hr	lb/hr	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	4	8	125	0.753	0.414	24.09	13.24	1.51	0.83
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	3	8	180	0.753	0.414	18.07	9.93	1.63	0.89
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	3	8	95	0.753	0.414	18.07	9.93	0.86	0.47
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	2	8	113	0.753	0.414	12.04	6.62	0.68	0.37
Canal rebuilding/relining	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Table topping deadend facilities	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Canal Automation	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Flow Measurement	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Siphon modifications	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Siphon demolition	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Intertie projects	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Reservoirs and Recharge Basins	2	8	40	0.753	0.414	12.04	6.62	0.24	0.13
Highlands	0	0	0	0.753	0.414	0.00	0.00	0.00	0.00
Owens Creek Diversion Channel	3	8	99	0.753	0.414	18.07	9.93	0.89	0.49
Black Rascal Diversion Channel	3	8	19	0.753	0.414	18.07	9.93	0.17	0.09
Merced River Water Recovery	2	8	133	0.753	0.414	12.04	6.62	0.80	0.44
Le Grand Canal near Black Rascal Automation Project	1	8	9	0.753	0.414	6.02	3.31	0.03	0.01
Northside Canal Flumes	1	8	7	0.753	0.414	6.02	3.31	0.02	0.01

Note:  
PM emissions were calculated using the following equation and parameters (CalEEMod Appendix A):  
Emission Factor (lb/hr)= k x (s)<sup>1.5</sup> / (M)<sup>1.4</sup> For PM10 and k x 5.7 x (s)<sup>1.2</sup> / (M)<sup>1.3</sup> for PM2.5  
k = Scaling Constant (0.75 for PM10 and 0.105 for PM2.5)  
s = Silt Content (assumed to be 6.9% - CalEEMod default for overburden)  
M = Moisture Content = 7.9% (CalEEMod default)

B) Grading  
Fugitive dust emissions from grading

2023

Activity		Number of Grading Equipment	# acres/equipme nt	Acreage Graded/Da y	Number of Days/Year	Grader VMT		Emission Factors		Daily Emissions		Annual Emissions	
								PM10	PM2.5	PM10	PM2.5	PM10	PM2.5
				acres		miles/day	miles/year	lb/VMT	lb/VMT	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	Grader	3	0.5	1.5	100	1.03	103.13	1.54	0.167	1.59	0.17	0.08	0.01
	Scaper	8	1	8	90	5.50	495.00	1.54	0.167	8.48	0.92	0.38	0.04
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	Grader	2	0.5	1	120	0.69	82.50	1.54	0.167	1.06	0.11	0.06	0.01
	Scaper	2	1.5	3	120	2.06	247.50	1.54	0.167	3.18	0.34	0.19	0.02
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	Grader	3	0.5	1.5	65	1.03	67.03	1.54	0.167	1.59	0.17	0.05	0.01
	Scaper	8	1	8	50	5.50	275.00	1.54	0.167	8.48	0.92	0.21	0.02
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	Grader	2	2	4	78	2.75	214.50	1.54	0.167	4.24	0.46	0.17	0.02
Canal rebuilding/relining	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Table topping deadend facilities	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Canal Automation	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Flow Measurement	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Siphon modifications	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Siphon demolition	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Intertie projects	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Reservoirs and Recharge Basins	Grader	1	0.5	0.5	40	0.34	13.75	1.54	0.167	0.53	0.06	0.01	0.00
	Scaper	2	1	2	40	1.38	55.00	1.54	0.167	2.12	0.23	0.04	0.00
Highlands	Grader	0	0	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Owens Creek Diversion Channel	Grader	1	0.5	0.5	63	0.34	21.66	1.54	0.167	0.53	0.06	0.02	0.00
	Scaper	8	1	8	53	5.50	291.50	1.54	0.167	8.48	0.92	0.22	0.02
Black Rascal Diversion Channel	Grader	1	1	1	12	0.69	8.25	1.54	0.167	1.06	0.11	0.01	0.00
	Scaper	8	0.5	4	10	2.75	27.50	1.54	0.167	4.24	0.46	0.02	0.00
Merced River Water Recovery	Grader	1	1.5	1.5	12	1.03	12.38	1.54	0.167	1.59	0.17	0.01	0.00
	Scaper	0	2.5	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Le Grand Canal near Black Rascal Automation Project	Grader	1	3.5	3.5	9	2.41	21.66	1.54	0.167	3.71	0.40	0.02	0.00
	Scaper	0	4.5	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00
Northside Canal Flumes	Grader	1	5.5	5.5	7	3.78	26.47	1.54	0.167	5.83	0.63	0.02	0.00
	Scaper	0	6.5	0	0	0.00	0.00	1.54	0.167	0.00	0.00	0.00	0.00

Analysis Year  
Fugitive Dust Emissions Northern Commute Scenario  
Grading Emission Summary

2023

	Daily Emissions		Annual Emissions	
	PM10	PM2.5	PM10	PM2.5
	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project				
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	10.07	1.09	0.46	0.05
Main Canal Improvements at Tunnel No.1 Project				
Option 2: Open Channel on New Alignment North of the Existing Alignment	4.24	0.46	0.25	0.03
Main Canal Improvements at Tunnel No.1 Project				
Option 3: Open Channel along Existing Tunnel Alignment	10.07	1.09	0.26	0.03
Main Canal Improvements at Tunnel No.1 Project				
Option 4: Rehabilitation of Existing Tunnel	4.24	0.46	0.17	0.02
Canal rebuilding/relining	0.00	0.00	0.00	0.00
Table topping deadend facilities	0.00	0.00	0.00	0.00
Canal Automation	0.00	0.00	0.00	0.00
Flow Measurement	0.00	0.00	0.00	0.00
Siphon modifications	0.00	0.00	0.00	0.00
Siphon demolition	0.00	0.00	0.00	0.00
Intertie projects	0.00	0.00	0.00	0.00
Reservoirs and Recharge Basins	2.65	0.29	0.05	0.01
Highlands	0.00	0.00	0.00	0.00
Owens Creek Diversion Channel	9.01	0.97	0.24	0.03
Black Rascal Diversion Channel	5.30	0.57	0.03	0.00
Merced River Water Recovery	1.59	0.17	0.01	0.00
Le Grand Canal near Black Rascal Automation Project	3.71	0.40	0.02	0.00
Northside Canal Flumes	5.83	0.63	0.02	0.00

Note:

PM emissions were calculated using the following equation and parameters:

Emission factor (lb/VMT) = k x 0.051 x (S)<sup>2.0</sup> for PM10 and k x 0.040 x (S)<sup>2.5</sup> for PM2.5

k = Scaling Constant (0.60 for PM10 and 0.031 for PM2.5)

S = Mean Vehicle Speed, CalEEMod default = 7.1 miles/hour

VMT = As / Wb X 43,560 (sqft/acre) /5280 (ft/mile)

VMT: vehicle miles traveled

As: the acreage of the grading site (0.5 acres per grader, 1 acre for scapter, CalEEMod defaults)

Wb: blade width of the grader. CalEEMod default Wb = 12 ft.

C). Earth Material Loading/Handling

Dust from demolition and soil loading

Projects	Total Amount Handled  cy	Material Amount  cy/day      cy/year		Material Amount  ton/day      ton/year		Emission Factors		Daily Emissions		Annual Emissions	
						PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
						lb/ton	lb/ton	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	850100	1610.0	425,050	2035.4	537333.8	0.00011	0.000017	0.23	0.034	0.0298	0.0045
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	900100	1704.7	450,050	2155.1	568938.0	0.00011	0.000017	0.24	0.036	0.0316	0.0048
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	575100	2178.4	287,550	2753.9	363511.0	0.00011	0.000017	0.31	0.046	0.0202	0.0031
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	9000	34.1	4,500	43.1	5688.7	0.00011	0.000017	0.00	0.001	0.0003	0.0000
Canal rebuilding/relining	8000	60.6	8,000	76.6	10113.3	0.00011	0.000017	0.01	0.001	0.0006	0.0001
Table topping deadend facilities	12600	572.7	12,600	724.0	15928.5	0.00011	0.000017	0.08	0.012	0.0009	0.0001
Canal Automation	550	4.2	550	5.3	695.3	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Flow Measurement	0	0.0	0	0.0	0.0	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Siphon modifications	800	9.1	800	11.5	1011.3	0.00011	0.000017	0.00	0.000	0.0001	0.0000
Siphon demolition	250	5.7	250	7.2	316.0	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Intertie projects	1020	3.9	1,020	4.9	1289.4	0.00011	0.000017	0.00	0.000	0.0001	0.0000
Reservoirs and Recharge Basins	150250	379.4	100,167	479.6	126627.3	0.00011	0.000017	0.05	0.008	0.0070	0.0011
Highlands	120	1.4	120	1.7	151.7	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Owens Creek Diversion Channel	14050	35.5	9,367	44.9	11841.0	0.00011	0.000017	0.00	0.001	0.0007	0.0001
Black Rascal Diversion Channel	3250	24.6	3,250	31.1	4108.5	0.00011	0.000017	0.00	0.001	0.0002	0.0000
Merced River Water Recovery	7506	28.4	7,506	35.9	9488.8	0.00011	0.000017	0.00	0.001	0.0005	0.0001
Le Grand Canal near Black Rascal Automation Project	0	0.0	0	0.0	0.0	0.00011	0.000017	0.00	0.000	0.0000	0.0000
Northside Canal Flumes	500	5.7	500	7.2	632.1	0.00011	0.000017	0.001	0.000	0.000	0.000

Note:

Fugitive dust from materials unloading from trains and/or trucks are calculated using the following equations and parameters:

Emission factor (lb/ton) = (k)(0.0032)[(U/5)<sup>1-3</sup>]/[(M/2)<sup>1-4</sup>]

k = Particle Size Constant (0.35 for PM10 and 0.053 for PM2.5)

U = average wind speed = 2.6 m/s (5.816 mph) for MDAQMD (CalEEMod default)

M = moisture content = 12% (CalEEMod Default)

Material density (CalEEMod default)

1.264 ton/CY

C) Vehicle Fugitive Dust Emissions on Paved Roads

Emission factor (g/VMT) = k X (sL)^0.91 X W^1.02

		PM10	PM2.5
k		1.0	0.25
sL	g/m2	0.10	0.10
W	tons	2.4	2.4
EF	(g/VMT)	0.300	0.075

Equation from: AP-42 13.2.1

sL and W (silt loading and vehicle weight) are CalEEMod default values

Projects	Maximum Daily Emissions			Annual Emissions		
	Trip miles	PM10	PM2.5	Trip miles	PM10	PM2.5
	VMT/day	lb/day	lb/day	VMT/year	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	2,120	1.40	0.35	293,970	0.097	0.024
Main Canal Improvements at Tunnel No.1 Project Option 2: Open Channel on New Alignment North of the Existing Alignment	2,120	1.40	0.35	239,370	0.079	0.020
Main Canal Improvements at Tunnel No.1 Project Option 3: Open Channel along Existing Tunnel Alignment	1,730	1.15	0.29	131,640	0.044	0.011
Main Canal Improvements at Tunnel No.1 Project Option 4: Rehabilitation of Existing Tunnel	1,808	1.20	0.30	148,254	0.049	0.012
Canal rebuilding/relining	843	0.56	0.14	55,638	0.018	0.005
Table topping deadend facilities	843	0.56	0.14	18,546	0.006	0.002
Canal Automation	620	0.41	0.10	26,348	0.009	0.002
Flow Measurement	38	0.03	0.01	836	0.000	0.000
Siphon modifications	230	0.15	0.04	8,060	0.003	0.001
Siphon demolition	620	0.41	0.10	16,316	0.005	0.001
Intertie projects	1,228	0.81	0.20	107,020	0.035	0.009
Reservoirs and Recharge Basins	3,378	2.24	0.56	363,420	0.120	0.030
Highlands	211	0.14	0.03	18,568	0.006	0.002
Owens Creek Diversion Channel	652	0.43	0.11	132,036	0.044	0.011
Black Rascal Diversion Channel	766	0.51	0.13	82,080	0.027	0.007
Merced River Water Recovery	888	0.59	0.15	127,296	0.042	0.011
Le Grand Canal near Black Rascal Automation Project	618	0.41	0.10	94,728	0.031	0.008
Northside Canal Flumes	540	0.36	0.09	44,400	0.015	0.004

D) Vehicle Fugitive Dust Emissions on Unpaved Roads

Uncontrolled Emission Factors and Emissions

	Emission Factors (lb/VMT)	
	PM10	PM2.5
Unpaved Road (uncontrolled)	0.86	0.09
Unpaved Road (with watering unpaved road twice a day)	0.45	0.04

Emission factor (lb/VMT) = (k)[(s/12)<sup>0.5</sup>][[(W/3)<sup>0.45</sup>]\*(1-P/365) (EPA AP-42, 13.2.2, for industrial sites)

k = constant (lb/VMT) = 1.5 lb/VMT for PM10 and 0.15 lb/VMT for PM2.5

s = Silt Content (8.5%, construction sites, AP-42, Table 13.2.2.1)

W = avg. vehicle weight (tons) = 2.4 ton

P = number of days in a year with at least 0.1 inch of precipitation, 49 days for Merced County (CalEEMod)

Control efficiency of watering the unpaved road twice a day 55% (data from SCAQMD CEQA Handbook, TABLE XI-D, MITIGATION MEASURE EXAMPLES: FUGITIVE DUST FROM UNPAVED ROADS, 2007)

Emissions from Unpaved Roads

Projects	Maximum Daily Emissions			Annual Emissions		
	Total Trip miles	PM10	PM2.5	Total Trip miles	PM10	PM2.5
	VMT/day	lb/day	lb/day	VMT/year	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project						
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	80	35.81	3.58	13,630	3.051	0.305
Main Canal Improvements at Tunnel No.1 Project						
Option 2: Open Channel on New Alignment North of the Existing Alignment	80	35.81	3.58	12,230	2.737	0.274
Main Canal Improvements at Tunnel No.1 Project						
Option 3: Open Channel along Existing Tunnel Alignment	70	31.33	3.13	6,760	1.513	0.151
Main Canal Improvements at Tunnel No.1 Project						
Option 4: Rehabilitation of Existing Tunnel	72	32.23	3.22	7,186	1.608	0.161
Canal rebuilding/relining	37	16.56	1.66	2,442	0.547	0.055
Table topping deadend facilities	37	16.56	1.66	814	0.182	0.018
Canal Automation	20	8.95	0.90	1,092	0.244	0.024
Flow Measurement	2	0.90	0.09	44	0.010	0.001
Siphon modifications	10	4.48	0.45	340	0.076	0.008
Siphon demolition	20	8.95	0.90	564	0.126	0.013
Intertie projects	52	23.28	2.33	4,180	0.936	0.094
Reservoirs and Recharge Basins	102	45.66	4.57	13,380	2.995	0.299
Highlands	9	4.03	0.40	792	0.177	0.018
Owens Creek Diversion Channel	28	12.53	1.25	6,364	1.424	0.142
Black Rascal Diversion Channel	34	15.22	1.52	4,000	0.895	0.090
Merced River Water Recovery	32	14.32	1.43	5,664	1.268	0.127
Le Grand Canal near Black Rascal Automation Project	22	9.85	0.98	3,512	0.786	0.079
Northside Canal Flumes	20	8.95	0.90	1,680	0.376	0.038

Summary of Fugitive Dust Emissions

Projects	Maximum Daily Emissions		Annual Emissions	
	PM10	PM2.5	PM10	PM2.5
	lb/day	lb/day	ton/year	ton/year
Main Canal Improvements at Tunnel No.1 Project				
Option 1: Open Channel on New AlignmentSouth of the Existing Alignment	71.60	18.29	5.14	1.21
Main Canal Improvements at Tunnel No.1 Project				
Option 2: Open Channel on New Alignment North of the Existing Alignment	59.76	14.36	4.73	1.22
Main Canal Improvements at Tunnel No.1 Project				
Option 3: Open Channel along Existing Tunnel Alignment	60.93	14.48	2.70	0.67
Main Canal Improvements at Tunnel No.1 Project				
Option 4: Rehabilitation of Existing Tunnel	49.72	10.60	2.50	0.57
Canal rebuilding/relining	17.13	1.80	0.57	0.06
Table topping deadend facilities	17.20	1.81	0.19	0.02
Canal Automation	9.36	1.00	0.25	0.03
Flow Measurement	0.92	0.10	0.01	0.00
Siphon modifications	4.63	0.49	0.08	0.01
Siphon demolition	9.36	1.00	0.13	0.01
Intertie projects	24.09	2.53	0.97	0.10
Reservoirs and Recharge Basins	62.64	12.04	3.42	0.47
Highlands	4.17	0.44	0.18	0.02
Owens Creek Diversion Channel	40.05	12.27	2.60	0.67
Black Rascal Diversion Channel	39.10	12.15	1.12	0.19
Merced River Water Recovery	28.55	8.37	2.12	0.58
Le Grand Canal near Black Rascal Automation Project	19.99	4.80	0.86	0.10
Northside Canal Flumes	21.17	4.92	0.43	0.06

## Appendix D

# Biological Resources Information

# Biological Resources Technical Memorandum

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## TECHNICAL MEMORANDUM

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**TO:** Mark Oliver, Project Manager, Jacobs  
**FROM:** Michael Bumgardner, Bumgardner Biological Consulting  
**SUBJECT:** Merced Irrigation District Water Resources Management Plan (WRMP)  
Programmatic EIR Biological Evaluation, Merced County, California  
**DATE:** 2/17/2020

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### INTRODUCTION

This technical memorandum (TM) identifies potential biological constraints/issues associated with the proposed construction and operation of new or improved water conveyance, storage, and operation infrastructure projects identified as the preferred alternative (Proposed Program) in the Merced Irrigation District (MID) Water Resources Management Plan (WRMP) and further refined in the MID Programmatic Environmental Impact Report (PEIR). The Program Area includes individual projects, which are distributed within the MID boundaries and support MID's future water service goals. The study area for this TM includes the proposed locations of all currently identified proposed projects as well as all surrounding lands out to five miles from each project.

The Proposed Program is in eastern Merced County, California (Figure 1). The identified constraints/issues are based on reconnaissance-level surveys of representative project sites within the Program Area conducted on June 27 and 28, and October 24, 2017, as well as data queries of the California Department of Fish and Wildlife's (CDFW's) California Natural Diversity Database (CNDDB) (CDFW 2019) and California Native Plant Society's Inventory of Rare and Endangered Plants (CNPS 2019).

### SUMMARY OF THE PROPOSED PROGRAM

The Proposed Program analyzed in this TM includes the "Balanced Approach Alternative" that was identified as the preferred alternative in the WRMP. The Balanced Approach Alternative was selected as MID's preferred approach because it best aligns with MID's goals and provides maximum flexibility to help guide future decision-making. Implementation of the Proposed Program would include various projects that allow for full implementation of MID's Capital Improvement Plan and modernization of the system. These projects are identified as System Improvements in the WRMP and PEIR and include the following:

## Main Canal Improvements at Tunnel No. 1 Project

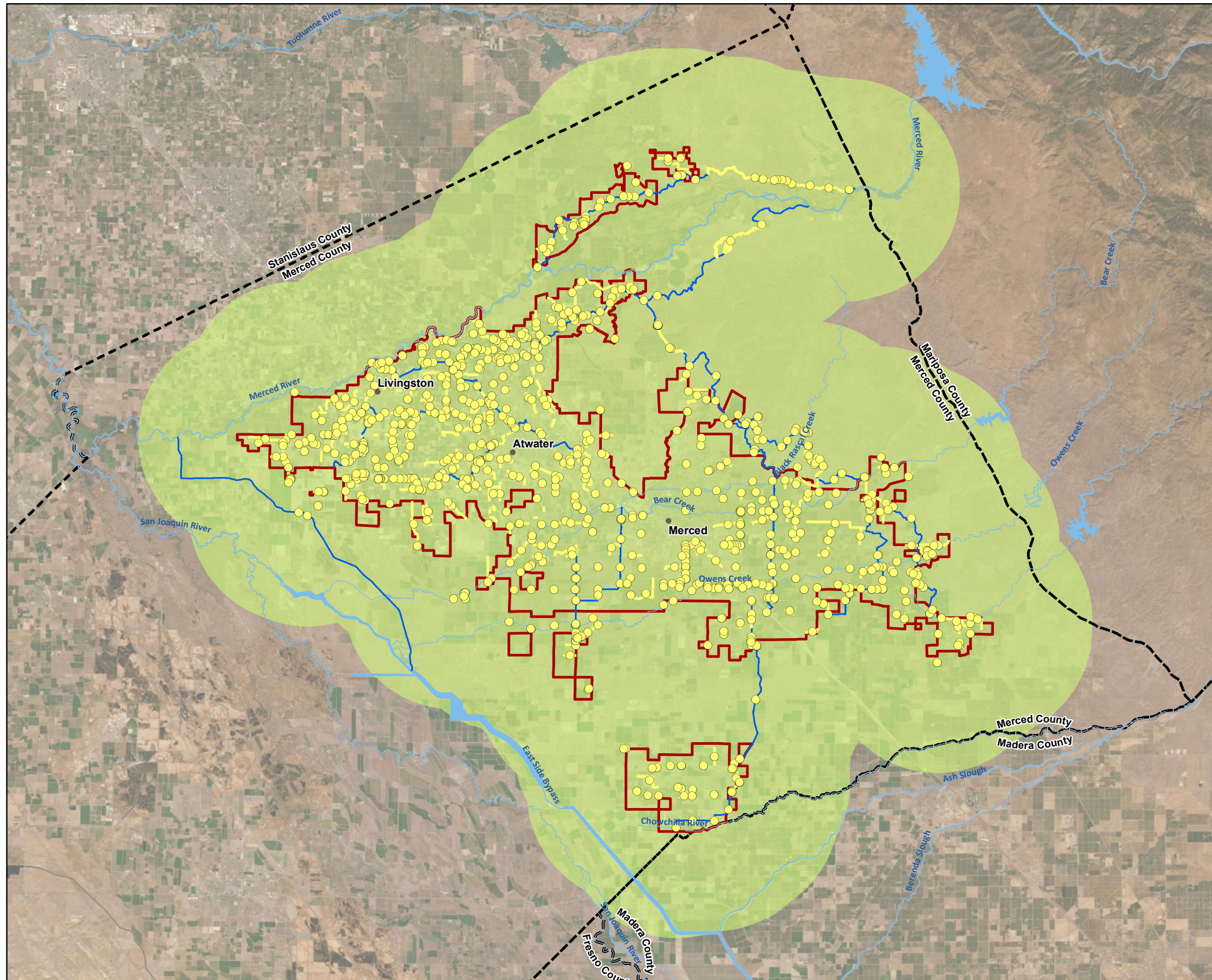
- Canal/Lateral Operations and Measurement Projects
  - Canal Rebuilding/Lining and Table Topping Dead-end Facilities
  - Canal Automation and Flow Measurement Improvements
  - Siphon Modifications
  - Interties
  - Pipelining or, Re-routing Open Channels on Customer Property
- Reservoirs and Recharge Basins
- Conjunctive Water Use Management Projects
  - Highlands Projects
  - Stormflow Diversions
  - Merced River Water Recovery Project

The timing and phasing for the implementation of the projects identified in the Preferred Program would be dependent on funding availability, year-to-year repair and rehabilitation priorities, project-specific environmental clearances, and securing agreements with cooperating partners (such as neighboring irrigation districts). It is anticipated that program implementation and construction schedule will vary as the requisite supporting activities are completed, with corresponding shifts in the prioritization as determined necessary.

In addition to the System Improvements, two other elements are identified in the WRMP and PEIR: (1) Class II to Class I conversion which is a one-time opportunity for water users in the District's El Nido area to convert from Class II to Class I for a fee; and (2) water transfers which entails transfers of water when District water is available and at the Board's discretion. These two elements are addressed further in the biological resources section of the PEIR and not analyzed in this technical memorandum.

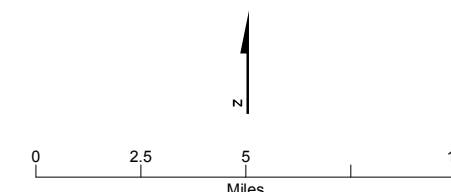
## LIKELIHOOD OF OCCURRENCE ANALYSIS

A special-status species likelihood of occurrence analysis was conducted for the study area prior to conducting reconnaissance-level surveys within the study area (Table A-1 in Appendix A). As described above, the study area for the likelihood of occurrence analysis was based on the proposed locations of all currently identified WRMP projects as well as all surrounding lands out to five miles from each project (Figure 1). The initial search for special-status species that could occur within the study area was based on a Rarefind 5 query of the California Natural Diversity Data Base (CNDDB). The CNDDB contains records for special-status species, as well as sensitive natural communities, which have been reported to the California Department of Fish and Wildlife (CDFW). Figures showing special-status species occurrences for the study area is provided in Appendix B. A digital copy of the CNDDB/Rarefind 5 report for the study area is available upon request due to large file size. Each of the species identified in the Rarefind 5



# **LEGEND**

- Proposed Project
- Proposed Project
- Study Area (5-Mile Buffer from Proposed Projects)
- MID Service
- County
- Canal
- Natural Drainages
- Major River



**FIGURE 1 BIOLOGICAL RESOURCES STUDY AREA FOR THE MERCED IRRIGATION DISTRICT WATER RESOURCES MANAGEMENT PLAN**  
 MERCED IRRIGATION DISTRICT  
 WATER RESOURCES MANAGEMENT PLAN  
 PROGRAMMATIC ENVIRONMENTAL IMPACT REPORT  
 MERCED COUNTY, CALIFORNIA

report were then evaluated in terms of their likelihood of occurrence within and immediately adjacent to the project sites (i.e., draft likelihood of occurrence analysis). This draft analysis considered the known distribution and habitat requirements of the species such that one of the following findings was prepared:

- Known to Occur – species has previously been documented within or immediately adjacent to a project site.
- Potential to Occur – has not been documented within or immediately adjacent to a project site, but its presence cannot be completely discounted due to incomplete information on the taxon's distribution or habitat requirements and lack of focused surveys for the taxon.
- No Potential to Occur– species does not occur within a project site due to the lack of required habitat features for the species or the known range of the species is well defined and does not include a project site.

Other sources of information on special-status species in California were subsequently reviewed given that the CNDDDB is not inclusive of all special-status species that may occur in an area. Therefore, a review of the CDFW's List of Special Animals (August 2018) and List of Special Vascular Plants, Bryophytes, and Lichens (August 2018) was conducted to determine if any special-status species not identified in the Rarefind 5 report have the potential to occur at or near project sites. This review was based on the professional experience of the author within the region and elsewhere in California, but also included review of other published sources of information on special-status species in California. These additional sources include the following:

- The Jepson Manual: Vascular Plants of California. (Baldwin and Goldman 2012).
- California Native Plant Society (CNPS), Rare Plant Program. 2019. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). website <http://www.rareplants.cnps.org> (Accessed: July 2, 2019).
- Amphibian and Reptile Species of Special Concern in California (Jennings and Hayes 1994).
- California Bird Species of Special Concern. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California and California Department of Fish and Game (Shuford and Gardali 2008).
- The Distribution of the Birds of California (Grinnell and Miller 1944).
- California Birds: Their Status and Distribution (Small 1994).
- California's Wildlife Volume II Birds (Zeiner et al. 1990).

- eBird. 2019. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: <http://www.ebird.org>. (Accessed: July 2, 2019).
- Mammalian Species of Special Concern in California (Williams 1986).
- Terrestrial Mammal Species of Special Concern in California (unfinished 1998 update) (Bolster 1998).
- Mammals of the Pacific States: California, Oregon, and Washington (Ingles 1978).
- Bat species accounts prepared as course materials for Ecology and Conservation of California Bats offered through San Francisco State University's Sierra Nevada Field Campus.
- Western Bat Working Group website (<http://wbwg.org/western-bat-species/>).
- Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998).
- Wildlife and Rare Plant Ecology of Eastern Merced County's Vernal Pool Grasslands (Volmar Consulting 2002).
- USFWS list of federally threatened or endangered species that may occur in Merced Irrigation District proposed project locations, and/or may be affected by the Proposed Program (Issued: July 19, 2019) (included in Appendix C).
- NMFS list of federally threatened or endangered species that may occur in Merced Irrigation District proposed project locations, and/or may be affected by the Proposed Program (Issued: November 14, 2017). (Appendix C).
- The Merced River Alliance Project - Biological Monitoring and Assessment, Final Report, Volume II, Stillwater Sciences, September 2008.

The draft likelihood of occurrence analysis was used to develop a “focus list” of species that should be searched for during any subsequent surveys of potential project sites. It was created on June 22, 2017 (revised on July 2, 2019). The final likelihood of occurrence analysis was then prepared to include any additional species not addressed by the Rarefind 5 report, but that were recorded during subsequent surveys of the project sites and review of other sources of information on special-status species that occur in the vicinity of the projects. Species that are known or expected to occur in the vicinity of the project sites were then further evaluated. It should be noted that unlike other likelihood of occurrence analyses that have been prepared for single projects, this likelihood of occurrence analysis addresses multiple projects. As such, the likelihood of species occurrence in Table A-1 in Appendix A is based on evaluation of all lands within the study area. Where a special-status species is known to occur within or immediately adjacent to a specific project site (including observations from the June 27 and 28, and October 24, 2017 reconnaissance-level surveys) or has some potential given the onsite and adjacent cover

types, that project is considered to have some potential to affect the identified special-status species.

## **SURVEY METHODS**

On June 27 and 28, and October 24, 2017, reconnaissance-level biological surveys were conducted by me and Jake Feriani (MID) at various representative project sites within the study area. These surveys were used to identify the various habitat types, wetlands, environmentally sensitive areas, and special-status species that may be associated with implementation of the Proposed Program. Approximately 30 individual project locations were evaluated. The project locations that were selected for evaluation included sites that are being proposed for upgrades to existing facilities or proposed new facilities. In addition, existing MID pipelines, service canals, and groundwater wells were reviewed as a general point of reference for proposed system improvements included as part of the Proposed Program. These surveys were conducted to provide a baseline understanding of habitat and potential for special-status species occurrences within the Program Area. The location of each site that was surveyed is identified on Figure 2. The study area was evaluated on foot and by vehicle where legal access was available. Surrounding areas to which legal access was not available were surveyed from the nearest road to which legal access was available. The survey focused on identifying and characterizing sensitive biological resources (e.g., important habitats, vegetation communities, and species) that could be adversely affected by the Proposed Program (particularly where existing research or documentation suggests that sensitive biological resources might currently exist).

## **RESEARCH RESULTS**

The following information on important, sensitive, or special-status biological resources applies broadly to all lands in the Program Area. It should be noted that all information below is based on documentation from various existing sources of information.

### *Vegetation Communities, Land Cover Types*

The study area is a predominately agricultural region in an area that was once mostly marshland, riparian woodland, oak woodland/savannah, valley alkali scrub, and vernal pool grassland. Though most of the land cover in the study area is now agricultural, remnant natural vegetation communities are scattered throughout the area (with larger tracts of natural vegetation in some areas particularly in the higher eastern-most terraces for vernal pool grasslands and in the lower valley floor areas for marshland). See figure in Appendix D for land cover in the study area. Most of the lands in the interior portions of the study area are either urban or in active agricultural production (i.e., row and field crops, hay/alfalfa, orchards, vineyards, etc.). Depending on the crop pattern and the land's proximity to natural vegetation communities, agricultural lands can provide relatively high value habitat for many wildlife species (including special-status species), particularly as foraging habitat. Raptor species use grazing and alfalfa agricultural lands for foraging because several species of common rodents are found in such

fields. Agricultural habitats also provide foraging and resting habitat for migrating and wintering waterfowl and shorebirds.

### *Special-Status Flora*

The majority of the special-status flora that occur (See Appendix B figures) or have some potential to occur within the study area are mostly associated with vernal pools, playas, or similar seasonal wetlands (19 of the 38 plant taxa [i.e., 50%] considered to have some potential to occur).

As such, most of these taxa would not be expected to be directly affected by the proposed projects apart from new reservoirs that flood vernal pool grasslands, playas, or similar seasonal wetlands. However, some of these taxa could also be indirectly affected by the proposed projects (e.g., due to changes in watersheds that provide surface and subsurface water to nearby, offsite seasonal water features).

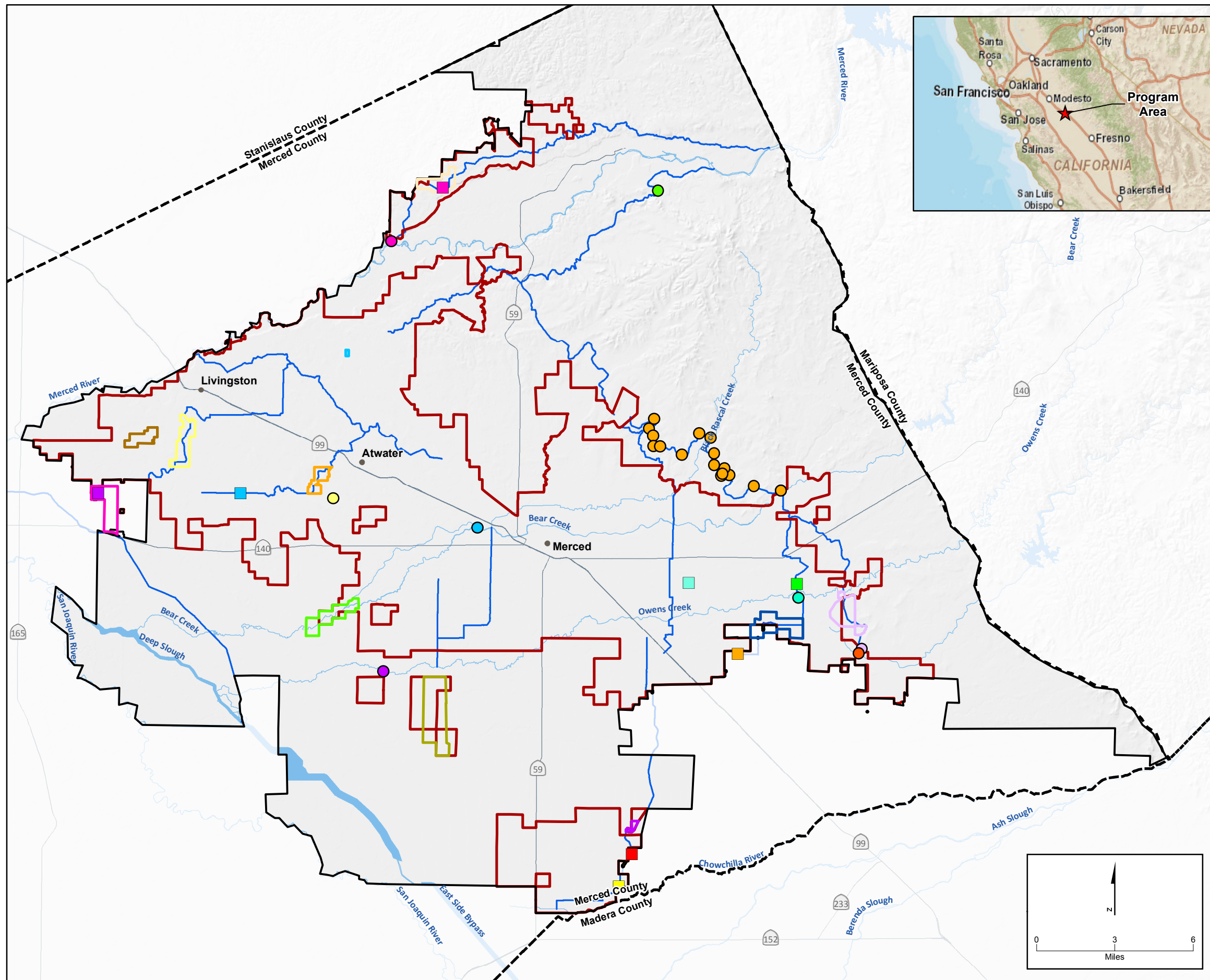
Another four taxa are associated with drier valley and foothill grasslands and could therefore also occur in areas of vernal pool grassland where there is a mosaic of drier and wetter grassland). Another four taxa occur in other wetlands (mostly perennial) and therefore have some potential to be affected in canals or where new reservoirs would flood existing wetlands. Given that most of the proposed projects are on lands that are already in agricultural production or used for water conveyance, the next mostly likely opportunities for adverse effects to special-status plants in the study area are associated with edge habitats (e.g., the banks of unlined canals, edges of agricultural fields that are regularly unplowed or otherwise unmanaged, and unusable riparian areas along ephemeral and perennial drainages).

### *Special-Status Fauna*

As with special-status flora, much of the special-status fauna, at least non-avian fauna, that occur or have some potential to occur within the study area are associated with vernal pools, playas, or similar seasonal wetlands (i.e., 9 of the 25 animal taxa [i.e., 36%] considered to have some potential) (Appendix A). As with the plant taxa, the special-status animal fauna associated with wetlands would not be expected to be directly affected by any proposed projects apart from new reservoirs that flood vernal pool grasslands, playas, or similar seasonal wetlands. Again, some of these taxa could also be indirectly affected by proposed projects (e.g., due to changes in watersheds that provide surface and subsurface water to nearby, offsite seasonal water features).

Several of the avian species with some potential to nest within the study area are birds that can nest in suitable edge habitats (as described above) (i.e., 5 of the 13 nesting species [i.e., 38%] with some potential to occur).

There are also several avian species with some potential to occur in the study area that are strictly or almost strictly wintering species. These latter species (e.g., ferruginous hawk, merlin,



- LEGEND**
- MID Program
  - MID Service
  - Main Canal Tunnel Replacement Project**
    - Main Canal Tunnel Replacement Project
  - Canal Rebuilding/Lining and Table Topping Dead-end Facilities**
    - Fancher Lateral Upgrades
    - Le Grand Canal Response Time Improvements
    - Relining of Main Canal/Levee Improvement
  - Canal Automation and Flow Measurement**
    - Bifurcation-Planada Canal-Dibblee Lateral
    - Crocker Dam Improvements
    - Flow Measurement Improvements – Le Grand Canal to Bear Creek Spill
    - Flow Measurement Improvements – Owens Creek West Boundary
    - Miles Dam Improvements
    - Northside Canal at Spill
  - Siphon Modifications**
    - El Nido Canal - Washington Road Siphon
    - El Nido Canal Creek Crossing
    - Planada Canal Check Structure Enlargement
    - Planada Canal Siphon under Santa Fe
    - Vaughn Lateral Siphon under Gerard
  - Interties**
    - Deane Drain Booster Pump
    - Supplement Fairfield Canal Flows with Creek Flows – Miles Creek
    - Supplement Fairfield Canal Flows with Creek Flows – Owens Creek
  - Reservoir and Recharge Basins**
    - Arena Canal Regulating Reservoir
    - Atwater Canal Regulating Reservoir and Recharge Basin
    - Bear Creek Regulating Reservoir
    - Cressey Regulating Reservoir and Recharge Basin
    - Hadley Lateral Reservoir
    - Increasing Capacity of the El Nido Reservoir
    - Le Grand Reservoir
    - McCoy Lateral Lower Regulating Reservoir
    - McCoy Lateral Upper Regulating Reservoir
    - Northside Regulating Reservoir
    - Spilker Canal Regulating Reservoir

**FIGURE 2 BIOLOGICAL RECONNAISSANCE SURVEY LOCATIONS**  
MERCED IRRIGATION DISTRICT  
WATER RESOURCES MANAGEMENT PLAN  
PROGRAMMATIC ENVIRONMENTAL IMPACT REPORT  
MERCED COUNTY, CALIFORNIA

bald eagle, mountain plover, etc.) tend to be wide-ranging, can often utilize fallow agricultural fields, and have substantial acreage of suitable wintering habitat within the study area and hence are unlikely to be substantially affected by the proposed projects.

The San Joaquin and Merced Rivers are major perennial watersheds within the Central Valley and provide habitat for both anadromous and resident fish communities within the study area. Overall, there is no direct evidence of a steelhead population in the Merced River and generally a paucity of data suggesting individuals currently occur in the river. The Central Valley steelhead DPS is listed as threatened under the ESA. Central Valley fall-run and late-fall-run Chinook salmon (*Oncorhynchus tshawytscha*), state-designated species of special concern, have also been documented in the lower Merced River. Other special-status fish species that were found in the lower Merced River include Kern brook lamprey (*Lampetra hubbsi*), Pacific lamprey (*Lampetra tridentata*), hardhead (*Mylopharodon conocephalus*), and Sacramento splittail (*Pogonichthys macrolepidotus*) (Stillwater Sciences 2008).

Anadromous salmonids migrating upstream from the ocean are prevented from traveling up the San Joaquin River beyond the confluence with the Merced River by the Hills Ferry Barrier. This fish screen, operated by CDFW, is intended to divert up-migrating salmonids into the Merced River or to be trap-and-hauled for those experimental salmonids created from the San Joaquin River Restoration Program into the upper San Joaquin River (SJRRP 2011). Because the streams in the Program Area eventually flow to the San Joaquin River, upstream of its confluence with the Merced River, the fish screen and trapping operations prevent anadromous salmonids from reaching streams in the Program Area such as Bear Creek, Burns Creek, Owens Creek, and Black Rascal Creek. Anadromous species are not likely to occur in other creeks, and thus, not in the connecting network of irrigation canals in the Program Area, given that the priority for these water features is delivery of water for agricultural purposes.

Kern brook lamprey and hardhead are both special-status species. Kern brook lamprey is a freshwater, non-parasitic species that generally resides in deep, slow, backwater environments (generally in the lower Merced River). Hardhead are found in either lacustrine habitat or clear, deep streams with the presence of mild flows (CALFISH 2019a, 2019b). These habitats do not exist in the areas planned for Proposed Program implementation. Habitats within the creeks and canals are highly modified and include frequent flow fluctuations.

Several species of bats have been documented from the study area, but due to difficulties with and the failure to conduct surveys for these species, their distribution in the area is not well known and likely under-represented in data sources such as the CNDDDB. Hence, there are six species of special-status bats with some potential to occur in or adjacent to Proposed Program project sites.

### *Raptors and Migratory Birds*

Other species/taxa of nesting birds that are not designated by the CDFW as special-status species are nonetheless provided protection under the federal Migratory Bird Treaty Act and applicable sections of the California Fish and Game Code (e.g., sections 3503, 3503.5, and 3513). Almost all project sites have some potential nesting habitat for one or more species of birds that are regulated by the above state and federal statutes. Though no nest structures were observed within project sites during the June 2017 reconnaissance-level surveys, the survey was conducted late in the nesting season when most species would have already completed nesting. As such, nesting birds should be expected at or near all proposed projects that are to be constructed between February 15 and August 15.

### *Designated Critical Habitat*

When a species is proposed for listing as endangered or threatened under the Endangered Species Act, the USFWS and NMFS must consider whether there are areas of habitat believed to be essential to the species' conservation. Those areas may be proposed for designation as critical habitat. Only activities that involve a federal permit, license, funding, or authorization (i.e., federal nexus) and are likely to destroy or adversely modify an area of critical habitat can be affected by the designation. In such a case, the USFWS and NMFS typically work with the appropriate federal lead agency as well as, private or other landowners (when appropriate), to amend their project to allow it to proceed without adversely affecting the critical habitat. Thus, most projects with a federal nexus are likely to go forward, but some may be modified to minimize harm to critical habitat.

Critical habitat units for 12 federally listed species have been designated within the MID study area; 11 of which would have proposed projects within unit boundaries (see figures in Appendix E). Critical habitat for longhorn fairy shrimp (*Branchinecta longiantenna*) is present within the MID study area, however proposed projects have not yet been identified within the designated units for this species. Each of the proposed projects that are located within designated critical habitat units are identified in Table 1. However, it should be noted that future Proposed Program refinements could result in currently unidentified impacts within critical habitat units. A summary of the critical habitat units designated for federally-listed vernal pool crustaceans and plants is provided in Federal Register Notice 71 FR 7118; February 10, 2006. This latter summary provides the unit number, name, and boundaries/location, as well as the “physical or biological features” (formerly primary constituent elements [PCEs]) found within the unit and special management considerations and protections that may be required for actions within the unit. “Physical or biological features” essential to the conservation of a species for which its designated or proposed critical habitat is based include space for individual and population growth and normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species’ historic geographic and ecological distribution.

<p style="text-align: center;"><b>TABLE 1</b></p> <p style="text-align: center;"><b>INDIVIDUAL MERCED IRRIGATION DISTRICT WATER RESOURCE MANAGEMENT PLAN PROJECTS</b></p> <p style="text-align: center;"><b>LOCATED IN DESIGNATED CRITICAL HABITAT UNITS, MERCED COUNTY<sup>1, 2, 13, 14</sup></b></p>												
<b>Project</b>	<b>LHFS<sup>1</sup></b>	<b>CTS<sup>2</sup></b>	<b>COGR<sup>3</sup></b>	<b>CFS<sup>4</sup></b>	<b>SUOC<sup>5</sup></b>	<b>GRTU<sup>6</sup></b>	<b>SJOG<sup>7</sup></b>	<b>VPFS<sup>8</sup></b>	<b>HOGR<sup>9</sup></b>	<b>HOSP<sup>10</sup></b>	<b>VPTS<sup>11</sup></b>	<b>STEE<sup>12</sup></b>
<b>Canal Automation &amp; Flow Measurement Improvements</b>												
Flow Measurement Improvement Edendale Creek Headworks			Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22				
Flow Measurement Improvement Escaladian Headworks			Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22				
Automate Main Canal Check Structure			Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22				
Flow Measurement Improvements Main Canal at Henderson Lateral			Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22				
Tower Lateral Headworks			Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22				

Livingston Canal Spill Water Tightening Auto No. 5												CA Central Valley Unit
Automate Northside Canal 2			Unit 5b		Unit 3a			Unit 21b	Unit 4a	Unit 5a		
Automate Le Grand Canal 1		Unit 10										
Le Grand Canal near Black Rascal Creek Automation		Unit 10										
<b>Canal Rebuilding/Lining and Table Topping Dead-end Facilities</b>												
Relining of Main Canal/Levee Improvement			Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22				
Northside Canal Flumes			Unit 6		Unit 3b			Unit 22	Unit 4a	Unit 5a		
Relining of Le Grand Canal		Unit 10	Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22				

Main Canal Improvements at Tunnel No. 1 Project												
Main Canal Improvements at Tunnel No. 1			Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22				
Conjunctive Water Use Management Projects												
Merced River Water Recovery Project			Unit 6	Unit 6	Unit 3b	Unit 7	Unit 1	Unit 22		Unit 5a		
<p>Notes: 1 - LHFS (longhorn fairy shrimp), 2 - CTS (California tiger salamander), 3 - COGR (Colusa grass), 4 - CFS (Conservancy fairy shrimp), 5 - SUOC (succulent owl's clover), 6 - GRTU (Greene's tuctoria), 7 - SJOG (San Joaquin orcutt grass), 8 - VPFS (vernal pool fairy shrimp), 9 - HOGH (hairy orcutt grass), 10 - HOSP (Hoover's spurge), 11 - VPTS (vernal pool tadpole shrimp), 12 - STEE (steelhead)</p> <p>13 - It should be noted that designated critical habitat for LHFS (longhorn fairy shrimp) and VPTS (vernal pool tadpole shrimp) occurs within the study area, but none of the currently identified projects are in critical habitat for the species.</p> <p>14 - Some of these projects (Automate Le Grand Canal 1, Automate Main Canal Check Structure, Automate Northside Canal 2, Tower Lateral Headworks, Flow Measurement Improvement Escaladian Headworks, and Flow Measurement Improvements Main Canal at Henderson Lateral) were not visited during the reconnaissance-level biological surveys within the study area.</p>												

Critical habitat within the Program Area is only an issue if a project has a federal nexus and may destroy or adversely modify critical habitat. On May 12, 2014, the Services proposed the following regulatory definition to address the relevant case law and to formalize the Services' guidance: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the conservation value of critical habitat for listed species. Such alterations may include, but are not limited to, effects that preclude or significantly delay the development of the physical or biological features that support the life history needs of the species for recovery." See Federal Register Notice 79 FR 27060; May 12, 2014.

As noted above, a summary of the critical habitat units designated for federally-listed vernal pool crustaceans and plants is provided in Federal Register Notice 71 FR 7118; February 10, 2006. Other critical habitat located within the study area is summarized for California tiger salamander (Federal Register Notice 70 FR 49380; August 23, 2005) and the California Central Valley steelhead (Federal Register Notice 70 FR 52488, September 2, 2005).

#### *Wetlands (including Vernal Pools) and Other Waters*

As described above, the eastern-most terraces of the study area support vernal pool grasslands while marshlands are common in the lower valley floor portions of the study area. Reservoirs, rivers, creeks, and canals are also present within the study area. The San Joaquin and Merced Rivers are in and adjacent to the study area and smaller tributaries including Bear Creek, Burns Creek, Owens Creek, and Black Rascal Creek are within the study area. MID uses both natural drainages, creeks, and streams as well as an extensive conveyance system of constructed canals and other infrastructure for conveyance of water. Wetlands and other waters in the study area represent both known and potential jurisdictional waters. Determination of jurisdiction must be made in coordination with both state and federal agencies.

### **PROJECT-SPECIFIC SURVEY RESULTS**

The following information on important, sensitive, or special-status biological resources (Table 2) is specific to each of the representative project sites surveyed and is based on the findings of the reconnaissance-level surveys conducted during June and October 2017.

<p style="text-align: center;"><b>TABLE 2</b></p> <p style="text-align: center;"><b>BIOLOGICAL CONDITIONS ASSOCIATED WITH INDIVIDUAL MERCED IRRIGATION DISTRICT WATER RESOURCE MANAGEMENT PLAN PROJECTS, MERCED COUNTY</b></p>		
<b>Project</b>	<b>Onsite and Adjacent Land Cover/Vegetation Types</b>	<b>Known and Potential Sensitive Biological Resources</b>
<b>Main Canal Improvements at Tunnel No. 1 Project</b>		
Main Canal Improvements at Tunnel No. 1	onsite and adjacent cover is a mix of annual grassland, vernal pool grassland, seasonal wetlands (due to canal leakage), and scattered cattail and Himalayan blackberry stands	potential for nesting birds, burrowing owl, tricolored blackbird, western pond turtle, California tiger salamander, vernal pool crustaceans, Merced kangaroo rat, San Joaquin pocket mouse, San Joaquin kit fox, Sanford's arrowhead, and other special-status plants
<b>Canal Rebuilding/Lining and Table Topping Dead-end Facilities</b>		
Relining of Main Canal/Levee Improvement	onsite cover is mostly canal-side ruderal vegetation with occasional small stands of cattail marsh; adjacent vegetation is a mix of ruderal vegetation, small stands of riparian trees, seasonal wetlands (due to canal leakage), scattered small stands of cattail marsh and Himalayan blackberry, orchard and other agricultural crops	potential for nesting birds, tricolored blackbird, western pond turtle (an unidentified turtle was seen briefly on the canal bank), San Joaquin kit fox, Sanford's arrowhead, and other special-status plants
Fancher Lateral Upgrades (siphon under Mariposa Creek)	onsite cover is riparian woodland/scrub along Mariposa Creek; adjacent cover is mostly orchard with some row crops; vernal pool grassland is less than 0.9 miles east of site	potential for nesting birds, Swainson's hawk, burrowing owl, San Joaquin kit fox, tree-roosting bats, western pond turtle, Sanford's arrowhead, and other special-status plants
Le Grand Canal Response Time Improvements– North	Onsite cover consists of levees and canal banks; adjacent cover consists of vernal pool grassland and canal overflow lakes (over former vernal pool grassland)	potential for nesting birds, burrowing owl, San Joaquin kit fox, American badger, western pond turtle, California tiger salamander, western spadefoot, vernal pool crustaceans, Sanford's arrowhead, and other special-status plants

Le Grand Canal Response Time Improvements – South (siphon under Bear Creek)	onsite cover is entirely riparian woodland/scrub along Bear Creek; adjacent cover is a mix of orchard and field crops to the south and mostly vernal pool grassland to the north	potential for nesting birds (cliff swallow colony at existing infrastructure and great blue heron nesting colony in trees within 600 feet of site), Swainson’s hawk (individuals soaring over site), western pond turtle; valley elderberry longhorn beetle (elderberries in riparian vegetation along Bear Creek), and special-status plants
<b>Canal Automation and Flow Measurement Improvements</b>		
Flow Measurement Improvements - Owens Creek West Boundary	all in-channel work with minimum laydown area, onsite cover is limited to creekside vegetation; some mature trees along creek corridor; adjacent cover is annual grassland/saltbush scrub within creek corridor, but all other nearby cover is in field crops	potential for nesting birds, Swainson’s hawk, burrowing owl, San Joaquin kit fox, American badger, tree-roosting bats, blunt-nosed leopard lizard, western pond turtle, vernal pool crustaceans, and Sanford’s arrowhead
Northside Canal at Spill	onsite cover is annual grassland/ruderal vegetation with scattered mature oaks as well as mixed riparian/oak woodland along the Merced River; adjacent cover is orchard and annual grassland/ruderal vegetation	potential for nesting birds, Swainson’s hawk, tree-roosting bats, western pond turtle, and Sanford’s arrowhead, and other special-status plants
Bifurcation of Planada Canal and Dibblee Lateral	all in-channel or bank work, onsite cover is limited to canal-side vegetation; adjacent cover is almost entirely orchard, but there are some mature trees near human habitation/structures	potential for nesting birds, Swainson’s hawk, western pond turtle, and Sanford’s arrowhead
Flow Measurement Improvements – Le Grand Canal to Bear Creek Spill	onsite cover is entirely riparian woodland/scrub along Bear Creek; adjacent cover is a mix of orchard and field crops to the south, north, and west; and mostly vernal pool grassland to the northwest	potential for nesting birds (cliff swallow colony at existing infrastructure and great blue heron nesting colony in trees within 600 feet of site), Swainson’s hawk (individuals soaring over site), western pond turtle; valley elderberry longhorn beetle (elderberries in riparian vegetation along Bear Creek), and special-status plants
Miles Dam Improvements	onsite cover consists of canal bank/road and mature trees; adjacent cover consists of	potential for nesting birds, tree-roosting bats, Swainson’s hawk (individuals soaring over site), burrowing owl,

	mature riparian woodland along Miles Creek and corn and ruderal vegetation throughout most of the rest of the area	western pond turtle, and Sanford's arrowhead
Crocker Dam Improvements	onsite cover consists of canal bank/road, riparian scrub, and some mature trees; adjacent cover consists of scattered mature trees along Bear and Black Rascal creeks and orchard and fallow fields throughout most of the rest of the area	potential for nesting birds, tree-roosting bats, Swainson's hawk (individuals soaring over site), burrowing owl, western pond turtle, and Sanford's arrowhead
<b>Siphon Modifications</b>		
Vaughn Lateral Siphon – (under Gerard Avenue)	all in-channel or bank work, onsite cover is limited to canal-side vegetation; adjacent cover is like onsite cover; however, there are some mature trees at nearby human habitation/structures	potential for nesting birds, Swainson's hawk, tree-roosting bats, western pond turtle, and Sanford's arrowhead
Planada Canal Creek Check Structure Enlargement	all in-channel or bank work, onsite cover is limited to canal-side vegetation; adjacent cover consists entirely of orchard and row crops	potential for nesting birds, Swainson's hawk, burrowing owl, San Joaquin kit fox, western pond turtle, tree-roosting bats, and Sanford's arrowhead
Planada Canal Siphon (under Santa Fe Avenue)	all in-channel or bank work, onsite cover is limited to canal-side vegetation; adjacent cover is orchard, vineyard, and row and field crops; there are some mature trees at nearby human habitation/structures/parking areas	potential for nesting birds, Swainson's hawk, tree-roosting bats, western pond turtle, and Sanford's arrowhead
El Nido Canal – Washington Road Siphon	all in-channel or bank work, onsite cover is limited to canal-side vegetation; adjacent cover is all corn and a composting facility	potential for nesting birds, San Joaquin kit fox, American badger, and Sanford's arrowhead
El Nido Canal Creek Crossing	onsite cover is limited to canal bank vegetation; adjacent cover is all corn	potential for nesting birds, San Joaquin kit fox, American badger, burrowing owl, western pond turtle, and Sanford's arrowhead

<b>Interties</b>		
Supplemental Fairfield Canal Flows with Creek Flows – Miles Creek	onsite cover consists of canal bank/road and riparian scrub; adjacent cover is orchard and sweet potatoes	potential for nesting birds, Swainson’s hawk, western pond turtle, Sanford’s arrowhead,
Supplemental Fairfield Canal Flows with Creek Flows – Owens Creek	onsite cover consists of canal bank/road and mature oaks; adjacent cover consists of oak woodland along Owens Creek and orchard throughout most of the rest of the area	potential for nesting birds, tree-roosting bats, Swainson’s hawk, western pond turtle, Sanford’s arrowhead, and other special-status plants
Deane Drain Booster Pump	onsite cover is limited to canal-side ruderal vegetation; adjacent cover is all in cotton, rice, or alfalfa	potential for nesting birds, burrowing owl, San Joaquin kit fox, American badger, western pond turtle, and Sanford’s arrowhead
<b>Reservoir and Recharge Basins</b>		
Arena Canal Regulating Reservoir	onsite cover is a mix of field crops (sweet potato and winter wheat) and orchard; site bisected by canal; some mature trees near human habitation/structures; adjacent cover is like onsite cover	potential for nesting birds, Swainson’s hawk, tricolored blackbird, tree-roosting bats, western pond turtle, and Sanford’s arrowhead
McCoy Lateral Upper Regulating Reservoir	onsite cover is a mix of field crops (sweet potato and winter wheat), and orchard (northern portion of site); site bisected by canal; small number of scattered mature trees; adjacent cover is like onsite cover	potential for nesting birds, tricolored blackbird, Swainson’s hawk, tree-roosting bats, western pond turtle, and Sanford’s arrowhead
McCoy Lateral Lower Regulating Reservoir (Note: this project is no longer included in the Proposed Program; however, it provides context related to biological resources in the area.)	onsite cover is a mix of field crops (sweet potato, corn, and winter wheat), vineyard, and orchard (northwest portion of site); site bisected by canal; dairy waste basins; small number of scattered mature trees; adjacent cover is similar to onsite cover	potential for nesting birds, Swainson’s hawk (individuals observed over and on site), tricolored blackbird, tree-roosting bats, western pond turtle, and Sanford’s arrowhead
Atwater Canal Regulating Reservoir and Recharge Basin	onsite cover is a mix of field crops, annual grassland/ruderal vegetation, and orchard; site bisected by canal; some mature trees near	potential for nesting birds, Swainson’s hawk, tricolored blackbird, tree-roosting bats, San Joaquin kit fox, western pond turtle, and Sanford’s arrowhead

	human habitation/structures; adjacent cover is like onsite cover	
Cressey Regulating Reservoir and Recharge Basin	most onsite cover is associated with existing fenced recharge basin; some associated ruderal vegetation and soil spoils; adjacent cover is almost entirely orchard	potential for nesting birds and burrowing owl
Northside Regulating Reservoir	onsite and adjacent cover is all orchard (established and new); site bisected by canal	potential for nesting birds, tree-roosting bats, western pond turtle, and Sanford's arrowhead
Hadley Lateral Reservoir	onsite cover is almost exclusively orchard west of Plainsburg Road, but is a mix of orchard, peppers, and corn east of Plainsburg Road; Duck Slough and its associated riparian corridor bisect the site; adjacent cover is like onsite cover	potential for nesting birds, Swainson's hawk, western pond turtle, San Joaquin kit fox, Sanford's arrowhead, and other special-status plants
Le Grand Reservoir	onsite cover is a mix of field crops (winter wheat, hay, and corn) and orchard (particularly in the southwestern portion of site); some riparian woodland/scrub occurs along the Le Grand Canal which bisects site; adjacent cover is a mix of field crops and orchard to the north, west, and south, but supports substantial vernal pool grassland to the east; there are some mature trees near human habitation/structures	potential for nesting birds, Swainson's hawk, burrowing owl, tricolored blackbird, American badger, San Joaquin kit fox, tree-roosting bats, western pond turtle, California tiger salamander, western spadefoot, vernal pool crustaceans, Sanford's arrowhead, and other special-status plants
Increasing Capacity of the El Nido Reservoir	all in reservoir or bank work, onsite cover is limited to canal-side vegetation; adjacent land is grazed non-native annual grassland	potential for nesting birds, San Joaquin kit fox, American badger, burrowing owl, western pond turtle, California tiger salamander, western spadefoot, Sanford's arrowhead, and other special-status plants
Spiker Canal Regulating Reservoir	onsite cover is a mix of field crops (corn, hay, alfalfa, and cotton) as well as new orchard and ruderal vegetation; site bisected by Duck Slough and Deadman Creek which both	potential for nesting birds, Swainson's hawk, burrowing owl, San Joaquin kit fox, American badger, tree-roosting bats, blunt-nosed leopard lizard, western pond turtle, California tiger salamander, western spadefoot, vernal pool

	support riparian woodland; adjacent cover is similar to onsite cover, but includes non-native annual grassland and seasonal wetlands	crustaceans, Sanford's arrowhead, heartscale, and other special-status plants
Bear Creek Regulating Reservoir	onsite cover is a mix of field crops (corn, tomatoes, alfalfa, and cotton) as well as scattered mature trees along Bear Creek; site bisected by creek; adjacent cover is similar to the onsite cover other than the downstream portion of the project area abuts vernal pool grassland/ruderal vegetation	potential for nesting birds, Swainson's hawk, burrowing owl, San Joaquin kit fox, American badger, tree-roosting bats, blunt-nosed leopard lizard, western pond turtle, western spadefoot, California tiger salamander, vernal pool crustaceans, Sanford's arrowhead, and other special-status plants
Notes: 1 - The projects in Table 2 reflect only those project sites that were visited and evaluated for their biological resources. In addition, these projects were selected given that they are representative of the types and geographic distribution of projects under the Proposed Program.		

## CONCLUSIONS AND RECOMMENDATIONS

Given that the June and October 2017 reconnaissance-level surveys were not focused surveys for specific special-status species, the following process is recommended to determine if such species are likely to be adversely affected by projects included in the Proposed Program:

- 1) conduct geographic information system (GIS) analysis to determine if any special-status species occurrences in the CNDDB have been documented within the potential area of effect for the project;
- 2) conduct preconstruction survey to determine if suitable habitat is present and warrants any species-specific focused surveys (note that the reconnaissance-level survey may be required a year or more in advance of the project to ensure compliance with timing requirements of some protocol surveys);
- 3) if necessary, conduct focused protocol surveys consistent with the protocols identified in Table 3 or with the most current agency-approved protocol for a given species;
- 4) implement recommended mitigation measures (as identified in this document) for all special-status species that would be potentially affected by construction and maintenance of each project associated with the Proposed Program; and
- 5) consult with the CDFW and/or USFWS if evidence of state or federally-listed species is found in the potential area of effect and implement mitigation measures recommended by

the agencies to avoid “take” of individuals and “destruction or adverse modification” of designated critical habitat.

<p style="text-align: center;"><b>TABLE 3</b></p> <p style="text-align: center;"><b>RECOMMENDED SPECIAL-STATUS SPECIES SURVEYS FOR PROJECTS ASSOCIATED WITH THE MERCED IRRIGATION DISTRICT WATER RESOURCES MANAGEMENT PLAN, MERCED COUNTY</b></p>	
<b>Survey Type</b>	<b>Survey Notes</b>
focused survey for special-status plants	survey conducted consistent with <i>Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities</i> (CDFW 2009) within all project sites (and out to 100 feet) where potentially suitable habitat is present
focused survey for special-status vernal pool invertebrates (e.g., vernal pool fairy shrimp)	survey conducted consistent with <i>Survey Guidelines for the Listed Large Branchiopods</i> (USFWS 2015) where suitable habitat is present onsite or within 250 feet of project
focused survey for valley elderberry longhorn beetle	survey conducted consistent with <i>Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)</i> (USFWS 2017)
focused survey for Molestan blister	survey conducted as a minimum of 2 visits with 1 visit no less than 14 days prior to construction (at least 30 days between visits during April 1 to July 15) where suitable habitat is present
focused survey for Crotch bumble bee	survey for nests of species will be conducted by a qualified biologist as a minimum of 2 visits during June 15 to September 15 (i.e., peak active season of the species) with at least 30 days between visits
focused survey for special-status vernal pool amphibians (e.g., California tiger salamander and western spadefoot)	survey conducted consistent with <i>Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander October 2003</i> where suitable habitat is present
focused survey for northern leopard frog	survey conducted as single nighttime survey during April 1 to May 31 within any aquatic and adjacent upland habitat on and within 100 feet of projects located within 0.5 miles of Dan McNamara Road Canal
focused survey for blunt-nosed leopard lizard	survey conducted consistent with <i>Approved Survey Methodology for the Blunt-Nosed Leopard Lizard</i> (CDFW 2004) (note that the requirements of this protocol may not allow for completion until September of the year the survey is conducted) - surveys to be conducted only in suitable habitat west of State Route 59 and south of State Route 140
focused survey for Blainville’s horned lizard	survey conducted concurrently with surveys for Crotch bumble bee, blunt-nosed leopard lizard, burrowing owl, San Joaquin kit fox, and American badger given overlap in suitable habitat with the horned lizard and compatible survey strategies for each of

	these species – survey conducted during the activity period of the horned lizard (April 1 to October 15)
focused survey for nesting birds	survey conducted as a minimum of 2 visits during 14 days prior to construction (at least 1 week between visits) if project commences between February 15 and August 15 (at and within 100 feet of project except for raptors where a threshold of 400 feet applies)
focused survey for large wader colonial nest sites (great blue heron and great egret)	survey conducted as a single visit prior to “leaf out” (i.e., prior to March 1) to locate colonial nest sites followed by a second visit to confirm previously found sites are active (April 1 to June 1)
focused survey for nesting Swainson’s hawk	survey conducted consistent with <i>Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (Buteo swainsoni) in the Central Valley of California</i> (CDFG 1994) along the Planada Canal within and up to 0.25 mile from project site
focused survey for burrowing owl	survey conducted consistent with <i>Staff Report on Burrowing Owl Mitigation</i> (CDFW 2012) along all roads and levees and within all other non-agricultural, low, sparse vegetation types within the project site (and out to 250 feet) where suitable habitat is present
focused survey for nesting tricolored blackbird colonies	survey conducted as a minimum of 2 visits at and within 250 feet of project at least 14 days prior to construction (at least 30 days between visits) if project commences during breeding season (i.e., between February 15 and July 15)
focused survey for San Joaquin kit fox and American badger	survey conducted consistent with <i>San Joaquin Kit Fox Survey Protocol for the Northern Range</i> (USFWS 1999) within all upland portions of the project site (not in active agricultural production)
focused survey for San Joaquin pocket mouse and Merced kangaroo rat	survey conducted as live-trapping survey with Sherman traps in suitable habitat east of State Route 59 and north of State Route 140 – 10 traps per transect to provide enough coverage for detection during 5 consecutive trap nights
focused survey for non-tree roosting bats	survey conducted to find roosting bats or evidence of roosting bats (i.e., guano, urine stains, etc.) within structures proposed for demolition or refurbishing during 14 days prior to construction
focused survey for tree roosting bats (e.g., western red bat and hoary bat)	survey conducted to find evidence of tree roosting bats in trees proposed for removal or where other trees are within 120 feet of trees proposed for removal – detection will be conducted through the use of appropriate acoustic equipment to record calls of the target species and will be conducted for 2 consecutive nights during 7 days prior to construction

The following mitigation measures are recommended for the species described in Table A-1 of Appendix A that are considered to have some potential to occur within or immediately adjacent to a Proposed Program project sites (i.e., within the potential area of effect).

### *Sanford's Arrowhead*

Adverse effects to Sanford's arrowhead will be mitigated as follows.

- No less than 25 percent of the potentially affected plugs (1 ft x 1 ft x 1 ft), with no fewer than three individual Sanford's arrowhead plants per plug will be transplanted to an unlined portion of the occupied canal(s) located immediately downstream from the project boundaries. The plug source locations shall be selected randomly to assure the greatest potential genetic diversity of the plants.
- The transplantation program shall not be bound by any survivorship monitoring standards given that it is expected that some of the source population will be unaffected by the project. However, the applicant will monitor the transplanted Sanford's arrowhead to evaluate the efficacy of such transplantation as it relates to future mitigation efforts for this species. Monitoring shall occur for three consecutive years after transplantation and a final report submitted to the CDFW by October of the final year of monitoring.

### *Other Special-Status Plants*

Adverse effects to other special-status plants will be mitigated consistent with the *Policy on Mitigation Guidelines Regarding Impacts to Rare, Threatened, and Endangered Plants* and will be accomplished through conference and coordination with the California Native Plant Society (CNPS). CNPS endorses the following measures:

- avoiding the impact altogether by not taking a certain action;
- minimizing the impact by limiting the degree or magnitude of the action;
- rectifying the impact by repairing, rehabilitating or restoring the impacted environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the project; and
- compensating for the impact by replacing or providing substitute resources or environments elsewhere.

Note that multiple measures may be necessary to effectively mitigate adverse effects to a given plant species but will always be at the discretion of MID if the effects can be reasonably expected to avoid, minimize, or compensate for the anticipated effects.

### *Vernal Pool Crustaceans*

Adverse effects to federally-listed and other special-status vernal pool crustaceans will be mitigated through formal consultation with the USFWS with the likely consulting federal agency being the U.S. Army Corps of Engineers (USACOE). The USACOE's guidelines for formal

consultation include the following. (Note: This assumes the Proposed Program will have some form of federal nexus. If that is not the case, mitigation will be required through Section 10 of the ESA).

- The precise location of the project site clearly delineated on either an original or high-quality copy of a U.S. Geological Survey topographic map (exact scale, 7.5-minute, 1 in. = 24,000 in.). The map should include: quad name(s); county name; project name; type of project by category (development or other [specify]); and townships(s), ranges(s), section(s) in which the project is located.
- Detailed map(s) of Proposed Project site. The map should include: potential habitat of listed vernal pool plants and invertebrates (i.e. vernal pools, swales, and other areas that pond water in winter-spring) on-site and on adjacent property where vernal pool complexes cross property boundary; other special-status species locations/habitats; location(s) of any proposed on-site reserves; location(s) of all Proposed Project features (buildings, roads, parking lots, bike trails, hiking paths, fences, irrigated and non-native landscaped areas, detention basins, recreation fields, parks, and any other open spaces, etc.; location(s) of existing infrastructure within proposed reserves such as power lines, easements, pipelines or any other underground structures for which access and maintenance privileges exist; spatial buffers between the project features and avoided vernal pool resources; and watershed boundaries of wetlands, both avoided and impacted to assist in evaluation of indirect effects.
- Area (in acres) directly and indirectly affected by the Proposed Project, including: total area of the project; estimated area of listed vernal pool species habitat filled/destroyed, including effects of interrelated and interdependent actions; estimated area of habitat of listed vernal pool crustaceans indirectly affected, estimated size of buffer between the project features and adjacent avoided or preserved area(s); land use of properties adjacent to both impacted area(s) and avoided or preserved area(s); and map or discussion describing hydrological relationships of both impacted and avoided wetlands with adjacent properties.
- Any conservation plan and/or conservation measures that the applicant proposes. To expedite consultation, such plans and measures should be developed during the informal consultation process with the USFWS, prior to initiation of formal consultation and should include the following: specific provisions for endowments for future management, maintenance, and ownership of any vernal pool reserves included in the conservation proposal; specific locations and construction methods for any compensatory wetlands, and monitoring protocols, success criteria, and remediation protocols for any compensatory wetlands.

- A survey is required for any listed vernal pool plants if the Proposed Project is within the range of such species. If presence of listed invertebrates is not assumed and the Proposed Project occurs in an area where the USFWS does not assume presence of listed invertebrates in the watershed, protocol surveys are necessary.
- In coordination with the requirements of any formal consultation regarding federally-listed vernal pool crustaceans, MID will implement measures consistent with the formal consultation and *Draft Vernal Pool Mitigation and Monitoring Guidelines for U.S. Army Corps of Engineers South Pacific Division* (2016) for compensatory mitigation projects involving vernal pool habitats as required for processing of Department of the Army (DA) permits under Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, and Section 103 of the Marine Protection, Research, and Sanctuaries Act.

#### *Valley Elderberry Longhorn Beetle*

Adverse effects to valley elderberry longhorn beetle will be mitigated consistent with the USFWS's *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* (2017). Mitigation measures in the framework include the following:

- avoidance and minimization measures;
- transplanting of elderberries;
- monitoring; and
- compensatory mitigation measures.

Specific detail and guidance in the implementation of the above mitigation measures is outlined in the USFWS's *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* (2017).

#### *Molestan Blister Beetle*

Adverse effects to Molestan blister beetle will be mitigated as follows:

- If individuals of Molestan blister beetle, a poorly understood species, are found during the preconstruction survey, pertinent data regarding the associated habitat (e.g., vegetation communities, soils, associated invertebrate species, etc.) shall be collected to better understand the ecology of the species.
- All pertinent data collected during the preconstruction survey shall be included in the information submitted to the California Natural Diversity Data Base (CNDDB) along with the new occurrence records.

- Construction involving ground disturbance (i.e., grading or excavation) within 50 feet of a documented occurrence will not start until after July 31 to minimize adverse effects to the species during its activity season.

#### *Crotch Bumble Bee*

Adverse effects to Crotch bumble bee will be mitigated as follows:

- A survey for nests of Crotch bumble bee species will be conducted by a qualified biologist as a minimum of 2 visits during June 15 to September 15 (i.e., peak active season of the species) with at least 30 days between visits. If bumble bee nests are found, they will be demarcated with exclusion fencing within 10 feet of the nest such that direct and indirect effects to the nest can be avoided until the end of the flight season (i.e., after November 15). If a nest is found in an area where it cannot be avoided while achieving the objectives of the project, it may be removed (particularly if it becomes an issue of health and safety). However, to the extent feasible no known nest will be removed until after November 15 to minimize adverse effects to the species during its active season.

#### *Northern Leopard Frog*

Adverse effects to northern leopard frog will be mitigated as follows:

- No dredging, excavation, or other disturbance of potentially occupied wintering habitat (i.e., substrate at the bottoms of lakes, ponds, and perennial slow-moving drainages) will occur during the wintering season (October 15 to March 15).
- A qualified biological monitor will be present onsite for any activities that disturb aquatic or adjacent upland habitat (i.e., within 100 feet of project) during the species' active season. Any northern leopard frogs found to potentially be in harm's way will be captured by dipnet or hand, contained in a 2-gallon plastic bucket with lid, and relocated immediately to other suitable aquatic habitat at least 300 feet from the project.

#### *California Tiger Salamander and Western Spadefoot*

Adverse effects to California tiger salamander (CTS) will be mitigated as follows:

- Concentrations of small mammal burrows and other suitable refugia that may support CTS will be avoided to the extent feasible. Prior to ground disturbance, linear routes will be mapped, marked in the field, and surveyed for burrows. Burrows within a vehicle access route that cannot be avoided and are susceptible to being crushed will be temporarily reinforced with PVC pipe or by other measures as deemed effective by a qualified biologist prior to allowing vehicle access (dry season only). Any reinforcing materials will be removed immediately after access is completed.

- Prior to any work within a project site with suitable CTS habitat or within one mile of suitable CTS habitat (or within two miles of known CTS occurrences where there is contiguous suitable habitat between the project and occurrence), a one-way exclusion fence will be established prior to the winter (i.e., prior to October 15) of the planned year of construction around the project site and will remain in place for the duration of the project. A qualified biologist will survey and delineate the fence route and be present during fence installation. Exit funnels or other appropriate exit structures for CTS will be provided no more than 60 feet apart along the entire fence alignment. The exclusion fence will be routinely inspected for repair for the duration of construction. Any damage, such as holes or gaps, will be repaired immediately.
- CTS found within a project site will be captured by hand, contained in a 2-gallon plastic bucket with lid, and relocated immediately to the outside of the nearest portion of the exclusion fence (in a ground squirrel burrow if available...otherwise under a 2 x 2 foot piece of plywood covered with styrofoam insulation).
- Prior to any disturbance of potentially suitable aquatic CTS breeding habitat, a qualified biologist will conduct presence/absence surveys within the habitat in concurrence with the USFWS's *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* October (2003).
- Prior to the start of work each morning within the CTS exclusion fence, a qualified biologist will check for CTS under equipment and materials that are to be moved that day. The qualified biologist will also check all excavated steep-walled holes or trenches for CTS. CTS will be removed by the qualified biologists and relocated immediately to the outside of the nearest portion of the exclusion fence (in a ground squirrel burrow if available...otherwise under a 2 ft x 2 ft piece of plywood covered with styrofoam insulation).
- A 10-mile-per-hour speed limit will be enforced at all project sites, except on roads with a posted speed limit. On roads with posted speed limits, construction traffic will be limited to the minimum safe speed.
- If dead or injured CTS are found, the qualified biologist will consult with the USFWS and CDFW to determine which, if any, additional protection measures will be implemented. These measures may include, but are not limited to, lower traffic threshold, more intensive monitoring, or controlled arrival and departures of construction traffic.
- Implementation of the above measures that address California tiger salamander also apply to western spadefoot and will also mitigate/compensate for potential adverse effects to this species within and adjacent to project sites.

### *Western Pond Turtle*

Adverse effects to western pond turtle will be mitigated as follows.

- During dewatering of any canal that is suitable for western pond turtle the applicant shall retain a qualified biologist to monitor the dewatering and salvage any stranded western pond turtles that are observed. Salvage shall be conducted by net and all individuals will be relocated to a downstream portion of the associated canal at least 500 feet downstream of the nearest boundary of the project site that has at least 300 linear feet of continuous aquatic habitat. Any non-native turtles (e.g., red-eared slider [*Trachemys scripta elegans*]) that are salvaged will not be released to the wild. The applicant will consult with the CDFW regarding the disposition of these latter individuals.
- When removing the top 12 inches of soil from any relatively undisturbed edge habitat on or near the project site (i.e., ungraded road shoulders and field edges that could provide potential egg-laying sites), the applicant will utilize a qualified biologist as a “spotter” whose responsibility is to watch for western pond turtle eggs or neonates that are overturned during earthmoving. If eggs or neonates are found, all earthmoving activities within 30 feet of the eggs or neonates will be temporarily halted until the eggs or neonates can be salvaged. The eggs or neonates will then be delivered to a nearby qualified wildlife rescue and rehabilitation facility that has been approved by the CDFW. The eggs or neonates will be held by the wildlife rescue and rehabilitation facility until they are ready for release into downstream portions of the associated canals (i.e., at least 500 feet downstream from the nearest project boundary). Once the top 12 inches of soil has been removed, no further monitoring for western pond turtle eggs or neonates is required given that western pond turtle nests are shallow (i.e., less than six inches in depth).

### *Blunt-nosed Leopard Lizard*

Adverse effects to blunt-nosed leopard lizard must be mitigated through avoidance given that the species is California fully-protected and authorization of “take” is not allowed. As such, adverse effects to blunt-nosed leopard lizards will be mitigated as follows:

- a final clearance survey will be conducted to ensure that no blunt-nosed leopard lizards are present, and no burrows have become established within the project site and a 50-foot avoidance buffer;
- all burrows suitable for potential use by blunt-nosed leopard lizard will be avoided by project activities;
- if suitable burrows that may serve as potential refugia for blunt-nosed leopard lizard cannot be avoided within the project site and a minimum 50-foot avoidance buffer cannot

be maintained, then additional surveys to detect the species will be completed in accordance with the CDFW's *Approved Survey Methodology for the Blunt-Nosed Leopard Lizard* (2004);

- if no individual blunt-nosed leopard lizards are observed and no burrows are identified within the project site and a 50-foot avoidance buffer during the final clearance survey, then project activities may proceed.
- when possible, conduct project activities when lizards are active (generally when temperatures are between 77° F and 95° F);
- all vehicle operators will check under vehicles and equipment prior to operation, or if left idle; and
- if a blunt-nosed leopard lizard is observed during project preconstruction or clearance surveys, the USFWS and CDFW will be notified for further guidance.

#### *Blainville's Horned Lizard*

Adverse effects to coast horned lizard will be mitigated as follows.

- Pre-construction visual surveys for horned lizards will be conducted weekly beginning 30 days prior to initial ground disturbing activities at any project site where prior evidence of the species has been obtained. All horned lizards found within and out to 50 feet from the project footprint will be captured and released into designated relocation areas approved by a qualified biologist.
- "Coverboards" will also be used to capture horned lizards. Coverboards will consist of untreated plywood at least 4 ft x 4 ft. Coverboards will be placed flat on the ground at least 30 days prior to construction and checked once a week. Captured horned lizards will be placed immediately into 5-gallon buckets containing sand and kept at a constant cool temperature. Horned lizards will be released in designated relocation areas no more than one hour after capture.
- During all initial grading activities (i.e., first 12 inches of soil), a qualified biologist will be present as a "spotter" to salvage any horned lizard that may be excavated or unearthed with native material. If the individuals are in good health, they will be immediately relocated to the designated relocation area. If they are injured, the individuals will be held by a local wildlife rescue and rehabilitation facility until they are ready for release back to the project site (i.e., upon completion of all construction and related activities).

### *Northern California Legless Lizard*

Adverse effects to northern California legless lizard will be mitigated as follows.

- When removing the top 12 inches of soil from any project site that has previously been identified as suitable habitat for northern California legless lizard, MID will utilize a qualified biologist as a “spotter” whose responsibility is to watch for individuals of the species that are overturned during earthmoving. If, neonates or adults are found, all earthmoving activities within 30 feet of the legless lizards will be temporarily halted until the individuals can be salvaged. The individuals will then be delivered to a nearby qualified wildlife rescue and rehabilitation facility that has been approved by the CDFW. The individuals will be held by the wildlife rescue and rehabilitation facility until they are ready for release back to the project site (i.e., upon completion of all construction and related activities). Once the top 12 inches of soil has been removed, no further monitoring for northern California legless lizard individuals is required.

### *Nesting Birds (including Loggerhead Shrike)*

The following measures are recommended to avoid adverse effects to nesting birds (including loggerhead shrike, but not including Swainson’s hawk or other special-status raptor species) that nest within or immediately adjacent to the project site.

- If construction occurs during the bird nesting season (generally February 15 - August 31), preconstruction nesting bird surveys (2 visits at least 1 week apart) will be conducted by a qualified biologist within the 14 days prior to construction to detect the presence of any nesting birds within or adjacent to the Proposed Project (within 400 feet for non-special status raptors and within 100 feet for all other non-special-status birds). If construction occurs during the nonbreeding season for nesting birds (September 1 - January 31), preconstruction surveys are not required.
- If the preconstruction nesting bird surveys detect actively nesting birds, the results of the surveys shall be submitted to the CDFW within three days of completing the surveys. If any active non-special-status bird nests are found onsite, the applicant shall avoid initiating any construction activities within the standard buffers described above (i.e., 400 and 100 feet as appropriate). The applicant will then develop and implement a plan for the protection and monitoring of these nests, to be approved by CDFW, in a timely manner. The results of any protective measures instituted as a part of the protection and monitoring plan shall be provided to the CDFW in electronic format within one week of implementation.

### *Nesting Great Blue Heron and Great Egret*

The following measures are recommended to avoid adverse effects to nesting colonies of great blue heron and great egret.

- Active nesting colonies of great blue heron or great egret will be avoided with a 400-foot buffer between the colony and active construction that utilizes heavy equipment or that involves tree removal.
- Minor modification activities may occur if they are short-term in duration (3 days or less), do not use heavy machinery, do not remove more than 900 square feet of vegetation, and avoid all activities within a 250-foot buffer between an active colony and construction activities.
- If construction is initiated during the non-nesting season (September 1 to January 31) construction activities may occur within 100 feet of the nearest portion of the nest colony site. However, no woody vegetation (particularly large trees) within 200 feet of the nest colony site may be removed.

### *Swainson's Hawk and White-tailed Kite*

Adverse effects to nesting Swainson's hawks and white-tailed kites will be mitigated as follows.

- If active Swainson's hawk or white-tailed kite nests are detected during preconstruction surveys, a no-disturbance buffer zone of 500 feet will be implemented during the nesting season (March 1 - September 15) or until August 15 if Management Authorization is provided by the CDFW (2000). Furthermore, a nest monitoring plan will be developed and implemented for all active nests. If monitoring demonstrates that nesting individuals are being adversely affected the no-disturbance zone will be increased in 100-foot increments until all adverse effects are eliminated.
- Compensation for loss of suitable Swainson's hawk foraging habitat (mostly with reservoir construction) will be conducted as follows: habitat acquisition (through fee title or conservation easement) at a 1:1 ratio for nest sites within 1 mile; 0.75:1 for nest sites within 5 miles, 0.5:1 for nest sites within 10 miles. Note that habitat acquisition can be "stacked" with mitigation for loss of agricultural land if the acquired land is planted in a suitable crop for Swainson's hawk foraging in three out of every five years. Compensation for loss of suitable white-tailed kite foraging habitat will be conducted concurrently with compensation for loss of suitable Swainson's hawk habitat.

### *Burrowing Owl*

Adverse effects to burrowing owls will be mitigated as follows.

- The results of preconstruction surveys for burrowing owl, including negative findings, will be submitted to the CDFW within three days of survey conclusion. If burrowing owls are found during the nesting season (i.e., February 15 - August 31), no ground disturbance will occur within 250 feet of occupied burrows until a qualified biologist determines that fledging has occurred (i.e., the juveniles are no longer dependent upon the nest burrows). If burrowing owls are found during the non-nesting season (i.e., September 1 - February 14) no ground disturbance will occur within 160 feet of occupied burrows.
- Alternatively, the applicant may retain a qualified biologist to conduct passive relocation of individuals from occupied burrows utilizing one-way doors for a minimum of three consecutive days (only during the non-nesting season). Once the occupied burrows have been cleared, the applicant may backfill the burrows. If passive relocation is utilized, the applicant will also provide alternate natural or artificial burrows that are beyond 160 feet from the impact area and that are within or contiguous to a minimum of 6.5 acres of foraging habitat for each pair of relocated burrowing owls. One alternate natural or artificial burrow will be provided for each burrow that will be excavated within the project site. Artificial burrow creation, if utilized, will follow the guidelines in Trulio (1995) and the CDFW *Staff Report on Burrowing Owl Mitigation* (2012). The applicant will be responsible for reporting all observations of burrowing owl to the CNDDDB within ten (10) days of the sighting.

### *Tricolored Blackbird*

Adverse effects to nesting tricolored blackbird colonies will be mitigated as follows:

- MID will prepare a habitat management plan (HMP) and incidental take permit application for submittal to and approval by the CDFW prior to any loss of suitable nesting habitat for tricolored blackbird on a project site. The HMP will, at a minimum, include the below provisions.
  - a) To avoid and minimize impacts to nesting tricolored blackbird, MID will not initiate grubbing, grading, or other soil/vegetation disturbance within 250 feet of project boundaries during the nesting season (March 15 through July 30). All project soil/vegetation disturbance will occur between August 1 and March 14 to the extent feasible.
  - b) Alternatively, if MID initiates project soil/vegetation disturbance between March 15 and July 30, surveys will be conducted for prospecting or nesting tricolored blackbird colonies in all potentially suitable nesting habitats that are within and

out to 250 feet from the project boundaries. The surveys will be conducted by a qualified biologist during the season immediately preceding initiation of the project. The surveys will be conducted according to the following schedule: a total of two visits during early March 15 to July 30 with at least one month between survey visits.

- c) If nesting colonies are found prior to initiation of project soil/vegetation disturbance in the year of the survey, a no work exclusion zone will be established within 250 feet of each active nesting colony until a qualified biologist determines that the young-of-the-year are no longer reliant upon the nest site.
- d) Alternatively, MID may retain a qualified biologist to conduct daily monitoring of any active nesting colonies that are within 250 feet or less from project soil/vegetation disturbance to determine if the individuals are exhibiting any behaviors that would suggest that nest failure could occur. If the qualified biologist determines that disturbance is enough to cause nest failure, all activities within 250 feet of the nesting colony will be terminated until the young-of-the-year are no longer reliant upon the nest.
- e) To compensate for the loss of known nesting habitat for tricolored blackbird on a project site, MID will plant Himalayan blackberry at a minimum 2:1 compensation ratio. The compensation stands of Himalayan blackberry will be sited on the nearest suitable land controlled by MID or on nearby alternative land on which MID has acquired a conservation easement acceptable to the CDFW. Compensation sites will be chosen to avoid any loss of existing natural wetland communities. Annual monitoring of the compensation stands will be conducted to determine if tricolored blackbirds are utilizing the compensation habitat. If no evidence of utilization has been found after five years of monitoring, MID will be required to plant additional Himalayan blackberry at a minimum 1:1 compensation ratio on other lands under MID control within Merced County where there is no active episodic human disturbance that would preclude tricolored blackbirds from settling and nesting in the compensation habitat.

### *Tree-roosting Bats*

Adverse effects to tree-roosting bats (i.e., western red bat and hoary bat) will be mitigated as follows.

- A qualified biologist will conduct a survey for tree-roosting bats at all suitable roosting habitat within 120 feet of the project boundaries. The survey will consist of the following: (1) daytime visual searches for individuals roosting in the foliage of onsite or adjacent large trees; and (2) evening Anabat or similar bioacoustics equipment surveys to show presence of foraging individuals. The surveys will be conducted on two

consecutive days/nights during the seven days prior to construction during months when these species may be present in the project area (i.e., March 1 to October 15).

- If the survey determines that individuals are present in onsite or adjacent roosting habitat (i.e., riparian woodland, orchards, or other nearby mature trees), no construction activities that result in fugitive noise, vibration, light, or dust shall occur within 120 feet of the roost site while it is occupied.
- On-going evening surveys will be continued until two consecutive nights without any nearby detections have occurred (other than during the pupping season) and will then be terminated. Construction must then start within the next two days.
- No additional evening surveys will be required at occupied sites and their 120-foot setback that are found during the pupping season (May 15 to July 15). Construction activities at such site will be avoided until after mid-July. Construction must then start within the next two days.
- All project night-lighting shall be shielded and directed away from suitable roosting habitat.

#### *Non-tree-roosting Bats*

Adverse effects to non-tree-roosting bats will be mitigated as follows.

- A qualified biologist will conduct a survey for evidence of non-tree-roosting bats at any human structures onsite or within 100 feet of project boundaries (including bridges).
- On-site day roosts will be avoided while the bat colony is present. A qualified biologist will assess when such roosts have been abandoned for the winter (typically early September to late-March). Removal, demolition, or reconstruction of structures can then proceed once cleared by the biologist.
- Work is not to occur within 100 feet of an active roost. Airspace access to and from the occupied structure should remain unchanged. Combustion equipment, such as generators, pumps, and vehicles, are not to be parked nor operated under or adjacent to the structure. Personnel are not to be present near the colony, especially during the evening exodus.
- Where work must occur in the area of a seasonal colony. Bats are to be excluded from directly affected work areas prior to April 15 of the construction year. Exclusion is to be done selectively, and only to the extent necessary, to prevent morbidity or mortality to the colony. Expandable foam or other acceptable methods are to be used for exclusion. Exclusionary devices are to be removed between August 31 and April 15, once construction is complete. Airspace access to and from the bridge is not to be eliminated.

Colony ventilation and protection is to remain the same. Clearing and grubbing is to be minimal, whenever possible. Combustion equipment, such as generators, pumps, and vehicles, are not be parked nor operated under or adjacent to the structure unless they are required to be in contact with the structure. The presence of personnel directly adjacent to the colony is to be minimized.

- Where work must occur in the area of a seasonal colony and the work requires either permanent demolition or substantial change of the structure, MID will consult with the CDFW (for all bats) and USFWS (for federally-listed species) in regards to construction, placement, and operation of temporary or permanent replacement habitat and monitoring. Such replacement habitat and monitoring will be consistent with the guidelines in Caltrans' *California Bat Mitigation Techniques, Solutions, And Effectiveness* (2004).

#### *Merced Kangaroo Rat and San Joaquin Pocket Mouse*

Adverse effects to Merced kangaroo rat and San Joaquin pocket mouse will be mitigated as follows:

- Merced kangaroo rat (MKR) and San Joaquin pocket mouse (SJPM) trapping efforts will be conducted by qualified biologists within all suitable habitat associated with a project. Meandering visual transect surveys for MKR burrow complexes and sign (e.g., tail drags, sand baths, seed caches) will be conducted by two biologists in all suitable habitat within and out to 100 feet from the project boundaries. All burrow complex locations that are found will be recorded utilizing a GPS unit, while data on the number of burrows, level of activity, and general suitability for MKR will be recorded in field notes. Information on vegetation type and percent cover also will be recorded.
- Following completion of the visual transect surveys, potential trapping sites will be prioritized based on a combination of the level of MKR activity (as evidenced by burrow density and/or the presence of other sign, though some areas without obvious sign may also be trapped) and project area coverage. Live trap stations and trap lines then will be established (staked and recorded with a GPS unit) at the highest priority sites.
- Traps (Sherman live traps [Model XLKR: 13 inches x 3.5 inches x 3 inches]) will be set near active burrows, dust baths, or tracks (particularly along evident runways). Ten or more traps (or a number determined by the surveyor) will be set in relatively tight clusters (5-foot trap spacing) at high activity areas. Traps also will be set at 30 to 50-foot intervals (two traps per station) along evident movement corridors. Traps will be baited with a mixture of millet, crimped oats, wild birdseed, or other suitable seed. Bedding (crumpled unbleached paper towel) will be placed at the inside end of each trap and will not be allowed to contact the tripping mechanism. Paper towels will be replaced each time an animal is captured in the trap. Traps will be opened and baited at sunset and checked one to two times/evening as deemed appropriate by the lead biologist. All traps

will be closed after they have been checked at dawn. Trapping will be conducted at each trap site for five consecutive nights. Trapping will not be conducted during the week of a full moon, unless the sky is overcast, and moonlight is substantially reduced. Trapping will not be conducted in December or January or in periods of cold or inclement weather detrimental to MKR.

- Trapped MKR or SJPM from donor sites will be held for no more than two days before moving them to a translocation site in 5-gallon plastic buckets with wire mesh tops. The buckets will contain approximately two inches of sand and approximately four ounces of millet seed.
- Trapped MKR or SJPM will then be translocated to nearby suitable translocation sites. The translocation sites will be chosen based on replicate habitat structure and plant communities, proximity to the donor site (less than three miles), absence of large numbers of kangaroo rats currently occupying the site (density threshold to be determined in consultation with CDFW), and high number of available burrows. To assess the current rodent population on a proposed translocation site before translocation of MKR, two nights of small mammal trapping will occur. After this, suitable translocation sites for hard release of MKR will be prepared for introduction by creating artificial burrows using a soil or hand auger to drill artificial burrows into the ground at a 30° angle to approximately 24 inches in depth. Approximately three ounces of seed will be placed inside of each artificial burrow. To avoid any potential aggressive interactions among kangaroo rats, artificial burrows will be placed at least 50 feet apart. MKF will be placed inside of an artificial burrow approximately one hour before sunset. The entrance to the burrow will be blocked with a small paper bag filled with soil until after sunset. Upon darkness, the burrow will be unplugged allowing individuals to exit on their own accord.
- Implementation of the above measures for MKR will also address SJPM.

#### *San Joaquin Kit Fox and American Badger*

Adverse effects to San Joaquin kit fox and American badger will be mitigated as follows:

- If the early evaluation conducted for the Proposed Project (USFWS 1999) determines that the project site represents San Joaquin kit fox habitat, the applicant will initiate discussions with the CDFW and USFWS to determine appropriate project modifications to protect San Joaquin kit fox, including avoidance, minimization, restoration, preservation, or compensation measures. At a minimum, the applicant will conduct preconstruction surveys for dens, burrows, or other subterranean structures (i.e., potential dens) that could be occupied by the taxon. The preconstruction surveys will be conducted within no less than 14 days and no more than 30 days prior to the beginning of ground disturbance and/or construction activities. Appropriate exclusion zones around potentially occupied subterranean habitat will then be observed where feasible as follows:

- a) potential den - 50 feet
- b) atypical den - 50 feet
- c) known den - 100 feet
- d) natal/pupping den – CDFW and USFWS must be contacted

Where infeasible to utilize an exclusion zone, limited destruction of potential dens will be conducted. Destruction of potential dens will be accomplished by careful excavation until it is certain that no San Joaquin kit foxes are inside. The potential dens will be fully excavated, filled with dirt, and compacted to ensure that individuals cannot reenter or use the den during the construction period. If at any point during excavation, an individual is discovered inside the den, the excavation activities will cease immediately, and monitoring of the den will be conducted. Destruction of the den will be completed when in the judgment of the biologist, the individual has escaped, without further disturbance, from the partially destroyed den. Destruction of any known or natal/pupping den requires take authorization from the CDFW and USFWS.

- Other applicable mitigation measures that address potential adverse effects to San Joaquin kit fox include the following:
  - a) Project-related vehicles will observe a daytime speed limit of 20-mph throughout the site in all project areas, except on county roads and State and Federal highways. Night-time construction will be minimized to the extent possible. However, if it does occur, the speed limit will be reduced to 10-mph. Off-road traffic outside of designated project areas will be prohibited.
  - b) To prevent inadvertent entrapment of San Joaquin kit foxes or other animals during construction, all excavated, steep-walled holes or trenches more than 2-feet deep will be covered at the close of each working day by plywood or similar materials. If the trenches cannot be closed, one or more escape ramps constructed of earthen-fill or wooden planks will be installed. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If at any time a trapped or injured San Joaquin kit fox is discovered, the CDFW and USFWS will be immediately contacted.
  - c) All construction pipes, culverts, or similar structures with a diameter of 4-inches or greater that are stored at a construction site for one or more overnight periods will be thoroughly inspected for San Joaquin kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If necessary, and under the direct supervision of a qualified biologist, the pipe may be moved only once to remove it from the path of construction activity, until the individual has escaped.

- d) All food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in securely closed containers and removed at least once a week from the project site.
- e) No firearms will be allowed on the project site.
- f) No pets, such as dogs or cats, will be permitted on the project site to prevent the harassment or mortality of San Joaquin kit foxes, or destruction of the taxon's dens.
- g) Use of rodenticides and herbicides in project areas will be restricted. This is necessary to prevent primary or secondary poisoning of individuals and the depletion of prey populations on which they depend. All uses of such compounds will observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the CDFW and USFWS. If rodent control must be conducted, zinc phosphide will be used because of its proven lower risk to San Joaquin kit fox.
- h) A representative will be appointed by the applicant who will be the contact source for any employee or contractor who might inadvertently kill or injure a San Joaquin kit fox or who finds a dead, injured or entrapped individual. The representative will be identified during the employee education program and their name and telephone number will be provided to the CDFW and USFWS.
- i) An employee education program will be prepared and delivered to all contractors, their employees, applicant personnel, and and/or agency personnel involved in the project. The program will consist of a brief presentation by persons knowledgeable in San Joaquin kit fox biology and legislative protection to explain endangered species concerns. The program, at a minimum, will include the following:
  - i. description of the San Joaquin kit fox and its habitat needs;
  - ii. description of known occurrences of San Joaquin kit fox in the project area;
  - iii. explanation of the status of the taxon and its protection under the state and federal Endangered Species Act; and
  - iv. list of measures being taken to reduce adverse effects to the taxon during project construction and implementation.

A fact sheet conveying the above information will be prepared for distribution to the previously referenced people and anyone else who may enter the project site.

- j) Upon completion of the project, all areas subject to temporary ground disturbances including storage and staging areas, temporary roads, pipeline corridors, etc. will be re-contoured if necessary, and revegetated to promote restoration of the area to pre-project conditions. An area subject to "temporary" disturbance means any area that is disturbed during the project, but after project completion will not be subject to further disturbance and has the potential to be revegetated. Appropriate methods and plant species used to revegetate such areas will be determined on a site-specific basis in consultation with the CDFW and USFWS.
  - k) In the case of trapped animals, escape ramps or structures will be installed immediately to allow the animal(s) to escape, or the CDFW and USFWS will be contacted for guidance.
  - l) Any contractor, employee, or applicant or agency personnel who are responsible for inadvertently killing or injuring a San Joaquin kit fox shall immediately report the incident to their representative. The representative will contact the CDFW immediately in the case of a dead, injured, or entrapped San Joaquin kit fox. The CDFW contact for immediate assistance is State Dispatch at (916) 445-0045. They will contact the local warden.
  - m) The Sacramento Fish and Wildlife Office and CDFW will be notified in writing within three working days of the accidental death or injury to a San Joaquin kit fox during project related activities. Notification must include the date, time, and location of the incident or of the finding of a dead or injured individual and any other pertinent information. The USFWS contact is the Chief of the Division of Endangered Species.
  - n) New sightings of San Joaquin kit fox will be reported to the California Natural Diversity Database (CNDDDB). A copy of the reporting form and a topographic map clearly marked with the location where the San Joaquin kit fox was observed will also be provided to the USFWS at the following address: Endangered Species Division, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-1846.
- Implementation of the above measures that address San Joaquin kit fox will also mitigate/compensate for potential adverse effects to American badger within the project site.

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**APPENDIX A**  
**SPECIAL-STATUS SPECIES LIKELIHOOD OF OCCURRENCE ANALYSIS**  
**FOR THE MERCED IRRIGATION DISTRICT**  
**WATER RESOURCES MANAGEMENT PLAN STUDY AREA**

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<b>PLANTS</b>				
<i>Agrostis hendersonii</i>	Henderson's bent grass	none/none/CNPS list 3.2	This species occurs in vernal pools and mesic areas of valley and foothill grassland in Calaveras, Merced, Shasta, and Tehama Counties. It blooms from April to May.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and mesic areas of valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Astragalus tener</i> var. <i>tener</i>	alkali milk-vetch	none/none/CNPS list 1B.2	This milkvetch occurs in alkali playa, valley and foothill grassland, and vernal pools of the southern Sacramento Valley, northern San Joaquin Valley, and San Francisco Bay-Delta. It flowers from March to June.	<b>Potential to Occur.</b> No individuals of this taxon were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and mesic areas of valley and foothill grassland) does occur within the WRMP area. Therefore, the taxon has some potential to occur within or adjacent to WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Atriplex cordulata</i> var. <i>cordulata</i>	heartscale	none/none/CNPS list 1B.2	This annual saltbush occurs in chenopod scrub, valley and foothill grassland, and vernal pools (typically on alkaline soils and frequently in scalded areas). It is known from Alameda, Contra Costa, Butte, Fresno, Glenn, Kings, Kern, Madera, Merced, San Joaquin, Solano, Stanislaus, Tulare, and Yolo Counties. It blooms from April to October.	<b>Potential to Occur.</b> No individuals of this taxon were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., chenopod scrub, valley and foothill grassland, and vernal pools) does occur within the WRMP area. Therefore, the taxon has some potential to occur within or adjacent to WRMP project sites.
<i>Atriplex depressa</i>	brittlescale	none/none/CNPS list 1B.2	This annual saltbush occurs in valley and foothill grassland, chenopod scrub, meadows, and playas (usually in alkali scalds, alkali clay meadows, or annual grassland). It is known from Alameda, Contra Costa, Butte, Fresno, Glenn, Kings, Kern, Madera, Merced, San Joaquin, Solano, Stanislaus, Tulare, and Yolo Counties. The species blooms during May to October.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., chenopod scrub, valley and foothill grassland, and playas) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Atriplex minuscula</i>	lesser saltscale	none/none/CNPS list 1B.1	This annual saltbush grows in sandy alkaline areas in chenopod scrub, playas, and valley and foothill grassland. It blooms from May to	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			October. It is known from locations in Alameda, Butte, Fresno, Kern, Madera, Merced, Stanislaus, and Tulare Counties.	However, suitable habitat (i.e., chenopod scrub, valley and foothill grassland, and playas) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Atriplex persistens</i>	vernal pool smallscale	none/none/CNPS list 1B.2	This annual saltbush occurs in alkaline vernal pools. It has been recorded from Glenn, Merced, Solano, Stanislaus, and Tulare Counties. It blooms from July to October.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., alkaline vernal pools) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Atriplex subtilis</i>	subtle orache	none/none/CNPS list 1B.2	This annual saltbush is known from approximately 20 extant occurrences in Butte, Fresno, Kings, Kern, Madera, Merced, Stanislaus, and Tulare Counties. It grows on alkaline soils in valley and foothill grassland, and blooms during June to October.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>California macrophylla</i>	round-leaved filaree	none/none/CBR	This species occurs on clay soils in cismontane woodland and valley and foothill grassland from San Diego County north through the Coast Ranges to Lake County and in the valley and foothills of the San Joaquin and Sacramento Valleys. It has also been recorded in Lassen County. It blooms from March to May.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Calycadenia hooveri</i>	Hoover's calycadenia	none/none/CNPS list 1B.3	An annual herb that blooms from July–September. It occurs in valley and foothill grassland (particularly in rocky soils). It has been recorded in Calaveras, Madera, Merced, Mariposa, and Stanislaus Counties.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Castilleja campestris</i> <i>ssp. succulenta</i>	succulent owl's- clover	FT/SE/CNPS list 1B.2	This subspecies is currently known from sites in eastern Merced, southeastern Stanislaus, Madera, San Joaquin, and northern Fresno Counties where it occurs on the margins of vernal pools, swales, and some	<b>Potential to Occur.</b> No individuals of this subspecies were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools, swales, and some seasonal wetlands)

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			seasonal wetlands (often on acidic soils). It blooms in May.	does occur within the WRMP area. Therefore, the subspecies has some potential to occur within WRMP project sites.
<i>Clarkia biloba</i> ssp. <i>australis</i>	Mariposa clarkia	none/none/CNPS list 1B.2	The species is an annual that blooms from April to June and occurs on serpentinite in chaparral and cismontane woodland. It has been recorded in Mariposa and Tuolumne Counties.	<b>No Potential.</b> No individuals of this subspecies were observed within or near the project site. In addition, suitable habitat (i.e., serpentinite in chaparral and cismontane woodland) does not occur within the WRMP area. Furthermore, the subspecies has not been recorded in Merced County. Therefore, the subspecies is considered to have no potential to occur within WRMP project sites.
<i>Clarkia rostrata</i>	beaked clarkia	none/none/CNPS list 1B.3	The species is an annual that blooms from April to May and occurs in valley and foothill grassland and cismontane woodland. It has been recorded in Merced, Mariposa, Stanislaus, and Tuolumne Counties.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Cryptantha hooveri</i>	Hoover's cryptantha	none/none/CNPS list 1A	This annual species has been recorded on inland dunes and sandy soils in valley and foothill grassland in the northern San Joaquin Valley (Madera to Stanislaus Counties) as well as Contra Costa County. It is currently believed to be extinct. Blooming occurs during April to May.	<b>No Potential.</b> No individuals of this species were observed within or near the project site. Though suitable habitat (sandy soils in valley and foothill grassland) does occur within the WRMP area, the species has not been recorded in Merced County. Nor has it been seen in neighboring counties since 1939. Therefore, the species is considered to have no potential to occur within WRMP project sites.
<i>Cuscuta obtusiflora</i> var. <i>glandulosa</i>	Peruvian dodder	none /none/CNPS list 2.2	This annual (parasitic) taxon is associated with freshwater wetlands and has been recorded in Butte, Merced, San Bernardino, and Sonoma Counties, but not since 1948. It blooms from July to October.	<b>No Potential.</b> No individuals of this taxon were observed within or near the project site. Though suitable habitat (i.e., freshwater wetlands) does occur within the WRMP area, the taxon has only been recorded in Merced County at one location (near Snelling). Nor has it been seen at this latter location since 1948. Therefore, the taxon is considered to have no potential to occur within WRMP project sites.
<i>Delphinium recurvatum</i>	recurved larkspur	none/none/CNPS list 1B.2	This perennial herb occurs in alkaline areas in cismontane woodland, valley and foothill grassland, and chenopod scrub. It is known from Alameda,	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area.

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			Butte, Contra Costa, Colusa, Fresno, Glenn, Kings, Kern, Madera, Merced, Monterey, San Joaquin, San Luis Obispo, Solano, Sutter, and Tulare Counties. It blooms from March to June.	However, suitable habitat (i.e., valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Downingia pusilla</i>	dwarf downingia	none/none/CNPS list 2.2	This annual herb blooms from March to May and is known from Merced, Mariposa, Napa, Placer, Sacramento, Solano, Sonoma, Stanislaus, Tehama, and Yuba Counties. It occurs in vernal pools and mesic grasslands.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and mesic valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Eryngium racemosum</i>	Delta button-celery	FE/none/CNPS list 1B.1	This annual and perennial species occurs in wet riparian areas and freshwater wetlands (typically on seasonally inundated clay). Known occurrences have been documented in the northern San Joaquin Valley (Merced to Calaveras Counties) and in Contra Costa County. Blooming occurs during June to September.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., wet riparian areas and freshwater wetlands) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Eryngium spinosepalum</i>	spiny-sepaed button-celery	none/none/CNPS list 1B.2	This perennial species occurs in wet valley and foothill grassland and vernal pools. Known occurrences have been documented in the San Joaquin Valley (Kern to Stanislaus Counties), along the Central Coast (Monterey and San Luis Obispo Counties), and in Contra Costa County. Blooming occurs during April to May.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and mesic valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Euphorbia hooveri</i>	Hoover's spurge	FT/none/CNPS list 1B.2	An annual herb that occurs mostly in association with large vernal pools. It has been recorded below 820 feet in elevation in Tulare, Merced, Stanislaus, Butte, Glenn, and Tehama Counties. It blooms mostly during July, but flowering may persist as late as October if there is sufficient moisture.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Etriplex joaquiniana</i>	San Joaquin spearscale	none/none/CNPS list 1B.2	This annual saltbush occurs mostly in chenopod scrub, valley and foothill grassland, and alkali meadows (typically in seasonal alkali wetlands or alkali sink scrub). It is known from the	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., chenopod

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			Sacramento Valley, northern San Joaquin Valley, San Francisco Bay-Delta, and a few locations in the central Coast Ranges. It blooms from April to September.	scrub, valley and foothill grassland, and alkali wetlands) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Gratiola heterosepala</i>	Boggs Lake hedge-hyssop	none/SE/CNPS list 1B.2	This annual species is found in Fresno, Lake, Lassen, Madera, Merced, Modoc, Placer, Sacramento, Shasta, Siskiyou, San Joaquin, Solano, and Tehama Counties. It blooms from April to August. It occurs on clay soils of vernal pools, lake margins, and marshes.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools, lake margins, and marshes) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Lagophylla dichotoma</i>	forked hare-leaf	none/none/CNPS list 1B.1	The species is an annual that blooms from April to September and occurs in valley and foothill grassland and cismontane woodland (often on clay). It has been recorded in Butte, Calaveras, Fresno, Merced, Monterey, San Benito, and Stanislaus Counties.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Lasthenia glabrata</i> ssp. <i>coulteri</i>	Coulter's goldfields	none/none/CNPS list 1B.1	This annual taxon is associated with marshes and swamps (coastal salt), playas, and vernal pools. It blooms from February to June. It has been recorded in Colusa, Kern, Los Angeles, Merced, Orange, Riverside, Santa Barbara, San Bernardino, San Diego, San Luis Obispo, Tehama, Tulare, Ventura, and Yolo Counties.	<b>Potential to Occur.</b> No individuals of this subspecies were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools) does occur within the WRMP area. Therefore, the subspecies has some potential to occur within or adjacent to WRMP project sites.
<i>Lepidium latipes</i> var. <i>heckardii</i>	Heckard's pepper-grass	none/none/CNPS list 1B.2	This annual herb is associated with alkaline flats in valley and foothill grasslands. It blooms from April to May. It occurs in Glenn, Solano, and Yolo Counties.	<b>Potential to Occur.</b> No individuals of this taxon were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., alkaline flats in valley and foothill grassland) does occur within the WRMP area. Therefore, the taxon has some potential to occur within WRMP project sites.
<i>Monardella</i> <i>leucocephala</i>	Merced monardella	none/none/CNPS list 1A	This annual species is associated with wet, sandy valley and foothill grassland. It has been recorded in Kern, Mariposa, Merced, and Stanislaus Counties, but is currently	<b>No Potential.</b> No individuals of this species were observed within or near the project site. Though suitable habitat (i.e., wet, sandy valley and foothill grassland) does occur within the WRMP area, the species has only been recorded in Merced

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			believed to be extinct. It blooms from May to August.	County at one location (0.75 mile north of Merced River, 1.5 miles south of Delhi). Nor has it been seen at this latter location since 1941. Therefore, the species is considered to have no potential to occur within WRMP project sites.
<i>Navarretia myersii</i> <i>ssp. myersii</i>	pincushion navarretia	FSC/none/CNPS list 1B.1	This annual herb is known from fewer than 20 occurrences in Amador, Lake, Merced, and Sacramento Counties. It blooms from April to May and occurs in vernal pools (often on acidic soils).	<b>Potential to Occur.</b> No individuals of this subspecies were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools in valley and foothill grassland) does occur within the WRMP area. Therefore, the subspecies has some potential to occur within or adjacent to WRMP project sites.
<i>Navarretia nigelliformis</i> <i>ssp. radians</i>	shining navarretia	none/none/CNPS list 1B.2	The subspecies is an annual herb that occurs in vernal pools in valley and foothill grassland and cismontane woodland. It blooms from May to July and has been found in Fresno, Merced, Monterey, San Benito, and San Luis Obispo Counties.	<b>Potential to Occur.</b> No individuals of this subspecies were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools in valley and foothill grassland) does occur within the WRMP area. Therefore, the subspecies has some potential to occur within or adjacent to WRMP project sites.

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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<i>Navarettia prostrata</i>	prostrate navarettia	none/none/CNPS list 1B.1	This species occurs on alkaline soils or in vernal pools in valley and foothill grassland and coastal scrub. It has been recorded in Merced, Alameda, and Monterey Counties as well as southern coastal California (Los Angeles, San Bernardino, Orange, and San Diego Counties). The species blooms from April to May.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools in valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Neostapfia colusana</i>	Colusa grass	FT/SE/CNPS list 1B.1	This grass occurs in vernal pools (typically larger or more persistent pools) and some constructed wetlands (e.g., stock ponds) within valley and foothill grassland. It is distributed primarily along the eastern margin of the San Joaquin Valley in Stanislaus and Merced Counties, but also occurs in Solano and Yolo Counties. It flowers from May to July.	<b>No Potential.</b> No individuals of this species were observed within or near the project site. In addition, suitable habitat (i.e., large persistent vernal pools) does not occur within the WRMP area. Therefore, the species is considered to have no potential to occur within or adjacent to WRMP project sites.
<i>Orcuttia pilosa</i>	hairy orcutt grass	FE/SE/CNPS list 1B.1	This grass occurs in vernal pools (typically larger or more persistent pools) within valley and foothill grassland. It is distributed along the eastern margin of the Sacramento and	<b>No Potential.</b> No individuals of this species were observed within or near the project site. In addition, suitable habitat (i.e., large persistent vernal pools) does not occur within the WRMP area. Therefore,

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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			San Joaquin Valleys from Tehama County south to Stanislaus, Merced, and Madera Counties. It flowers from May to September.	the species is considered to have no potential to occur within or adjacent to WRMP project sites.
<i>Orcuttia inaequalis</i>	San Joaquin Valley orcutt grass	FT/SE/CNPS list 1B.2	This grass occurs in vernal pools (typically larger or more persistent pools) within valley and foothill grassland. The remaining populations of this species occur mostly in the southeastern San Joaquin Valley (Fresno, Merced, and Madera Counties). Historically, the species also occurred in Stanislaus County. It flowers from April to September.	<b>No Potential.</b> No individuals of this species were observed within or near the project site. In addition, suitable habitat (i.e., large persistent vernal pools) does not occur within the WRMP area. Therefore, the species is considered to have no potential to occur within or adjacent to WRMP project sites.
<i>Phacelia ciliata</i> var. <i>opaca</i>	Merced phacelia	none/none/CNPS list 1B.2	This taxon occurs in valley and foothill grassland (typically on clay soils, sometimes on alkaline soils). It blooms from February to May and is known from fewer than 10 extant occurrences in Merced County.	<b>Potential to Occur.</b> No individuals of this taxon were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., valley and foothill grassland) does occur within the WRMP area. Therefore, the taxon has some potential to occur within WRMP project sites.

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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<i>Potamogeton zosteriformis</i>	eel-grass pondweed	none/none/CNPS list 2B.2	This annual aquatic herb occurs in assorted freshwater marshes and swamps. It blooms in June and July and has been found in Contra Costa, Lake, Lassen, Merced, Mono, Modoc, and Shasta Counties.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., freshwater marshes) does occur within the WRMP area. Therefore, the species has potential to occur within some WRMP project sites.
<i>Pseudobahia bahifolia</i>	Hartweg's golden sunburst	FE/SE/CNPS list 1B.1	The species occurs in cismontane woodland and valley and foothill grassland (almost always on shallow, well-drained, fine-textured soils on the north- or northeast-facing side of mima mounds). It has been recorded in Fresno, Madera, Tulare, and Stanislaus Counties. Blooming occurs during March to April.	<b>No Potential.</b> No individuals of this species were observed within or near the project site. Though, suitable habitat (i.e., mima mound topography) does occur within the WRMP area, no projects would be constructed in such topography. Therefore, the species is considered to have no potential to be adversely affected at WRMP project sites.
<i>Puccinellia simplex</i>	California alkali grass	none/none/CNPS list 1B.2	This annual herb occurs in alkaline, vernal mesic; sinks, flats, and lake margins in chenopod scrub, meadows and seeps, valley and foothill grassland, and vernal pools. It has been recorded in Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn,	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., alkaline, vernal mesic; sinks, flats, and lake margins in chenopod scrub, meadows and

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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			King, Kern, Lake, Los Angeles, Madera, Merced, Napa, San Bernardino, Santa Clara, Santa Cruz, San Luis Obispo, Solano, Stanislaus, Tulare, and Yolo Counties. It blooms from March to May.	seeps, valley and foothill grassland, and vernal pools) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Sagittaria sanfordii</i>	Sanford's arrowhead	none/none/CNPS list 1B.2	This perennial species occurs in shallow, standing, fresh water, and slow-moving waterways (e.g., marshes, ponds, vernal pools, lakes, reservoirs, sloughs, ditches, unlined canals, streams, and rivers) at elevations below 2,000 feet. It blooms from late May to August.	<b>Known to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., marshes, ponds, vernal pools, lakes, reservoirs, sloughs, ditches, unlined canals, streams, and rivers) does occur within the WRMP area. Furthermore, the species is known from the lowermost pond within Bear Creek Reservoir. Therefore, the species is known to occur at one WRMP project site and is considered to have some potential to occur within other WRMP project sites.
<i>Sidalcea keckii</i>	Keck's checkerbloom	FE/none/CNPS list 1B.1	This species is an annual that occurs on clay and serpentinite in valley and foothill grassland and cismontane woodland. It blooms from April to June and has been recorded in Colusa,	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., clay soils in

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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			Fresno, Merced, Napa, Solano, Tulare, and Yolo Counties.	valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Tuctoria greenei</i>	Greene's tuctoria	FE/CR/CNPS list 1B.1	This grass occurs in the dry bottoms of vernal pools in valley and foothill grassland. It is known to occur in Butte, Glenn, Merced, Shasta, and Tehama Counties. Historically, it also occurred in Fresno, Madera, Stanislaus, San Joaquin, and Tulare Counties. It flowers from May through July.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools in valley and foothill grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<b>INVERTEBRATES</b>				
<i>Branchinecta conservatio</i>	Conservancy fairy shrimp	FE/none/none	Occurs in very large turbid vernal pools and playa pools underlain by clay substrates such as the Mehrten Formation. There are relatively few occurrences of this species, but it is known from Tehama, Glenn, Solano, Stanislaus, and Merced Counties.	<b>No Potential.</b> No individuals of this species were observed within or near the project site. Though, suitable habitat (i.e., large playa pools) does occur within the WRMP area no projects would be constructed in or adjacent to such features. Therefore, the species is considered to have no potential to be adversely affected at WRMP project sites.

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Branchinecta longiantenna</i>	longhorn fairy shrimp	FE/none/none	This species has been found in clear water vernal pools in sandstone outcrops as well as clear to turbid clay- and grass-bottomed vernal pools. It is distributed along the eastern interface of the central Coast Ranges with the San Joaquin Valley (from Contra Costa and Alameda Counties south to San Luis Obispo County), but also occurs on the valley floor in Merced National Wildlife Refuge.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and similar seasonal wetlands) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Branchinecta lynchii</i>	vernal pool fairy shrimp	FT/none/none	Occurs primarily in vernal pools (sandstone depression, grass swale, earth slump, or basalt-flow depression pools) in grassland and oak savannah of the Central Valley. However, the species also occurs at a few locations in the central Coast Ranges from Monterey County south to Santa Barbara County and in the South Coast Mountains in Riverside County.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and similar seasonal wetlands) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Branchinecta mesovallensis</i>	midvalley fairy shrimp	none/SA/none	This species occurs in small vernal pools and intermound pools within valley and foothill grassland (i.e., the smallest and most ephemeral vernal pools). It has been recorded from the central portion of the Central Valley from Sacramento and Solano Counties south to Madera and Fresno Counties.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and similar seasonal wetlands) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Lepidurus packardi</i>	vernal pool tadpole shrimp	FE/none/none	Inhabits clear to turbid vernal pools and swales, stock ponds, and other seasonal wetlands in the Sacramento Valley and northern San Joaquin Valley (from Shasta County south to Merced and Tulare Counties). It has also been recorded in three pools at the San Francisco Bay National Wildlife Refuge in Alameda County.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and similar seasonal wetlands) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Linderiella occidentalis</i>	California fairy shrimp	none/SA/none	Occurs primarily in vernal pools and other seasonal wetlands in grassland and oak savannah of the Central Valley. However, the species has also been recorded at scattered locations in	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			the Coast Ranges from Mendocino County south to Ventura County.	and similar seasonal wetlands) does occur within the WRMP area. Therefore, the species has some potential to occur within or adjacent to WRMP project sites.
<i>Desmocerus californicus dimorphus</i>	valley elderberry longhorn beetle	FT/none/none	The subspecies occurs at scattered locations in the Central Valley and adjacent foothills of the Sierra Nevada and Coast Ranges. The subspecies is entirely dependent upon its host plant (elderberry spp.), typically in riparian vegetation associations, but occasionally in single, isolated shrubs or stands of the plant.	<b>Potential to Occur.</b> No individuals of this subspecies were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., valley elderberry shrubs) does occur within the WRMP area and near a small number of the surveyed WRMP project sites. Given the number of known CNDDDB occurrences in the WRMP area and number of projects in or adjacent to riparian habitat that may contain elderberry shrubs, it is considered to have potential to occur within some WRMP project sites.
<i>Lytta molesta</i>	Molestan blister beetle	none/SA/none	Occurs primarily in vernal pools and other seasonal wetlands in valley and foothill grassland and oak savannah of the Central Valley (April to July). However, the species has also been recorded at scattered locations in the	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., vernal pools and other seasonal wetlands in valley and foothill grassland) does occur within the

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WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			Coast Ranges from Mendocino County south to Ventura County.	WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<i>Bombus crotchii</i>	Crotch bumble bee	none/SCE/none	This species occurs from coastal California east to the Sierra Nevada-Cascade crest. It occurs at relatively warm and dry sites in open grassland and scrub habitats. Colonies are annual, and only the new, mated queens overwinter. Nests are often located underground in abandoned rodent nests, or aboveground in tufts of grass, old bird nests, rock piles, or cavities in dead trees.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., warm and dry sites in open grassland) does occur within the WRMP area. Therefore, the species has some potential to occur within WRMP project sites.
<b>FISHES</b>				
<i>Entosphenus hubbsi</i>	Kern brook lamprey	none/CSC/none	This species is found on the east side of the San Joaquin Valley, in the lower portions of the Merced, Kaweah, Kings, and San Joaquin Rivers. It inhabits silty backwaters of rivers and spawns in gravel riffles. Both the larval and adult stages of this species were originally collected from the	<b>Potential to Occur.</b> No individuals of this species were observed within or near the project site. Furthermore, the only known occurrence is associated with the lower Merced River (below the Crocker-Huffman diversion dam). The potential for this species to be adversely affected at WRMP project sites would therefore only occur if

**TABLE A-1**

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			Friant-Kern Canal, which is 85 percent concrete lined.	currently unforeseen projects are developed in the river downstream of Crocker-Huffman diversion dam.
<i>Lampetra tridentata</i>	Pacific lamprey	none/CSC/none	Pacific lamprey have diverse life histories that are dependent on many variables; adult spawning migration typically occurs between early March and late June; they require cold, clear water for spawning and incubation; spawning is typically in low-gradient riffles.	<b>Potential to Occur.</b> No individuals of this species were observed within or near the project site. Furthermore, the small number of known CNDDDB occurrences are all associated with the lower Merced River (below the Crocker-Huffman diversion dam). The potential for this species to be adversely affected at WRMP project sites would therefore only occur if currently unforeseen projects are developed in the river downstream of Crocker-Huffman diversion dam.
<i>Pogonichthys macrolepidotus</i>	Sacramento splittail	none/CSC/none	This species is endemic to the Central Valley, but is now largely confined to the Delta, Suisun Bay, and Suisun Marsh as well as the lower parts of Sonoma Creek, Petaluma River, and Napa River. The species uses floodplain habitat for feeding and depends upon floodplain habitat for spawning.	<b>Potential to Occur.</b> No individuals of this species were observed within or near the project site. Furthermore, the small number of known CNDDDB occurrences are all associated with the lower Merced River (below the Crocker-Huffman diversion dam). The potential for this species to be adversely affected at WRMP project sites would therefore only occur if currently unforeseen projects are developed in the

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
				river downstream of Crocker-Huffman diversion dam.
<i>Mylopharodon conocephalus</i>	hardhead	none/CSC/none	This species' distribution is limited to the Sacramento-San Joaquin River system and Russian River system. It inhabits deep, rocky and sandy pools of small to large rivers where spawning substrate includes sand, gravel, and decomposed granite. Spawning occurs as early as May and June in the valley, but extends to August in the foothill regions of the upper San Joaquin River.	<b>Potential to Occur.</b> No individuals of this species were observed within or near the project site. Furthermore, the small number of known CNDDDB occurrences are all associated with the lower Merced River (below the Crocker-Huffman diversion dam). The potential for this species to be adversely affected at WRMP project sites would therefore only occur if currently unforeseen projects are developed in the river downstream of Crocker-Huffman diversion dam.
<i>Oncorhynchus tshawytscha</i>	Chinook salmon Central Valley fall and late-fall run evolutionary significant unit	none/CSC/none	This evolutionary significant unit includes all naturally spawned fall-run Chinook salmon in the San Joaquin and Sacramento Basins, east of Carquinez Strait. Fall-run juveniles spend 3 to 6 months rearing in freshwater, while late-fall run individuals spend about one year, before migrating to the sea in the spring. Fall-run individuals return to freshwater in September–October,	<b>Potential to Occur.</b> No individuals of this species were observed within or near the project site. Furthermore, the small number of known CNDDDB occurrences are all associated with the lower Merced River (below the Crocker-Huffman diversion dam). The potential for this species to be adversely affected at WRMP project sites would therefore only occur if currently unforeseen projects are developed in the

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			and late-fall run individuals in December or January.	river downstream of Crocker-Huffman diversion dam.
<i>Oncorhynchus mykiss irideus</i>	Steelhead - Central Valley distinct population segment	FT/none/none	This distinct population segment of steelhead includes all naturally spawned populations of steelhead (and their progeny) in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco Bay and San Pablo Bays and their tributaries. In California, peak spawning occurs from December through April in small streams and tributaries with cool, well-oxygenated water. Fry usually emerge from the gravel 4 to 6 weeks after hatching, but factors such as redd depth, gravel size, siltation, and temperature can speed or retard this time. The newly-emerged fry move to the shallow, protected areas associated with the stream margin (mainly in riffles), but they can use a variety of other habitat types.	<b>Potential to Occur.</b> No individuals of this species were observed within or near the project site. Furthermore, the small number of known CNDDDB occurrences are all associated with the lower Merced River (below the Crocker-Huffman diversion dam). The potential for this species to be adversely affected at WRMP project sites would therefore only occur if currently unforeseen projects are developed in the river downstream of Crocker-Huffman diversion dam.

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<b>AMPHIBIANS</b>				
<i>Ambystoma californiense</i>	California tiger salamander	FT/ST/none	Found in annual grassland, oak savannah, and coastal sage scrub adjacent to vernal pools, stock ponds, and ponded reaches of ephemeral streams (aquatic breeding sites). The species is distributed in the Central Valley from Glenn County to Kings County, but also occurs in Sonoma County and Alameda and Contra Costa Counties south through the interior valleys of the Coast Ranges.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., annual grassland with seasonal wetlands) does occur within the WRMP area and near a small number of the surveyed WRMP project sites. Furthermore, the species is known to travel long distances and may on occasion pass through agricultural lands (e.g., orchards). Given the number of known CNDDDB occurrences in the WRMP area (70+) and distribution throughout the WRMP area, it is considered to have potential to occur within some WRMP project sites.
<i>Hydromantes brunus</i>	limestone salamander	none/CFP/none	The species is endemic to California, being found along the Merced River from Lake McClure to about 4 miles northeast of Briceburg, Mariposa County. It also occurs along the Merced River tributaries including	<b>No Potential.</b> No individuals of this species were observed within or near the project site. No suitable habitat for the species (i.e., limestone crevices and talus in cismontane woodland and chaparral, typically on steep slopes) occurs within the

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			Bear Creek and its feeder creeks, south of Briceburg. It inhabits mossy limestone crevices and talus in cismontane woodland and chaparral, typically on steep slopes. It has also been found in abandoned mine tunnels.	WRMP area, and no known occurrences have been documented within the WRMP area. Therefore, the species is considered to have no potential to be adversely affected at WRMP project sites.
<i>Spea hammondi</i>	western spadefoot	none/CSC/none	Found in dry habitats (e.g., annual grassland, oak savannah and woodland, and coastal sage scrub) adjacent to vernal pools, stock ponds, and overflow channels of low-gradient drainages within the Central Valley and coastal California from Monterey County to San Diego County.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., annual grassland with seasonal wetlands) does occur within the WRMP area and near a small number of the surveyed WRMP project sites. Given the number of known CNDDB occurrences in the WRMP area (25) and distribution within the WRMP area it is considered to have potential to occur within WRMP project sites.
<i>Rana boylei</i>	foothill yellow-legged frog	none/CSE/none	The species was historically distributed throughout the foothill portions of the Sierra Nevada and Coast Ranges drainages from the Oregon border to the San Gabriel River (Los Angeles County). The species requires shallow,	<b>No Potential.</b> No individuals of this species were observed within or near the project site. Though suitable habitat for the species (i.e., small to moderate streams, typically with some cobble-sized substrate and riffle habitat) occurs within the WRMP

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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			small to moderate streams (typically with some cobble-sized substrate and riffle habitat).	area, no known occurrences have been documented within the WRMP area. Therefore, the species is considered to have no potential to occur within WRMP project sites.
<i>Lithobates pipiens</i>	northern leopard frog	none/CSC/none	This species is native to northern California, but has also been introduced in California (and throughout the west) in the past 100 years, partly due to escapees from the widespread use of the species for study and dissection. Historic populations in California existed at scattered locations below 6,500 feet in Siskiyou and Modoc Counties, in the northern Owens Valley, and possibly near Lake Tahoe. Individuals of unknown origin were introduced into El Dorado, Kern, Los Angeles, Merced, San Francisco, Sierra, Tehama, and Tulare Counties between 1905 and 1970. Several of these introduced populations experienced rapid growth and range expansions before completely disappearing. Except for a small population present in Merced County (near Dan McNamara Road Canal), all	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, known occurrences within the WRMP area are limited to near the Dan McNamara Road Canal. Therefore, the species has some potential to occur within WRMP project sites, but only those sites near the Dan McNamara Road Canal.

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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			of these introduced populations have apparently perished. It inhabits grassland, wet meadows, forests, woodland, brushlands, springs, canals, bogs, marshes, and reservoirs. It generally prefers permanent water with abundant aquatic vegetation.	
<b>REPTILES</b>				
<i>Anniella pulchra</i>	northern California legless lizard	none/CSC/none	This species occurs as a fossorial species in sand, sandy loam, or leaf-mold substrates in the San Joaquin Valley and coastal California from Contra Costa County south to San Diego County. It can be found in a variety of habitats that include coastal beach, chaparral, pine-oak woodland, and riparian habitats. Soil moisture is essential. It appears to be active mostly during the morning and evening, just beneath the surface of sunlight-warmed substrate. It may also be active on the surface at night when substrate temperatures remain warm for extended intervals. It should be noted that recent mitochondrial and	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, known CNDDB occurrences within the WRMP area are limited to the westernmost portions of the area. Therefore, the species has some potential to occur within WRMP project sites, but likely only in suitable sites west of Atwater.

**TABLE A-1**

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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			nuclear DNA work has resulted in the species being split into five distinct species with the local species ( <i>A. pulchra</i> ) occurring only along the coast and in the Coastal Ranges as far south as northwestern Ventura County.	
<i>Emys marmorata</i>	western pond turtle	none/CSC/none	The species historically occurred throughout most of the Pacific-slope drainages in California (below approximately 4,000 feet). The species now occurs at scattered locations throughout its former range (primarily in the central Sierra Nevada foothills, Central Valley, San Francisco Bay area, and north-central coast and Coast Ranges). It occurs in and adjacent to ponds, reservoirs, or other slow-moving perennial aquatic habitats (e.g., sloughs, streams, and rivers).	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, known CNDDB occurrences are scattered within the WRMP area (typically in natural drainages). However, the species cannot be discounted from occurring in canals. Therefore, the species has some potential to occur within or near WRMP project sites.
<i>Gambelia sila</i>	blunt-nosed leopard lizard	FE/SE/none	This species is found in the San Joaquin Valley from Merced County south to Ventura County. The species also occurs in the dry interior valleys adjacent to the southern San Joaquin Valley (i.e., Carrizo Plain and Cuyama	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, an occurrence is known from the far southwestern portion of the WRMP area

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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			Valley). It occurs in open, sparsely vegetated areas of low relief (typically in native or non-native grassland or alkali sink scrub).	(south of Merced National Wildlife Refuge). Therefore, the species has some potential to occur within WRMP project sites, but only south of Sandy Mush Road.
<i>Phrynosoma blainvillii</i>	coast horned lizard	none/CSC/none	Found at scattered locations throughout coastal California from the San Francisco Bay area to Ventura and northern Los Angeles Counties. Also occurs along the Sierra Nevada foothills in the Sacramento Valley and throughout the San Joaquin Valley. Requires open natural vegetation communities for basking, loose soils for burial, and ants as a prey base.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, an occurrence is known from the far western portion of the WRMP area (southwest of Atwater). Therefore, the species has potential to occur within WRMP project sites, but only in areas of suitable habitat south of State Route 140 and State Route 59.
<i>Thamnophis gigas</i>	giant garter snake	FT/ST/none	Found in low-gradient streams, marshes, and adjacent ricelands where there is abundant vegetative cover. Furthermore, the habitat is supported by perennial fresh water. The species is limited to the floor of the Central Valley where it occurs in fragmented populations.	<b>No Potential.</b> No individuals of this species were observed within or near the project site. Though suitable habitat for the species (i.e., low-gradient streams, marshes, and canals) occurs within the WRMP area, there is only a single known occurrence has been documented within the WRMP area. This occurrence is considered to be extirpated. Furthermore, the next nearest extant occurrence is more than 18 miles

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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				away outside the WRMP. Therefore, the species is considered to have no potential to occur within WRMP project sites.
<b>BIRDS</b>				
<i>Ardea alba</i>	great egret (nesting)	none/SA/none	This species is fairly common throughout most of California where there are shallow estuaries, or freshwater or saltwater emergent wetlands. However, it is less common above the foothills in the mountains and in desert regions. Rookeries are typically active from March to as late as July and occur in the tops of secluded large snags or live trees. Rookeries are sometime shared with great blue heron or other large wading birds.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable nesting habitat (i.e., secluded large snags or live trees) does occur within the WRMP area. Furthermore, a mixed colony of great egrets and great blue herons formerly occurred within the WRMP area and may still persist. Therefore, the species has some potential to nest within or near WRMP project sites.
<i>Ardea herodias</i>	great blue heron (nesting)	none/SA/none	This species is fairly common throughout most of California where there are shallow estuaries, or freshwater or saltwater emergent wetlands. However, it is less common along riverine and rocky coastal shores	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable nesting habitat (i.e., secluded large snags or live trees) does

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

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			and above the foothills in the mountains. Rookeries are typically active from February to as late as July and occur in the tops of secluded large snags or live trees. Rookeries are sometime shared with great egret or other large wading birds.	occur within the WRMP area. Furthermore, a mixed colony of great egrets and great blue herons formerly occurred within the WRMP area and may still persist. Therefore, the species has some potential to nest within or near WRMP project sites.
<i>Buteo swainsoni</i>	Swainson's hawk (nesting)	none/ST/none	Occurs in California as a breeding resident in the Central Valley (primarily in the southern Sacramento and northern San Joaquin Valleys), Klamath Basin, and Modoc Plateau. However, nesting pairs are also occasionally found in the Mojave Desert, Lanfair Valley (San Bernardino County), Antelope Valley (Los Angeles County), and eastern San Luis Obispo County. In the Central Valley, the species typically nests in riparian woodland or forest stands, or oak savannah. Nest territories are located adjacent to suitable foraging habitat (e.g., grassland, suitable grain and row crop fields, alfalfa, and pastures).	<b>Potential to Occur.</b> Multiple individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area (particularly near and south of State Route 99). However, nesting was not confirmed (but assumed) given the number of individuals, their distribution, and time of year (i.e., end of nesting season). Given the number of known CNDDB occurrences and distribution in the WRMP area (39), it is considered to have potential to nest within or near WRMP project sites with suitable nesting and hunting habitat.

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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Buteo regalis</i>	ferruginous hawk (wintering)	none/none/BCC	The species is a winter resident of the Modoc Plateau, Central Valley, and Coast Ranges. It forages in large, open tracts of grasslands, sparse scrubland, and deserts.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., large, open tracts of grasslands, sparse scrubland, and even fallow agricultural land) does occur within the WRMP area and near a small number of the surveyed WRMP project sites. Given the large number of known eBird occurrences and distribution in the WRMP area, it is considered to have potential to occur within or near some WRMP project sites.
<i>Circus hudsonius</i>	northern harrier (nesting)	none/CSC/none	The species is found as a resident and wintering species throughout the lower elevation portions of California in annual grasslands, oak savannah, and valley and coastal marshes. Nesting in the Central Valley typically occurs in emergent wetlands; tall, dense grasslands; or grain fields.	<b>Moderate Potential.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., large, open tracts of grasslands and oak savannah) does occur within the WRMP area and near a small number of the surveyed WRMP project sites. Furthermore, the species is typically under-documented as a nesting species in the CNDDDB. Given the large

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
				number of known eBird occurrences (during the nesting season) and distribution in the WRMP area it is considered to have potential to nest within or near WRMP project sites.
<i>Elanus leucurus</i>	white-tailed kite (nesting)	none/CFP/none	Found as a resident species throughout the lower elevation portions of California in low rolling grasslands with scattered oaks and river bottomlands or marshes adjacent to deciduous woodland. Requires grasslands, meadows, or marshes (for foraging) located near dense-topped trees (for nesting and roosting).	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, known eBird occurrences are scattered within the WRMP area (i.e., during the nesting season). Therefore, the species cannot be discounted from nesting at or near some WRMP project sites.
<i>Haliaeetus leucocephalus</i>	bald eagle	none/SE/BCC	The species winters throughout much of California at lakes, reservoirs, rivers, and some rangelands and coastal wetlands. Nesting occurs mainly in mountain and foothill forests and woodlands near reservoirs, lakes, and rivers. Most current nest territories are in northern California, but the species also nests in scattered locations in the central and southern Sierra Nevada mountains and foothills, in several	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, known eBird occurrences are scattered within the WRMP area (i.e., during the both the nesting and wintering seasons). Therefore, the species cannot be discounted from occurring at or near some WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			locations in the central Coast Ranges, inland southern California, and on Santa Catalina Island. In most of California, the nesting season lasts from January through July or August.	
<i>Falco columbarius</i>	merlin (wintering)	none/SA/none	This species winters in California from September to May. It occurs in a variety of low elevation, relative flat habitats that include wooded areas, coastlines, open grasslands, savannah, and the periphery of lakes. It is less often found in open desert. It typically requires dense stands of trees for cover and roosting. It is most often found where there are substantial populations of small birds (the primary prey item).	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (relative flat habitats that include wooded areas, open grasslands, savannah, and even fallow agricultural lands) and known eBird occurrences are scattered within the WRMP area. Therefore, the species cannot be discounted from occurring at or near some WRMP project sites (i.e., during the wintering season).

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Pandion haliaetus</i>	osprey	none/CSC/none	The species nests in northern California from the Cascade Ranges south through the Sierra Nevada, and along the coast south to Marin County. Nesting occurs from March to September with nests being sited at the top of large snags or dead-topped trees, on cliffs, or on constructed structures (e.g., telephone or power poles).	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, eBird occurrences are scattered within the WRMP area (during the nesting and wintering seasons – typically at water features). Therefore, the species cannot be discounted from occurring at or near some WRMP project sites.
<i>Charadrius montanus</i>	mountain plover (wintering)	FPT/CSC/BCC	The species occurs in California only as a wintering species where it is found on low, sparse grasslands or disced agricultural fields that are remote from urban development or disturbances. Mountain plovers are most frequently reported from two areas: (1) in the San Joaquin Valley south of Sacramento and west of State Route 99; and (2) in the Imperial Valley.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, known eBird occurrences are scattered within the WRMP area (primarily along and near Sandy Mush Road). Therefore, the species cannot be discounted from occurring at or near some WRMP project sites (particularly south of State Route 99).

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Athene cunicularia</i>	burrowing owl (burrow sites)	none/CSC/none	The species is found throughout the Central Valley, in the San Francisco Bay Area, at scattered locations along the coast, and in portions of the desert regions. It is a year-round resident in annual and perennial grasslands or other vegetation communities that support sparse or non-existent tree or shrub canopies.	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., annual grassland or other vegetation communities that support sparse or non-existent tree or shrub canopies) does occur within the WRMP area and near a small number of the surveyed WRMP project sites. Furthermore, the species can often occur very close to human habitation or operations. Given the large number of known eBird occurrences (during all seasons) and distribution in the WRMP area, it is considered to have potential to occur within or near WRMP project sites.
<i>Eremophila alpestris actia</i>	California horned lark (nesting)	none/SA/none	The taxon nests in the San Joaquin Valley, adjacent Sierra Nevada foothills, and coastal California from Sonoma County south to San Diego County. Preferred nesting habitat for the taxon is generally provided by level or gently rolling low, sparse grassland; mountain meadows; open coastal	<b>Potential to Occur.</b> No individuals of this taxon were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, known eBird occurrences are scattered within the WRMP area (primarily in the larger tracts of valley and foothill grasslands). Therefore, the taxon cannot be

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			plains; fallow grain fields, bald hills; and alkali flats.	discounted from occurring at or near some WRMP project sites.
<i>Vireo bellii pusillus</i>	least Bell's vireo (nesting)	FE/SE/none	Found as a summer resident (late March to late August) in coastal valleys from Monterey County south through coastal southern California to San Diego County. Also occurs at scattered locations along the western border of the deserts. There have been recent records from the Sacramento Valley given its recovery in southern California. It typically nests in dense willow riparian communities, but is also occasionally found in live oak stands adjacent to drainages.	<b>No Potential.</b> There is suitable nesting habitat for this subspecies (i.e., dense willow riparian scrub) within or immediately adjacent to some project sites in the WRMP area. However, the subspecies had been extirpated from the Central Valley and only recently has been found sporadically again in the valley (i.e., one nesting record from Merced National Wildlife Refuge in 2012). Therefore, the subspecies has no potential to occur within the project site.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Icteria virens</i>	yellow-breasted chat (nesting)	none/CSC/none	This species is found as a summer resident mostly in low to mid-elevation coastal, valley, foothill, and desert riparian habitats (up to 4,800 feet in foothill riparian and 6,500 feet east of the Sierra Nevada). Nesting typically occurs in dense vegetation adjacent to streams.	<b>No Potential.</b> There are small patches of suitable nesting habitat for this species (i.e., dense willow riparian scrub) within or immediately adjacent to some project sites in the WRMP area. However, the size of the existing stands is likely not large enough to support nesting by the species. Furthermore, there are no eBird records for the WRMP area that suggest nesting. Therefore, the species is considered to have no potential to nest within or near WRMP project sites.
<i>Lanius ludovicianus</i>	loggerhead shrike (nesting)	none/CSC/none	Found as a resident and wintering species throughout the lower elevation portions of California in grasslands, saltbush scrub, chaparral, oak savannah, and other open woodland types (generally where there are trees with dense cover for nesting).	<b>Potential to Occur.</b> No individuals of this species were observed during the reconnaissance-level surveys of specific project sites within the WRMP area. However, suitable habitat (i.e., annual grassland or other open vegetation communities with adjacent dense tree or shrub canopies) does occur within the WRMP area and near a small number of the surveyed WRMP project sites. Furthermore, the species can often occur close to human habitation or operations. Given the number of known eBird

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
				occurrences (during the nesting season) and distribution in the WRMP area, it is considered to have potential to occur within or near WRMP project sites.
<i>Agelaius tricolor</i>	tricolored blackbird (nesting colony)	none/CSE/none	Found as a resident species in annual grassland, oak savannah, and fresh water marsh within the Central Valley and coastal California from Sonoma to San Diego County. Nesting typically occurs in emergent freshwater marsh, but also occurs in dense stands of willow, blackberry, thistle, nettles, or grasses. Grasslands or rangeland providing abundant food (e.g., butterfly larvae or grasshoppers) often are within at least 3 miles of colonies.	<b>Potential to Occur.</b> Marginally suitable nesting habitat for this species occurs within the WRMP area (mostly in winter wheat fields). Furthermore, post-breeding flocks of the species have been recorded in mid-summer in the area during past years. Therefore, the species is considered to have some potential to nest within or near WRMP project sites.
<b>MAMMALS</b>				
<i>Perognathus inornatus inornatus</i>	San Joaquin pocket mouse	none/SA/none	This taxon typically occurs on fine-textured sandy soils on ridge tops and hillsides supporting grasslands or blue oak savannah. The species <i>P. inornatus</i> is distributed within the Central Valley from Yolo and Sutter	<b>Potential to Occur.</b> There is little suitable habitat for the subspecies within the WRMP area (i.e., fine-textured sandy soils on ridge tops and hillsides supporting grasslands or blue oak savannah). However, known occurrences from the area

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**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
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WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			Counties to the southernmost portions of the San Joaquin Valley and within and near the dry interior valleys of the Coast Range (e.g., Salinas and Cuyama Valleys, and Carrizo Plain).	have been documented north and northeast of Lake Yosemite and near the intersection of State Route 140 and Cunningham Road (east of Planada). Therefore, the subspecies is considered to have some potential to occur within or near some WRMP project sites.
<i>Dipodomys nitratoides exilis</i>	Fresno kangaroo rat	FE/SA/none	The known historical range of the subspecies encompassed grassland and chenopod scrub on the San Joaquin Valley floor from about the Merced River, Merced County, on the north, to the northern edge of the marshes surrounding Tulare Lake, Kings County, on the south, and extending from the edge of the valley floor near Livingston, Madera, Fresno, and Selma, westward to the wetlands of Fresno Slough and the San Joaquin River. Suitable habitat for the subspecies is described as sands and saline-sandy soils in chenopod scrub or annual grassland on the valley floor. The topography is typically nearly level, consists of bare alkaline clay-based soils subject to seasonal inundation, and is broken by slightly	<b>No Potential.</b> There is suitable habitat for the subspecies (i.e., sands and saline-sandy soils in chenopod scrub or annual grassland) within or immediately adjacent to some project sites in the WRMP area. However, the subspecies appears to be extirpated from its historic range given no documented occurrences since 1992. Therefore, the subspecies is considered to have no potential to occur within or near any WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
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<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
			<p>elevated mounds of more crumbly soils that accumulate around shrubs or grasses. There are currently no known populations of the subspecies within its historical geographic range. A single male was captured twice during fall 1992 on the Alkali Sink Ecological Reserve west of Fresno. Trapping at the reserve in 1993, 1994, and 1995 did not yield additional captures. Individuals were previously trapped on the Alkali Sink Ecological Reserve in 1981 and 1985, and on adjacent privately-owned land in 1981. Trapping at other sites in Merced, Madera, and Fresno Counties since 1988 have failed to locate other, extant populations within the area typically considered as the geographic range of the subspecies.</p>	
<i>Dipodomys heermanni dixonii</i>	Merced kangaroo rat	none/SA/none	The taxon occurs in valley and foothill grassland and oak savannah (typically on sandy soils in areas denuded of vegetation) in eastern Merced County, southeastern Stanislaus County, and southwestern Mariposa County.	<b>Potential to Occur.</b> There is little suitable habitat for the subspecies within the WRMP area (i.e., deep, well-drained, sandy soils supporting grassland or blue oak savannah). However, known occurrences from the area have been documented north of Lake Yosemite to the areas north and

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
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<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
				east of Snelling). Therefore, the subspecies is considered to have some potential to occur within or near some WRMP project sites.
<i>Vulpes macrotis mutica</i>	San Joaquin kit fox	FE/ST/none	The taxon is found in the San Joaquin Valley from Contra Costa County south to Kern County. It is also found in the dry interior valleys of the Coast Ranges (e.g., Salinas and Santa Clara Valleys). It occurs in open, sparsely vegetated areas of low relief (typically in native or non-native grassland or alkali sink scrub).	<b>Potential to Occur.</b> There is suitable denning habitat for the subspecies within the WRMP area (mostly along canals and unplowed field edges). However, the subspecies is known mostly as an occasional vagrant to the WRMP area. Therefore, the subspecies is considered to have some potential to occur within or near WRMP project sites.
<i>Taxidea taxus</i>	American badger	none/CSC/none	This species is found as a resident species at scattered localities throughout California (except in the coastal redwood region). Generally occurs in extensive, open habitats in the vicinity of abundant rodent populations.	<b>Potential to Occur.</b> There is suitable habitat for the species within the WRMP area (i.e., extensive dry open habitat). However, known occurrences from the area have been limited to south of Merced to the valley floor areas south of Stevinson. Therefore, the species is considered to have some potential to occur within or near some WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Antrozous pallidus</i>	pallid bat	none/CSC/none	The species is found as a resident in all desert, grassland, shrub, woodland, and forest habitats from sea level to approximately 6,000 feet. Day roosts are typically found in buildings, bridges, rocky outcrops, mines, caves, and trees. Night roosts are generally provided by bridges, mines, and caves.	<b>Potential to Occur.</b> No roosts for the species have been recorded within the WRMP area. Furthermore, suitable day or night roosts (even suitable buildings) do not occur at or adjacent to any of the WRMP project sites. However, there are multiple CNDDDB records for the WRMP area (particularly near the Merced River). Therefore, the species cannot be discounted from occurring at or near some WRMP project sites.
<i>Corynorhinus townsendii</i>	Townsend's big-eared bat	none/CSC/none	This species is distributed throughout much of California in a wide variety of habitats from sea level to the high mountains. It appears to be constrained mainly by availability of suitable roost sites and degree of human disturbance at roosts. Roosting habitat is limited to caves, mines, tunnels, and other features that mimic caves, such as large tree hollows, abandoned buildings with cave-like attics, water diversion tunnels, and internal spaces in bridges.	<b>Potential to Occur.</b> No roosts for the species have been recorded within the WRMP area. Furthermore, suitable day or night roosts (even suitable buildings) do not occur at or adjacent to any of the WRMP project sites. However, there is a single CNDDDB record for the WRMP area (near the Merced Falls diversion dam). Given that the species is likely under-represented in the CNDDDB, the species cannot be discounted from occurring at or near some WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Eumops perotis californicus</i>	western mastiff bat	none/CSC/none	The taxon is found as an uncommon resident in southern California, but also occurs along the lower west slope of the Sierra Nevada and in the interior Coast Ranges as far north as the Tumey Hills (eastern San Benito County). Roosts are typically found in crevices in cliff faces, cracks in boulders, or occasionally in buildings (particularly where the roost allows for a large vertical drop).	<b>Potential to Occur.</b> No roosts for the species have been recorded within the WRMP area. Furthermore, suitable day or night roosts (even suitable buildings) do not occur at or adjacent to any of the WRMP project sites. However, there are multiple CNDDDB records for the WRMP area (particularly near the Merced River). Therefore, the species cannot be discounted from occurring at or near some WRMP project sites.
<i>Lasiurus blossevillii</i>	western red bat	none/CSC/none	The species occurs at scattered locations throughout the lowland portions of California west of the Sierra Nevada crest and desert regions (typically in riparian forest or orchards). It is less abundant at low and middle elevations in coniferous forest. Roosting sites are found in tree or shrub foliage between 2 and 40 feet above ground (typically in large cottonwoods, sycamores, walnuts, and willows).	<b>Potential to Occur.</b> No roosts for the species have been recorded within the WRMP area. However, suitable day or night roosts (trees or shrubs with dense foliage) do occur at or adjacent to some of the WRMP project sites. There are also multiple CNDDDB records for the WRMP area (particularly near the Merced River). Therefore, the species cannot be discounted from occurring at or near some WRMP project sites.

**TABLE A-1**

**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

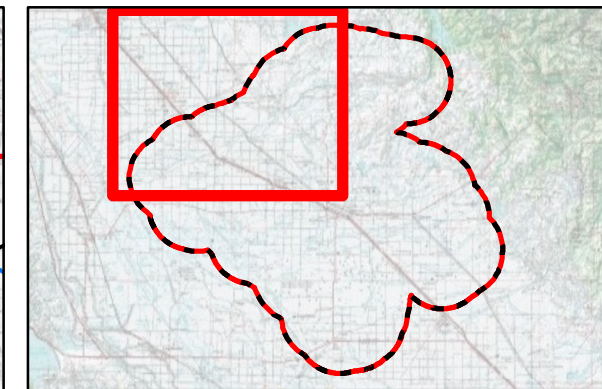
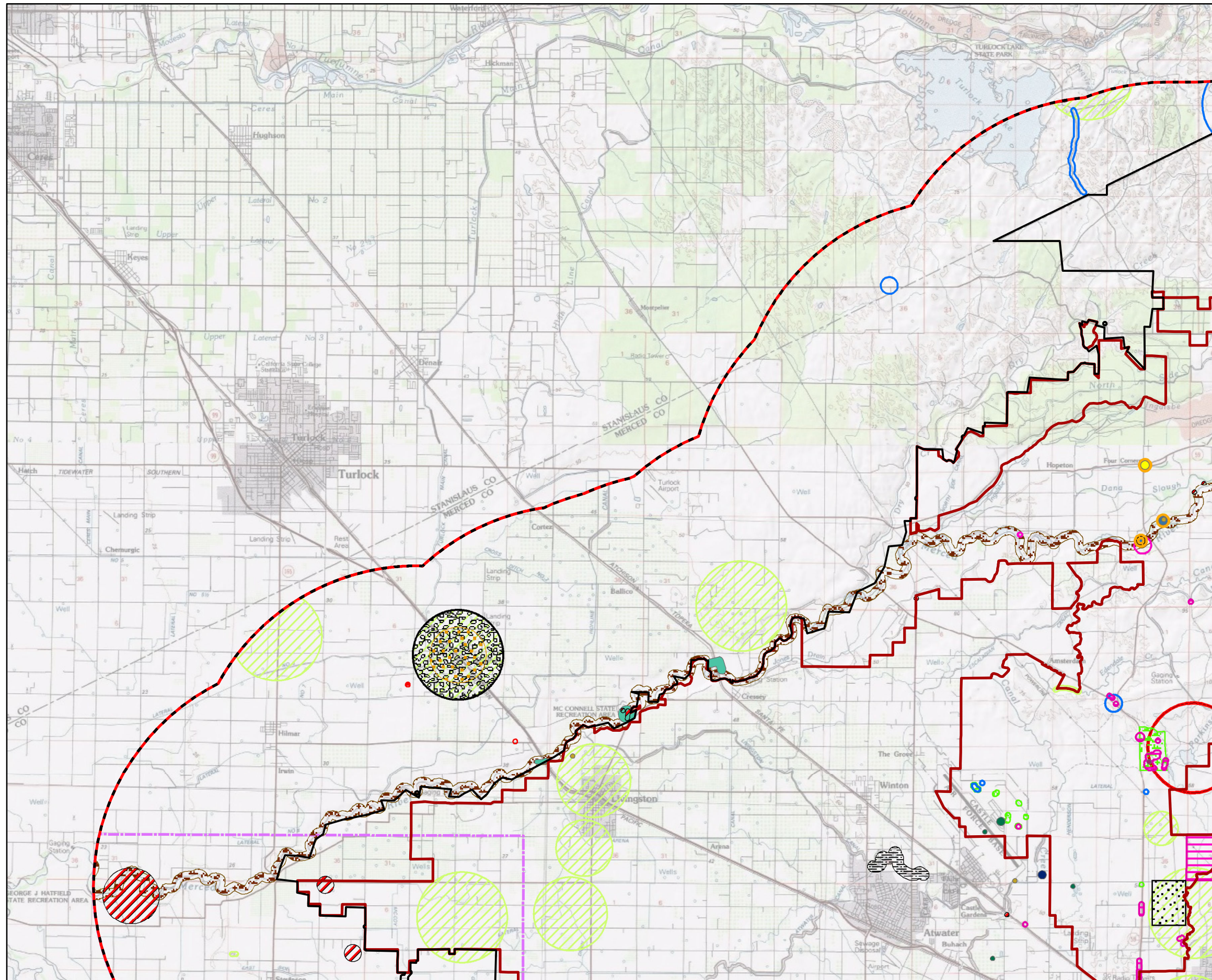
<b>Genus/Species</b>	<b>Common Name</b>	<b>Status Federal/CA/Other</b>	<b>Habitats and Seasonal Distribution in California</b>	<b>Likelihood of Occurrence within Project Site</b>
<i>Lasiurus cinereus</i>	hoary bat	none/SA/none	The species occurs in a wide variety of habitats throughout California from sea level to the high mountains. It is typically found in small numbers roosting in the dense foliage of medium to large trees near water in forest or woodland habitats.	<b>Potential to Occur.</b> No roosts for the species have been recorded within the WRMP area. However, suitable day or night roosts (trees or shrubs with dense foliage) do occur at or adjacent to some of the WRMP project sites. There are also three CNDDDB records for the WRMP area (all from near the Merced River). Therefore, the species cannot be discounted from occurring at or near some WRMP project sites and is considered to have a potential to occur within or near some WRMP project sites.
<i>Myotis yumanensis</i>	Yuma myotis	none/SA/none	Found in a variety of habitats with nearby sources of water over which the species forages. Day roosts are found in caves, mines, buildings, or crevices. Night roosts are typically associated with bridges, buildings, and other constructed structures.	<b>Potential to Occur.</b> A single roost for the species has been recorded within the WRMP area (Highway 99 bridge over Dutchman Creek). Furthermore, there are additional CNDDDB records for the WRMP area (particularly near the Merced River). Therefore, the species cannot be discounted from occurring at or near some WRMP project sites.

**TABLE A-1**

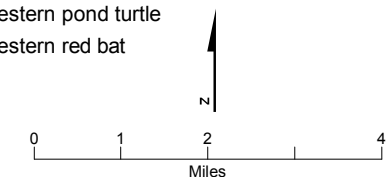
**SPECIAL-STATUS SPECIES RECORDED OR POTENTIALLY OCCURRING  
WITHIN THE VICINITY OF CURRENTLY IDENTIFIED MERCED IRRIGATION DISTRICT  
WATER RESOURCE MANAGEMENT PLAN PROJECTS**

Genus/Species	Common Name	Status Federal/CA/Other	Habitats and Seasonal Distribution in California	Likelihood of Occurrence within Project Site
NOTES:				
CNDDDB = California Natural Diversity Database				
WRMP = Water Resources Management Plan				
FEDERAL				
	FE	Federally listed as Endangered		
	FT	Federally listed as Threatened		
	FPE	Federally proposed as Endangered		
	FPT	Federally proposed as Threatened		
	FC	Federal Candidate Species (former Category 1 candidates)		
	BCC	U.S. Fish and Wildlife Service designated “Birds of Conservation Concern” 2008		
STATE				
	SE	State listed as Endangered		
	ST	State listed as Threatened		
	SCE	State candidate for listing as Endangered		
	SR	State listed as Rare		
	CFP	California Department of Fish and Wildlife designated “Fully Protected”		
	CSC	California Department of Fish and Wildlife designated “Species of Special Concern”		
	SA	California Department of Fish and Wildlife designated “Special Animal”		
OTHER				
	CNPS List 1A	Plants presumed extinct in California		
	CNPS List 1B	Plants that are rare, threatened, or endangered in California and elsewhere		
	CNPS List 2	Plants that are rare, threatened, or endangered in California, but are more common elsewhere		
	CNPS List 3	Plants about which we need more information – a review list		
	CNPS List 4	Plants of limited distribution – a watch list		
	CBR	Plants formerly considered, but now rejected for inclusion in the CNPS Inventory		
	CNPS Threat Rank 0.1	Seriously threatened in California (high degree/immediacy of threat)		
	CNPS Threat Rank 0.2	Fairly threatened in California (moderate degree/immediacy of threat)		
	CNPS Threat Rank 0.3	Not very threatened in California (low degree/immediacy of threats or no current threats known)		

**APPENDIX B**  
**MERCED IRRIGATION DISTRICT**  
**WATER RESOURCES MANAGEMENT PLAN**  
**STUDY AREA**  
**CNDDDB/RAREFIND FIGURES**



- Program Area\*
- MID Service Area
- Study Area
- CNDDDB (Animals)**
- California linderella
- California tiger salamander
- Merced kangaroo rat
- San Joaquin kit fox
- Swainson's hawk
- Yuma myotis
- burrowing owl
- ferruginous hawk
- hardhead
- hoary bat
- least Bell's vireo
- longhorn fairy shrimp
- midvalley fairy shrimp
- molestan blister beetle
- mountain plover
- northern California legless lizard
- pallid bat
- steelhead - Central Valley DPS
- tricolored blackbird
- valley elderberry longhorn beetle
- vernal pool fairy shrimp
- vernal pool tadpole shrimp
- western mastiff bat
- western pond turtle
- western red bat

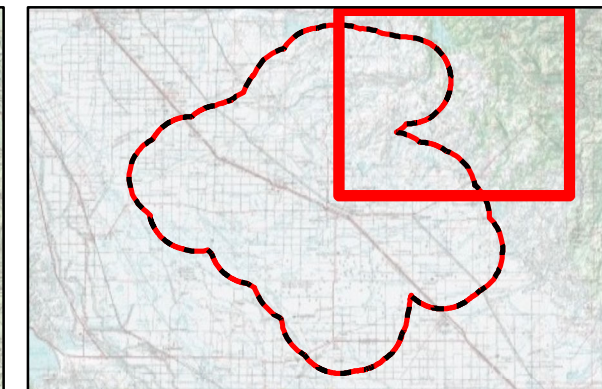
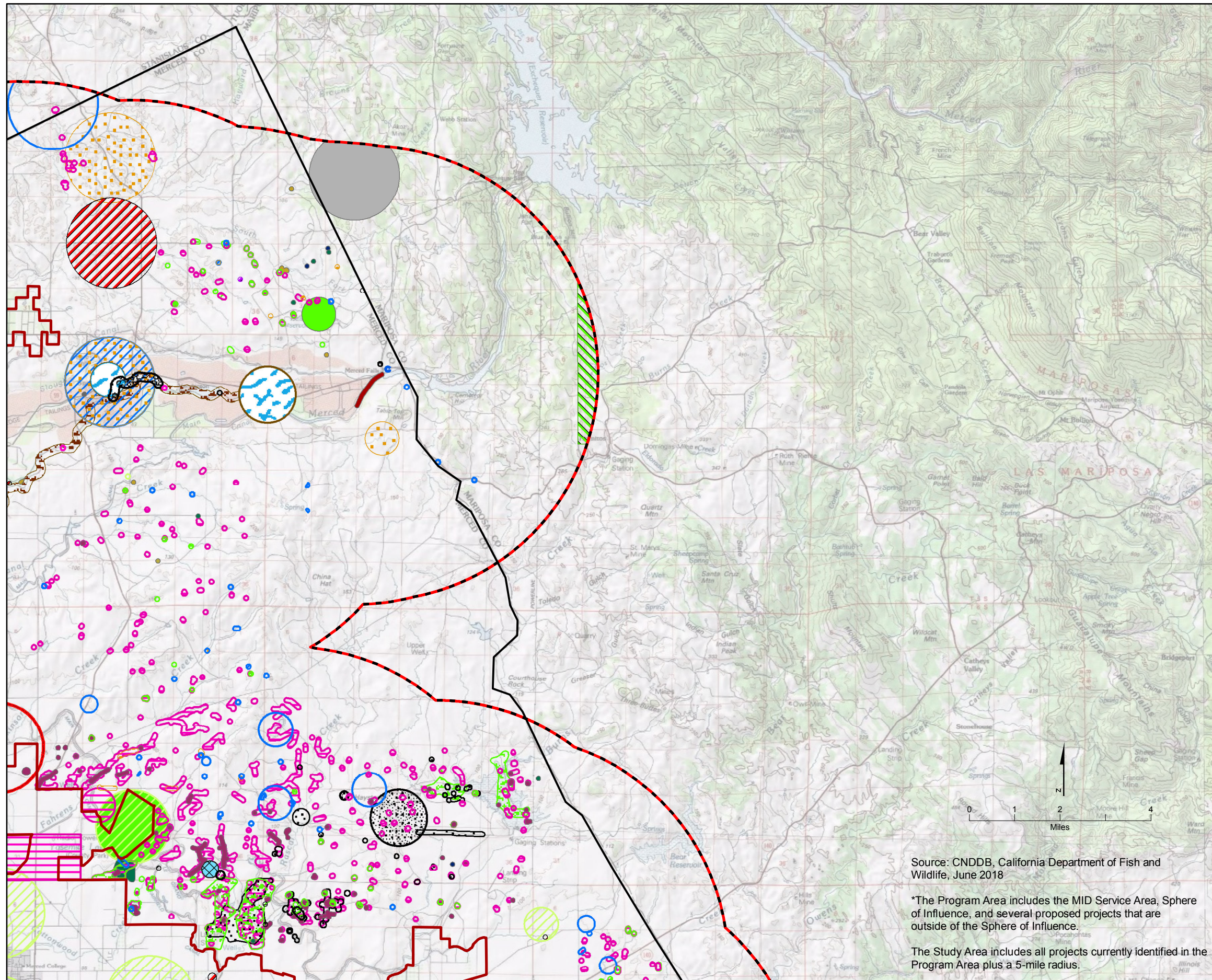


Source: CNDDDB, California Department of Fish and Wildlife, June 2018

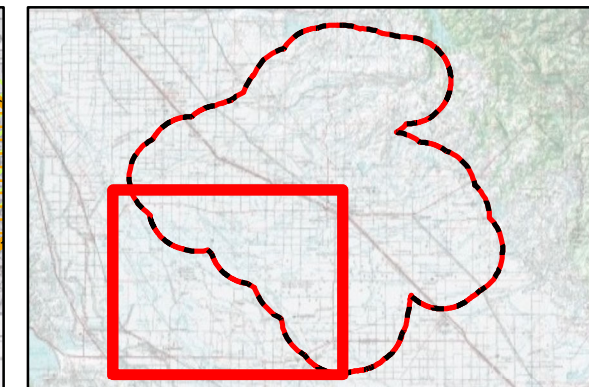
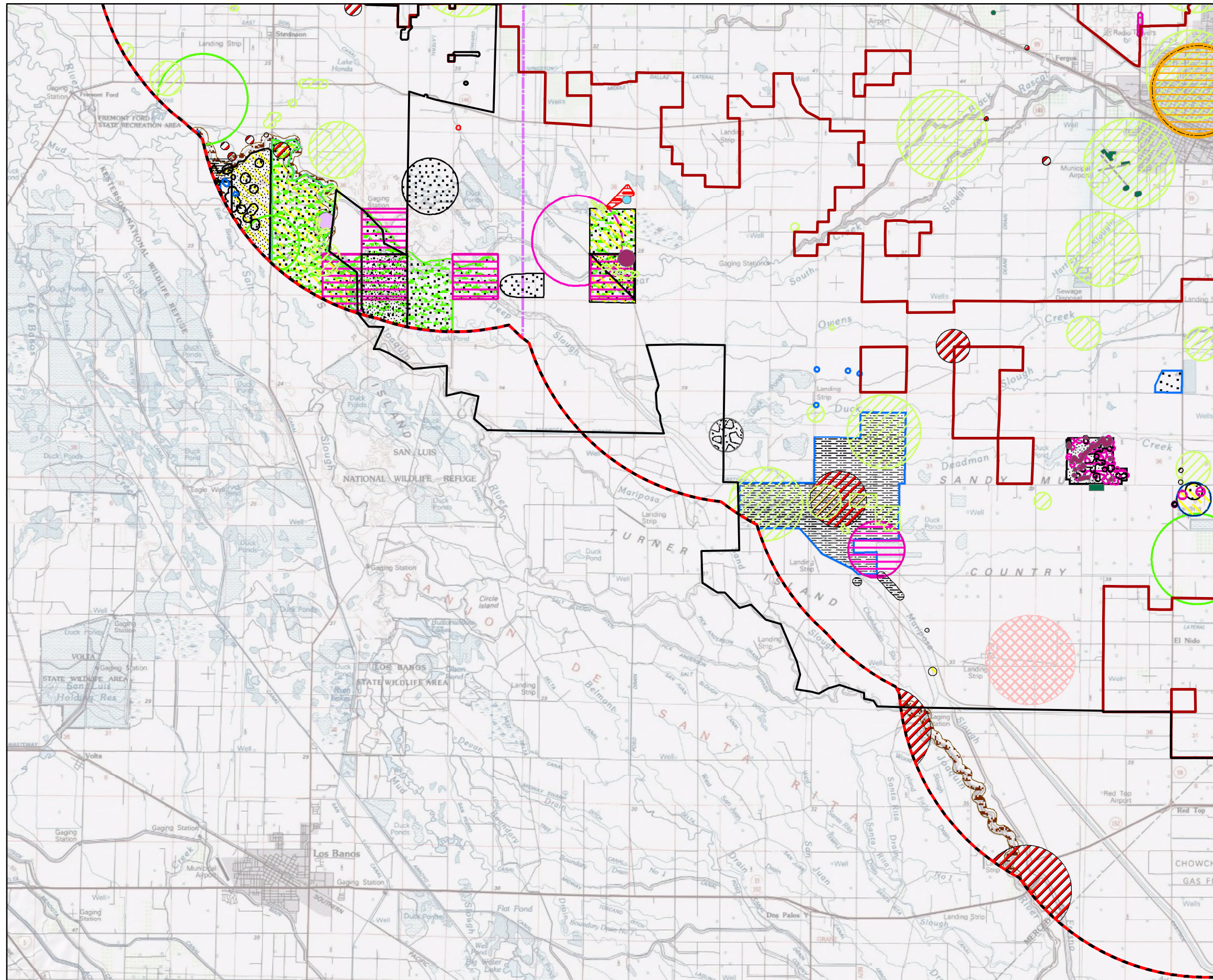
\*The Program Area includes the MID Service Area, Sphere of Influence, and several proposed projects that are outside of the Sphere of Influence.

The Study Area includes all projects currently identified in the Program Area plus a 5-mile radius.

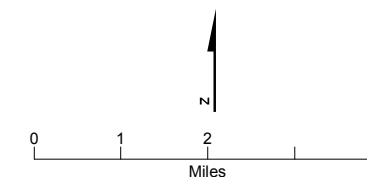
**Appendix B-1**  
 CNDDDB (Animals) - Sheet 1 of 4  
 Merced Irrigation District  
 Merced County, California



- Program Area\*
- MID Service Area
- Study Area
- CNDDDB (Animals)**
- California linderella
- California tiger salamander
- Conservancy fairy shrimp
- Crotch bumble bee
- Kern brook lamprey
- Merced kangaroo rat
- San Joaquin Pocket Mouse
- San Joaquin kit fox
- Swainson's hawk
- Townsend's big-eared bat
- bald eagle
- burrowing owl
- ferruginous hawk
- hardhead
- hoary bat
- least Bell's vireo
- limestone salamander
- merlin
- midvalley fairy shrimp
- molestan blister beetle
- mountain plover
- northern harrier
- osprey
- pallid bat
- steelhead - Central Valley DPS
- tricolored blackbird
- vernal pool fairy shrimp
- vernal pool tadpole shrimp
- western pond turtle
- western red bat
- western spadefoot
- yellow-breasted chat



- Program Area\*
- MID Service Area
- Study Area
- CNDDDB (Animals)**
- American badger
- California linderella
- California tiger salamander
- Conservancy fairy shrimp
- San Joaquin kit fox
- Swainson's hawk
- blunt-nosed leopard lizard
- burrowing owl
- coast horned lizard
- giant gartersnake
- great blue heron
- great egret
- hardhead
- longhorn fairy shrimp
- midvalley fairy shrimp
- northern California legless lizard
- northern leopard frog
- steelhead - Central Valley DPS
- tricolored blackbird
- vernal pool fairy shrimp
- vernal pool tadpole shrimp
- western mastiff bat
- western spadefoot

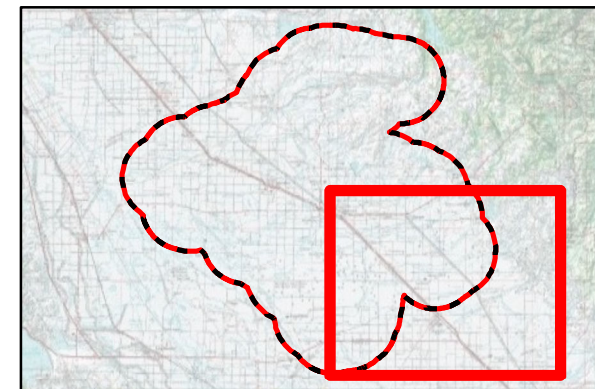
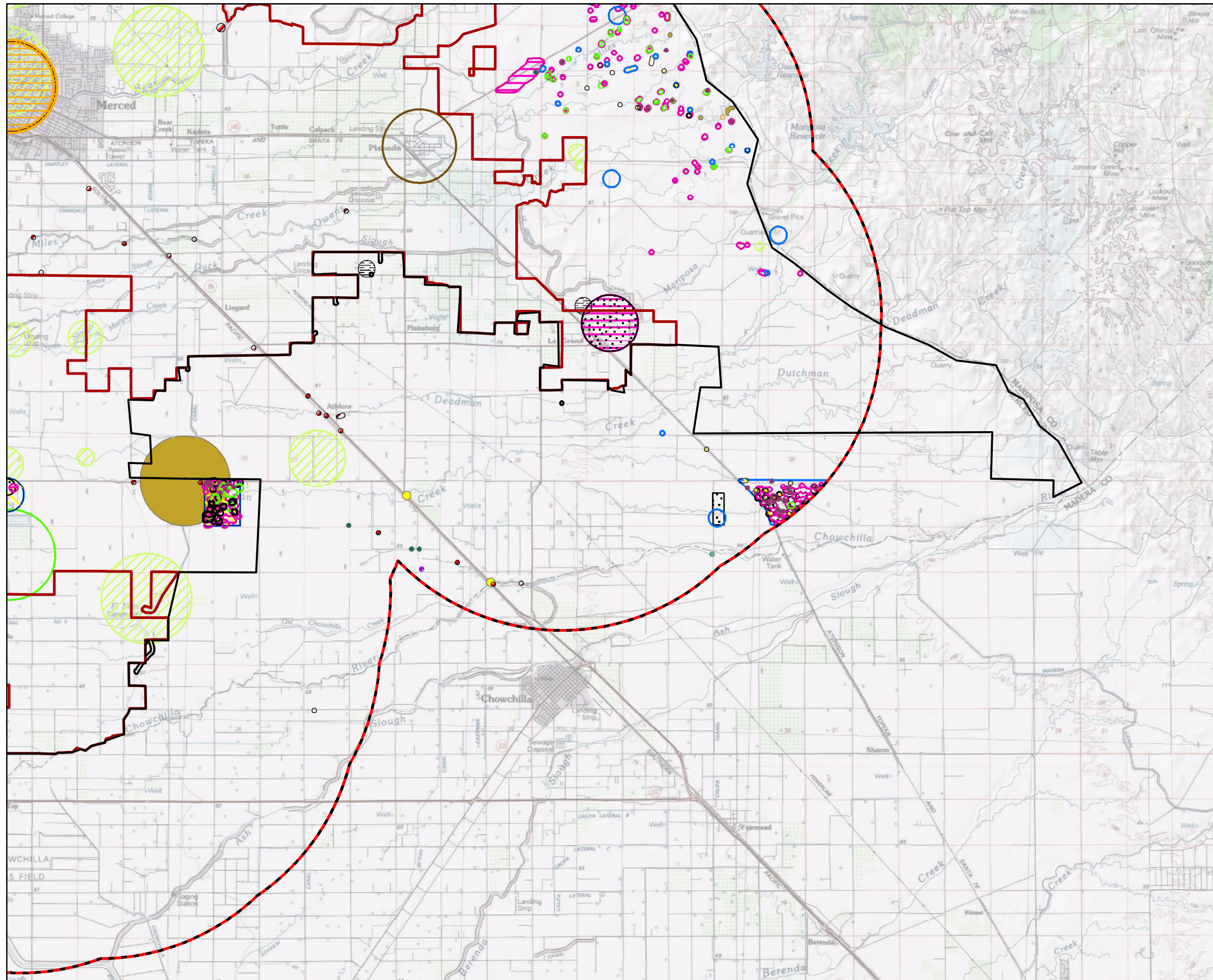


Source: CNDDDB, California Department of Fish and Wildlife, June 2018

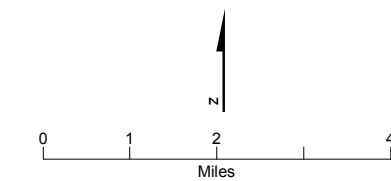
\*The Program Area includes the MID Service Area, Sphere of Influence, and several proposed projects that are outside of the Sphere of Influence.

The Study Area includes all projects currently identified in the Program Area plus a 5-mile radius.

**Appendix B-1**  
**CNDDDB (Animals) - Sheet 3 of 4**  
**Merced Irrigation District**  
**Merced County, California**



- Program Area\*
- MID Service Area
- Study Area
- CNDDDB (Animals)**
- American badger
- California linderella
- California tiger salamander
- Conservancy fairy shrimp
- Merced kangaroo rat
- San Joaquin Pocket Mouse
- San Joaquin kit fox
- Swainson's hawk
- Yuma myotis
- burrowing owl
- giant gartersnake
- hoary bat
- merlin
- midvalley fairy shrimp
- northern harrier
- tricolored blackbird
- valley elderberry longhorn beetle
- vernal pool fairy shrimp
- vernal pool tadpole shrimp
- western mastiff bat
- western pond turtle
- western spadefoot

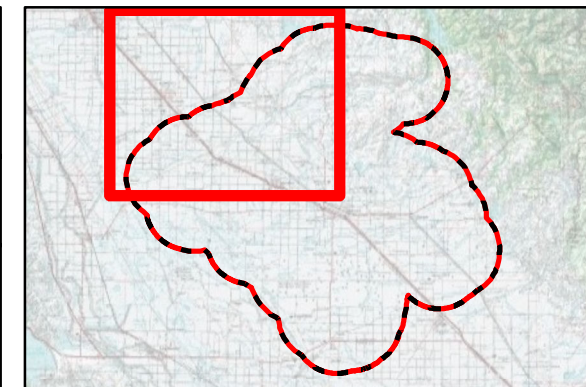
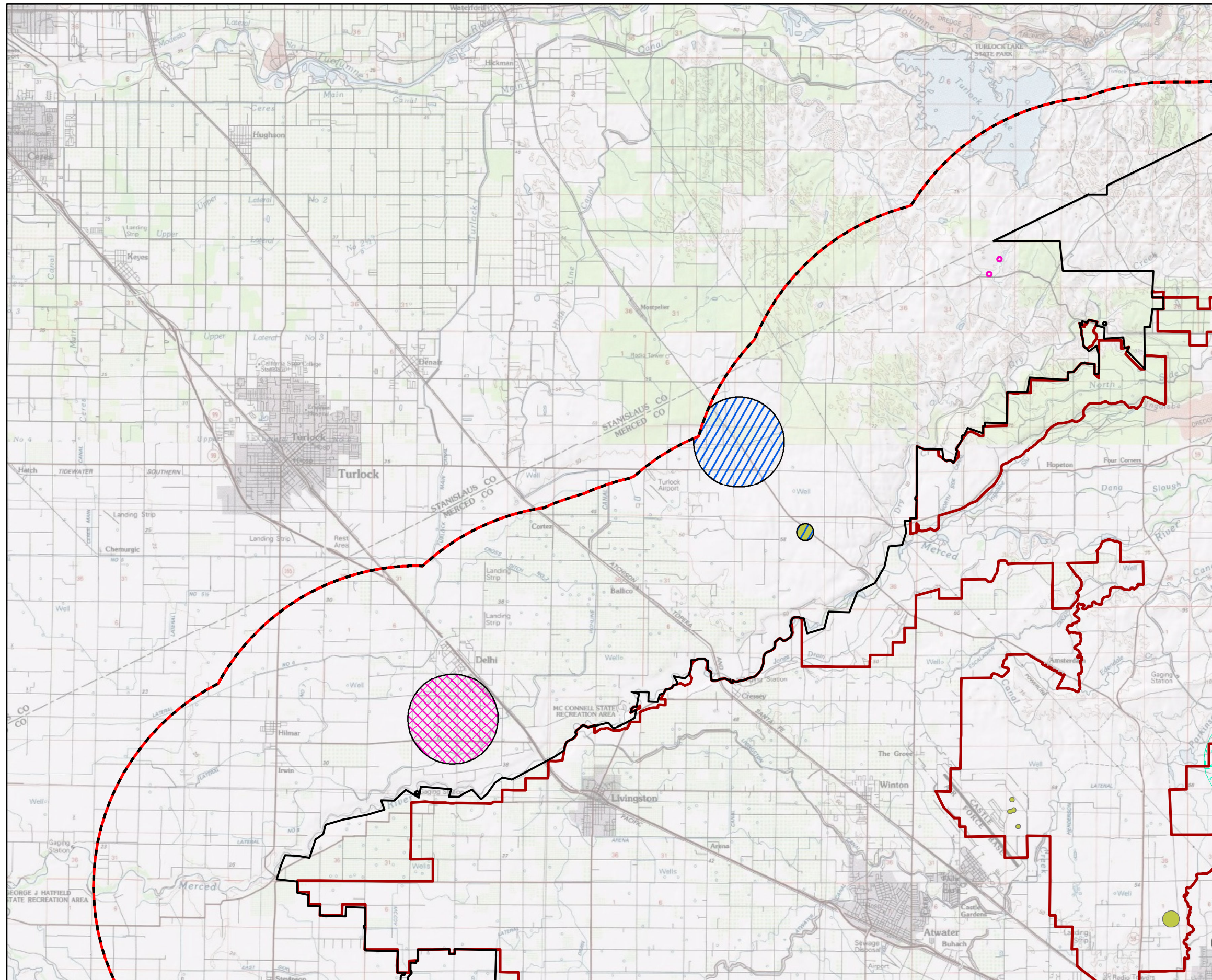


Source: CNDDDB, California Department of Fish and Wildlife, June 2018

\*The Program Area includes the MID Service Area, Sphere of Influence, and several proposed projects that are outside of the Sphere of Influence.

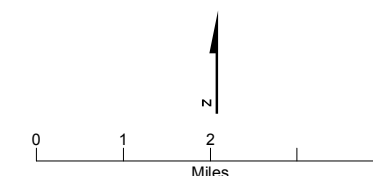
The Study Area includes all projects currently identified in the Program Area plus a 5-mile radius.

**Appendix B-1**  
 CNDDDB (Animals) - Sheet 4 of 4  
 Merced Irrigation District  
 Merced County, California



#### LEGEND

- Program Area\*
- MID Service Area
- Study Area
- CNDDDB (Plants)**
  - Colusa grass
  - Henderson's bent grass
  - Merced monardella
  - San Joaquin Valley Orcutt grass
  - Sanford's arrowhead
  - hairy Orcutt grass
  - succulent owl's-clover

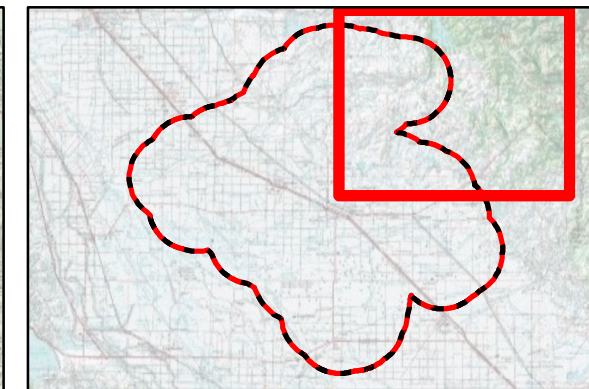
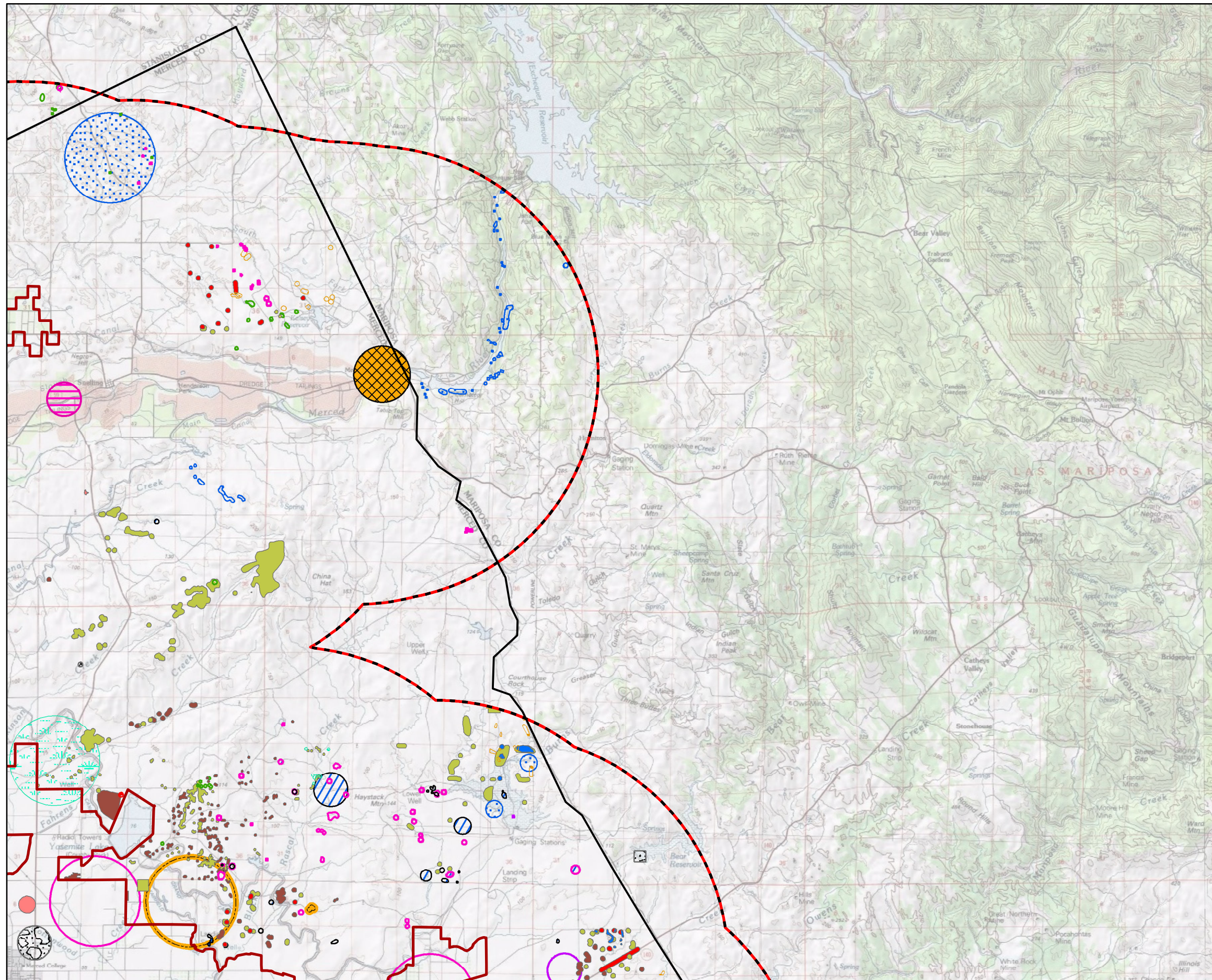


Source: CNDDDB, California Department of Fish and Wildlife, June 2018

\*The Program Area includes the MID Service Area, Sphere of Influence, and several proposed projects that are outside of the Sphere of Influence.

The Study Area includes all projects currently identified in the Program Area plus a 5-mile radius.

**Appendix B-2**  
 CNDDDB (Plants) - Sheet 1 of 4  
 Merced Irrigation District  
 Merced County, California

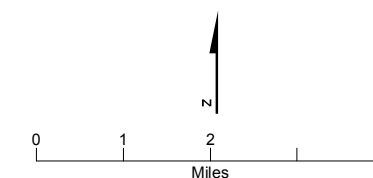


#### LEGEND

- Program Area\*
- MID Service Area
- Study Area

#### CNDDDB (Plants)

- Boggs Lake hedge-hyssop
- Colusa grass
- Greene's tuctoria
- Hartweg's golden sunburst
- Henderson's bent grass
- Hoover's calycadenia
- Keck's checkerbloom
- Merced phacelia
- Peruvian dodder
- San Joaquin Valley Orcutt grass
- Sanford's arrowhead
- beaked clarkia
- dwarf downingia
- eel-grass pondweed
- hairy Orcutt grass
- pincushion navaretia
- shining navaretia
- spiny-sepaled button-celery
- succulent owl's-clover

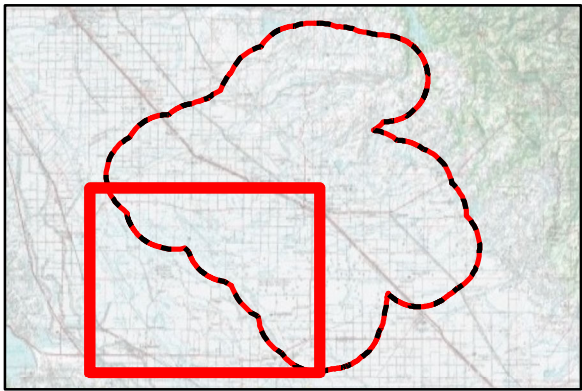
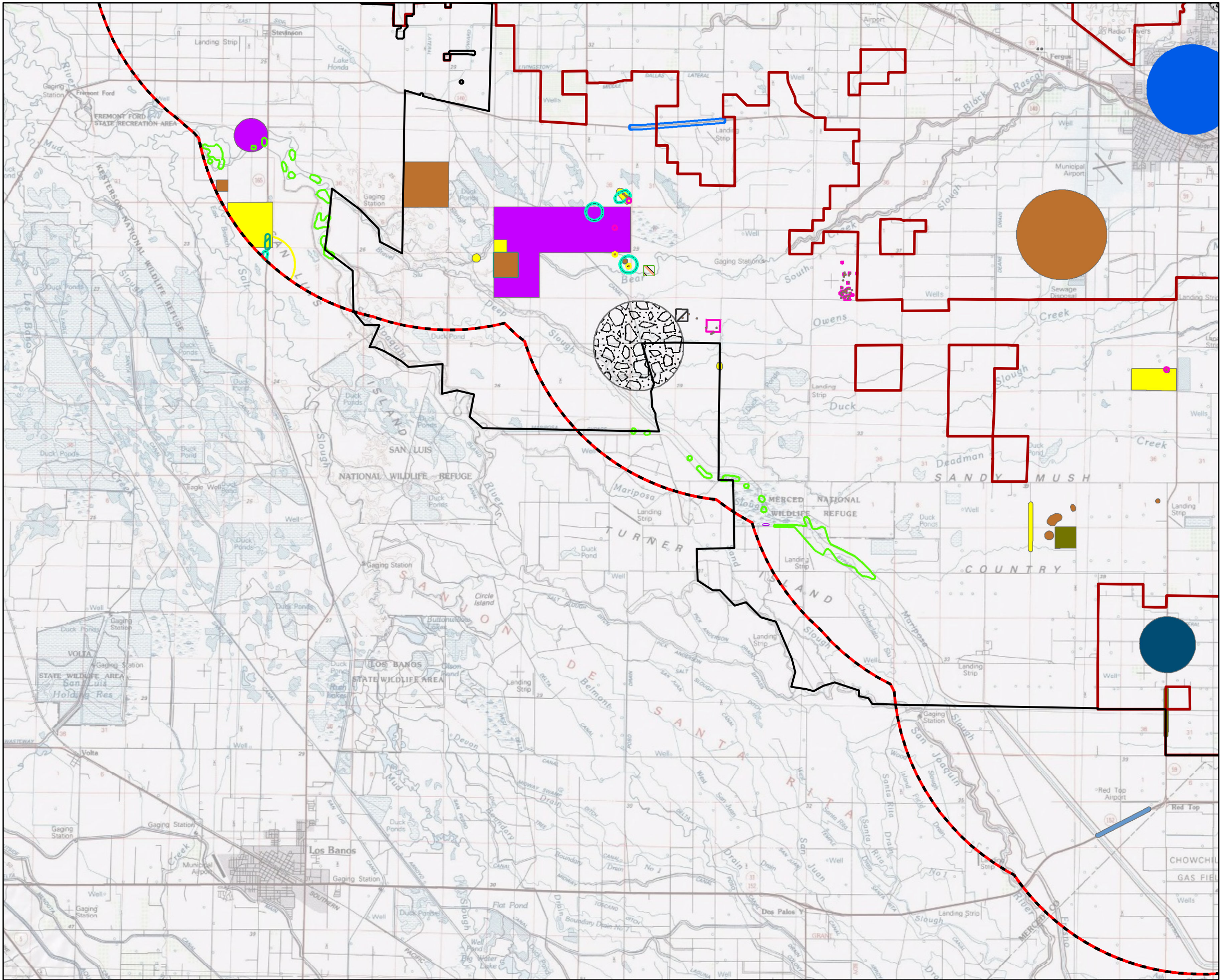


Source: CNDDDB, California Department of Fish and Wildlife, June 2018

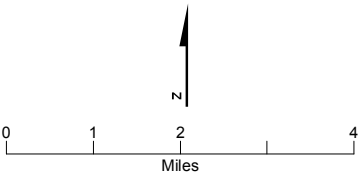
\*The Program Area includes the MID Service Area, Sphere of Influence, and several proposed projects that are outside of the Sphere of Influence.

The Study Area includes all projects currently identified in the Program Area plus a 5-mile radius.

**Appendix B-2**  
CNDDDB (Plants) - Sheet 2 of 4  
*Merced Irrigation District*  
Merced County, California



- LEGEND**
- Program Area\*
  - MID Service Area
  - Study Area
- CNDDDB (Plants)**
- California alkali grass
  - Colusa grass
  - Coulter's goldfields
  - Delta button-celery
  - Heckard's pepper-grass
  - Hoover's spurge
  - San Joaquin spearscale
  - Sanford's arrowhead
  - Wright's trichocoronis
  - alkali milk-vetch
  - brittlescale
  - forked hare-leaf
  - heartscale
  - lesser saltscale
  - prostrate vernal pool navarretia
  - recurved larkspur
  - subtle orache
  - vernal pool smallscale

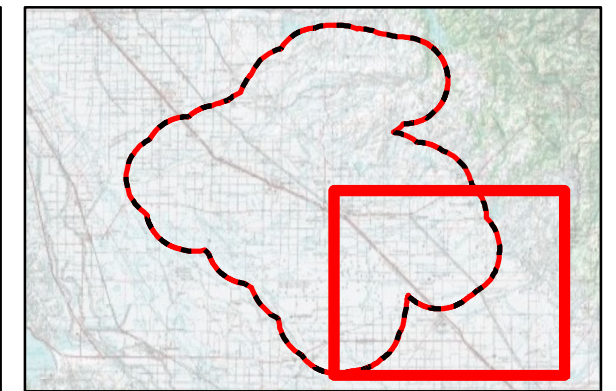
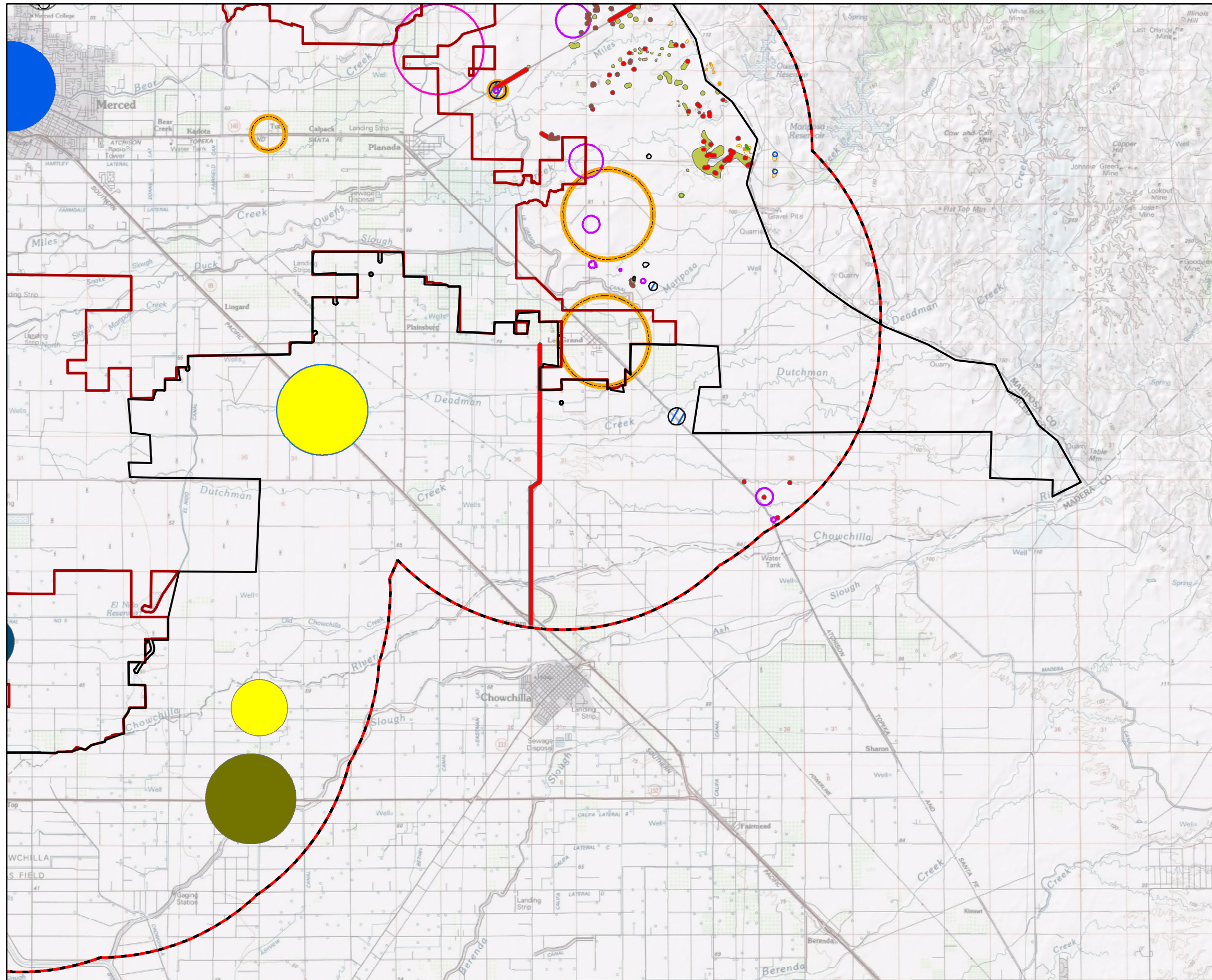


Source: CNDDDB, California Department of Fish and Wildlife, June 2018

\*The Program Area includes the MID Service Area, Sphere of Influence, and several proposed projects that are outside of the Sphere of Influence.

The Study Area includes all projects currently identified in the Program Area plus a 5-mile radius.

**Appendix B-2**  
CNDDDB (Plants) - Sheet 3 of 4  
Merced Irrigation District  
Merced County, California

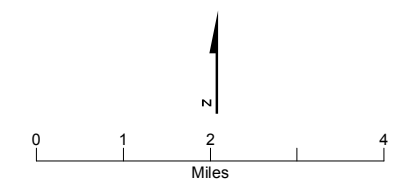


#### LEGEND

- Program Area\*
- MID Service Area
- Study Area

#### CNDDDB (Plants)

- California alkali grass
- Colusa grass
- Greene's tuctoria
- Hoover's calycadenia
- Hoover's cryptantha
- Merced phacelia
- San Joaquin Valley Orcutt grass
- Sanford's arrowhead
- beaked clarkia
- dwarf downingia
- forked hare-leaf
- heartscale
- lesser saltspur
- recurved larkspur
- shining navarretia
- spiny-sealed button-celery
- subtle orache
- succulent owl's-clover



Source: CNDDDB, California Department of Fish and Wildlife, June 2018

\*The Program Area includes the MID Service Area, Sphere of Influence, and several proposed projects that are outside of the Sphere of Influence.

The Study Area includes all projects currently identified in the Program Area plus a 5-mile radius.

**Appendix B-2**  
 CNDDDB (Plants) - Sheet 4 of 4  
 Merced Irrigation District  
 Merced County, California

**APPENDIX C**  
**USFWS OFFICIAL SPECIES LIST, NMFS SPECIES LIST**



## United States Department of the Interior

### FISH AND WILDLIFE SERVICE

Sacramento Fish And Wildlife Office

Federal Building

2800 Cottage Way, Room W-2605

Sacramento, CA 95825-1846

Phone: (916) 414-6600 Fax: (916) 414-6713



In Reply Refer To:

July 19, 2019

Consultation Code: 08ESMF00-2018-SLI-0141

Event Code: 08ESMF00-2019-E-08101

Project Name: Merced Irrigation District Program EIR

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

#### To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

[http://www.nwr.noaa.gov/protected\\_species/species\\_list/species\\_lists.html](http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html)

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan ([http://www.fws.gov/windenergy/eagle\\_guidance.html](http://www.fws.gov/windenergy/eagle_guidance.html)). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

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Attachment(s):

- Official Species List

## Official Species List

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

This species list is provided by:

**Sacramento Fish And Wildlife Office**

Federal Building

2800 Cottage Way, Room W-2605

Sacramento, CA 95825-1846

(916) 414-6600

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## Project Summary

Consultation Code: 08ESMF00-2018-SLI-0141

Event Code: 08ESMF00-2019-E-08101

Project Name: Merced Irrigation District Program EIR

Project Type: WATER SUPPLY / DELIVERY

Project Description: Short-term and long-term water supply and conveyance improvements within the Merced Irrigation District service area.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/37.343239405783144N120.51797977365729W>



Counties: Merced, CA

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## Endangered Species Act Species

There is a total of 19 threatened, endangered, or candidate species on this species list.

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

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

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

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

## Mammals

NAME	STATUS
Fresno Kangaroo Rat <i>Dipodomys nitratoideis exilis</i> There is <b>final</b> critical habitat for this species. Your location is outside the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/5150">https://ecos.fws.gov/ecp/species/5150</a> Species survey guidelines: <a href="https://ecos.fws.gov/ipac/guideline/survey/population/37/office/11420.pdf">https://ecos.fws.gov/ipac/guideline/survey/population/37/office/11420.pdf</a>	Endangered
San Joaquin Kit Fox <i>Vulpes macrotis mutica</i> No critical habitat has been designated for this species. Species profile: <a href="https://ecos.fws.gov/ecp/species/2873">https://ecos.fws.gov/ecp/species/2873</a>	Endangered

## Reptiles

NAME	STATUS
Blunt-nosed Leopard Lizard <i>Gambelia silus</i> No critical habitat has been designated for this species. Species profile: <a href="https://ecos.fws.gov/ecp/species/625">https://ecos.fws.gov/ecp/species/625</a>	Endangered
Giant Garter Snake <i>Thamnophis gigas</i> No critical habitat has been designated for this species. Species profile: <a href="https://ecos.fws.gov/ecp/species/4482">https://ecos.fws.gov/ecp/species/4482</a>	Threatened

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## Amphibians

NAME	STATUS
California Red-legged Frog <i>Rana draytonii</i> There is <b>final</b> critical habitat for this species. Your location is outside the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/2891">https://ecos.fws.gov/ecp/species/2891</a>	Threatened
California Tiger Salamander <i>Ambystoma californiense</i> Population: U.S.A. (Central CA DPS) There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/2076">https://ecos.fws.gov/ecp/species/2076</a>	Threatened

## Fishes

NAME	STATUS
Delta Smelt <i>Hypomesus transpacificus</i> There is <b>final</b> critical habitat for this species. Your location is outside the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/321">https://ecos.fws.gov/ecp/species/321</a>	Threatened

## Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle <i>Desmocerus californicus dimorphus</i> There is <b>final</b> critical habitat for this species. Your location is outside the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/7850">https://ecos.fws.gov/ecp/species/7850</a> Habitat assessment guidelines: <a href="https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf">https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf</a>	Threatened

## Crustaceans

NAME	STATUS
Conservancy Fairy Shrimp <i>Branchinecta conservatio</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/8246">https://ecos.fws.gov/ecp/species/8246</a>	Endangered
Vernal Pool Fairy Shrimp <i>Branchinecta lynchi</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/498">https://ecos.fws.gov/ecp/species/498</a>	Threatened
Vernal Pool Tadpole Shrimp <i>Lepidurus packardii</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/2246">https://ecos.fws.gov/ecp/species/2246</a>	Endangered

## Flowering Plants

NAME	STATUS
Colusa Grass <i>Neostapfia colusana</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/5690">https://ecos.fws.gov/ecp/species/5690</a>	Threatened
Fleshy Owl's-clover <i>Castilleja campestris ssp. succulenta</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/8095">https://ecos.fws.gov/ecp/species/8095</a>	Threatened
Greene's Tuctoria <i>Tuctoria greenei</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/1573">https://ecos.fws.gov/ecp/species/1573</a>	Endangered
Hairy Orcutt Grass <i>Orcuttia pilosa</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/2262">https://ecos.fws.gov/ecp/species/2262</a>	Endangered
Hartweg's Golden Sunburst <i>Pseudobahia bahiifolia</i> No critical habitat has been designated for this species. Species profile: <a href="https://ecos.fws.gov/ecp/species/1704">https://ecos.fws.gov/ecp/species/1704</a>	Endangered
Hoover's Spurge <i>Chamaesyce hooveri</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/3019">https://ecos.fws.gov/ecp/species/3019</a>	Threatened
Keck's Checker-mallow <i>Sidalcea keckii</i> There is <b>final</b> critical habitat for this species. Your location is outside the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/5704">https://ecos.fws.gov/ecp/species/5704</a>	Endangered
San Joaquin Orcutt Grass <i>Orcuttia inaequalis</i> There is <b>final</b> critical habitat for this species. Your location overlaps the critical habitat. Species profile: <a href="https://ecos.fws.gov/ecp/species/5506">https://ecos.fws.gov/ecp/species/5506</a>	Threatened

## Critical habitats

There are 10 critical habitats wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
California Tiger Salamander <i>Ambystoma californiense</i> <a href="https://ecos.fws.gov/ecp/species/2076#crithab">https://ecos.fws.gov/ecp/species/2076#crithab</a>	Final
Colusa Grass <i>Neostapfia colusana</i> <a href="https://ecos.fws.gov/ecp/species/5690#crithab">https://ecos.fws.gov/ecp/species/5690#crithab</a>	Final
Conservancy Fairy Shrimp <i>Branchinecta conservatio</i>	Final

NAME	STATUS
<a href="https://ecos.fws.gov/ecp/species/8246#crithab">https://ecos.fws.gov/ecp/species/8246#crithab</a>	
Fleshy Owl's-clover <i>Castilleja campestris ssp. succulenta</i> <a href="https://ecos.fws.gov/ecp/species/8095#crithab">https://ecos.fws.gov/ecp/species/8095#crithab</a>	Final
Greene's Tuctoria <i>Tuctoria greenei</i> <a href="https://ecos.fws.gov/ecp/species/1573#crithab">https://ecos.fws.gov/ecp/species/1573#crithab</a>	Final
Hairy Orcutt Grass <i>Orcuttia pilosa</i> <a href="https://ecos.fws.gov/ecp/species/2262#crithab">https://ecos.fws.gov/ecp/species/2262#crithab</a>	Final
Hoover's Spurge <i>Chamaesyce hooveri</i> <a href="https://ecos.fws.gov/ecp/species/3019#crithab">https://ecos.fws.gov/ecp/species/3019#crithab</a>	Final
San Joaquin Orcutt Grass <i>Orcuttia inaequalis</i> <a href="https://ecos.fws.gov/ecp/species/5506#crithab">https://ecos.fws.gov/ecp/species/5506#crithab</a>	Final
Vernal Pool Fairy Shrimp <i>Branchinecta lynchi</i> <a href="https://ecos.fws.gov/ecp/species/498#crithab">https://ecos.fws.gov/ecp/species/498#crithab</a>	Final
Vernal Pool Tadpole Shrimp <i>Lepidurus packardii</i> <a href="https://ecos.fws.gov/ecp/species/2246#crithab">https://ecos.fws.gov/ecp/species/2246#crithab</a>	Final

## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:20 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Arena Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Arena**  
Quad Number **37120-C6**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

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## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:20 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Arena Quad [EXTERNAL]

Thank you for using NMFS' California species list, providing information for ESA, MSA, and MMPA resources under the jurisdiction of NMFS. Messages sent to this email address are not responded to directly. For questions, please contact Darren Howe by phone at [707-575-3152](tel:707-575-3152) or by email at [darren.howe@noaa.gov](mailto:darren.howe@noaa.gov).

## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:23 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Atwater Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Atwater**  
Quad Number **37120-C5**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:23 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Atwater Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:52 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Bliss Ranch Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Bliss Ranch**  
Quad Number **37120-A4**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

**MMPA Species (See list at left)**

**ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account <nmfswcrca.specieslist@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:52 PM  
**To:** prvs=485746de2=lindsay.larsen@ch2m.com  
**Subject:** Auto reply - NMFS CA Species List Re: MID PEIR NMFS Species List - Bliss Ranch Quad [EXTERNAL]

Thank you for using NMFS' California Species List. Receipt of this message confirms that NMFS has received your email to [nmfswcrca.specieslist@noaa.gov](mailto:nmfswcrca.specieslist@noaa.gov). If you have used the tools and followed the steps outlined on the California Species List Tools webpage ([http://www.westcoast.fisheries.noaa.gov/maps\\_data/california\\_species\\_list\\_tools.html](http://www.westcoast.fisheries.noaa.gov/maps_data/california_species_list_tools.html)), you have generated an official species list.

Messages sent to this email address are not responded to directly. For project specific questions, please contact your local NMFS office.

Northern California/Klamath (Arcata) 707-822-7201

North-Central Coast (Santa Rosa) 707-387-0737

Southern California (Long Beach) 562-980-4000

California Central Valley (Sacramento) 916-930-3600

## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:05 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** FW: MID PEIR NMFS Species List - Cressey Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Cressey**  
Quad Number **37120-D6**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat - **X**  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account <nmfswcrca.specieslist@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:06 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Auto reply - NMFS CA Species List Re: FW: MID PEIR NMFS Species List - Cressey Quad [EXTERNAL]

Thank you for using NMFS' California Species List. Receipt of this message confirms that NMFS has received your email to [nmfswcrca.specieslist@noaa.gov](mailto:nmfswcrca.specieslist@noaa.gov). If you have used the tools and followed the steps outlined on the California Species List Tools webpage ([http://www.westcoast.fisheries.noaa.gov/maps\\_data/california\\_species\\_list\\_tools.html](http://www.westcoast.fisheries.noaa.gov/maps_data/california_species_list_tools.html)), you have generated an official species list.

Messages sent to this email address are not responded to directly. For project specific questions, please contact your local NMFS office.

Northern California/Klamath (Arcata) 707-822-7201

North-Central Coast (Santa Rosa) 707-387-0737

Southern California (Long Beach) 562-980-4000

California Central Valley (Sacramento) 916-930-3600

## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:41 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - El Nido Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **El Nido**  
Quad Number **37120-B4**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

**MMPA Species (See list at left)**

**ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:41 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - El Nido Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:46 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** FW: MID PEIR NMFS Species List - Le Grand Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Le Grand**  
Quad Number **37120-B2**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

**MMPA Species (See list at left)**

**ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:46 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: FW: MID PEIR NMFS Species List - Le Grand Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:25 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Merced Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Merced**  
Quad Number **37120-C4**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

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## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:26 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Merced Quad [EXTERNAL]

Thank you for using NMFS' California species list, providing information for ESA, MSA, and MMPA resources under the jurisdiction of NMFS. Messages sent to this email address are not responded to directly. For questions, please contact Darren Howe by phone at [707-575-3152](tel:707-575-3152) or by email at [darren.howe@noaa.gov](mailto:darren.howe@noaa.gov).

## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:44 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Plainsburg Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Plainsburg**  
Quad Number **37120-B3**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

**MMPA Species (See list at left)**

**ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

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**M** 1 949 697 3778

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Redding, CA 96001

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## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:44 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Plainsburg Quad [EXTERNAL]

Thank you for using NMFS' California species list, providing information for ESA, MSA, and MMPA resources under the jurisdiction of NMFS. Messages sent to this email address are not responded to directly. For questions, please contact Darren Howe by phone at [707-575-3152](tel:707-575-3152) or by email at [darren.howe@noaa.gov](mailto:darren.howe@noaa.gov).

## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:28 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Planada Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Planada**  
Quad Number **37120-C3**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

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## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:28 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Planada Quad [EXTERNAL]

Thank you for using NMFS' California species list, providing information for ESA, MSA, and MMPA resources under the jurisdiction of NMFS. Messages sent to this email address are not responded to directly. For questions, please contact Darren Howe by phone at [707-575-3152](tel:707-575-3152) or by email at [darren.howe@noaa.gov](mailto:darren.howe@noaa.gov).

## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:38 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Sandy Mush Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Sandy Mush**  
Quad Number **37120-B5**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

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Redding, CA 96001

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## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:39 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Sandy Mush Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:49 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Santa Rita Bridge Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Santa Rita Bridge**  
Quad Number **37120-A5**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

**MMPA Species (See list at left)**

**ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:50 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Santa Rita Bridge Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Thursday, November 9, 2017 10:40 AM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** FW: MID PEIR NMFS Species List - Snelling Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Snelling**  
Quad Number **37120-E4**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat - **X**  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

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Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Thursday, November 9, 2017 10:41 AM  
**To:** prvs=47953e0be=lindsay.larsen@ch2m.com  
**Subject:** Re: FW: MID PEIR NMFS Species List - Snelling Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:17 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Stevinson Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Stevinson**  
Quad Number **37120-C7**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat - **X**  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

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2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:17 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Stevinson Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Thursday, November 9, 2017 10:45 AM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Turlock Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Turlock**  
Quad Number **37120-D7**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat - **X**  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Thursday, November 9, 2017 10:46 AM  
**To:** prvs=47953e0be=lindsay.larsen@ch2m.com  
**Subject:** Re: MID PEIR NMFS Species List - Turlock Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Thursday, November 9, 2017 10:32 AM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** MID PEIR NMFS Species List - Turlock Lake Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Turlock Lake**  
Quad Number **37120-E5**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat -  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

**M** 1 949 697 3778

**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
**To:** [prvs=47953e0be=lindsay.larsen@ch2m.com](mailto:prvs=47953e0be=lindsay.larsen@ch2m.com)  
**Subject:** Auto reply - NMFS CA Species List Re: MID PEIR NMFS Species List - Turlock Lake Quad [EXTERNAL]  
**Date:** Thursday, November 9, 2017 10:32:20 AM

---

Thank you for using NMFS' California Species List. Receipt of this message confirms that NMFS has received your email to [nmfswcrca.specieslist@noaa.gov](mailto:nmfswcrca.specieslist@noaa.gov). If you have used the tools and followed the steps outlined on the California Species List Tools webpage ([http://www.westcoast.fisheries.noaa.gov/maps\\_data/california\\_species\\_list\\_tools.html](http://www.westcoast.fisheries.noaa.gov/maps_data/california_species_list_tools.html)), you have generated an official species list.

Messages sent to this email address are not responded to directly. For project specific questions, please contact your local NMFS office.

Northern California/Klamath (Arcata) 707-822-7201

North-Central Coast (Santa Rosa) 707-387-0737

Southern California (Long Beach) 562-980-4000

California Central Valley (Sacramento) 916-930-3600

## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:10 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** FW: MID PEIR NMFS Species List - Winton Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Winton**  
Quad Number **37120-D5**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat - **X**  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

## **ESA Marine Invertebrates**

Range Black Abalone (E) -  
Range White Abalone (E) -

## **ESA Marine Invertebrates Critical Habitat**

Black Abalone Critical Habitat -

## **ESA Sea Turtles**

East Pacific Green Sea Turtle (T) -  
Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

Coho EFH -  
Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

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**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

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**CH2M**

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Redding, CA 96001

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## Larsen, Lindsay/RDD

---

**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:11 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: FW: MID PEIR NMFS Species List - Winton Quad [EXTERNAL]

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## **Larsen, Lindsay/RDD**

---

**From:** Larsen, Lindsay/RDD  
**Sent:** Tuesday, November 14, 2017 3:14 PM  
**To:** 'nmfswcrca.specieslist@noaa.gov'  
**Subject:** FW: MID PEIR NMFS Species List - Yosemite Lake Quad

Local agency:  
Merced Irrigation District  
744 W. 20th Street  
Merced, CA 95340

Consultant/point of contact:  
Lindsay Larsen  
CH2M HILL  
[lindsay.larsen@ch2m.com](mailto:lindsay.larsen@ch2m.com)  
530-229-3211

Quad Name **Yosemite Lake**  
Quad Number **37120-D4**

### **ESA Anadromous Fish**

SONCC Coho ESU (T) -  
CCC Coho ESU (E) -  
CC Chinook Salmon ESU (T) -  
CVSR Chinook Salmon ESU (T) -  
SRWR Chinook Salmon ESU (E) -  
NC Steelhead DPS (T) -  
CCC Steelhead DPS (T) -  
SCCC Steelhead DPS (T) -  
SC Steelhead DPS (E) -  
CCV Steelhead DPS (T) - **X**  
Eulachon (T) -  
sDPS Green Sturgeon (T) -

### **ESA Anadromous Fish Critical Habitat**

SONCC Coho Critical Habitat -  
CCC Coho Critical Habitat -  
CC Chinook Salmon Critical Habitat -  
CVSR Chinook Salmon Critical Habitat -  
SRWR Chinook Salmon Critical Habitat -  
NC Steelhead Critical Habitat -

CCC Steelhead Critical Habitat -  
SCCC Steelhead Critical Habitat -  
SC Steelhead Critical Habitat -  
CCV Steelhead Critical Habitat - **X**  
Eulachon Critical Habitat -  
sDPS Green Sturgeon Critical Habitat -

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Range White Abalone (E) -

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Olive Ridley Sea Turtle (T/E) -  
Leatherback Sea Turtle (E) -  
North Pacific Loggerhead Sea Turtle (E) -

## **ESA Whales**

Blue Whale (E) -  
Fin Whale (E) -  
Humpback Whale (E) -  
Southern Resident Killer Whale (E) -  
North Pacific Right Whale (E) -  
Sei Whale (E) -  
Sperm Whale (E) -

## **ESA Pinnipeds**

Guadalupe Fur Seal (T) -  
Steller Sea Lion Critical Habitat -

## **Essential Fish Habitat**

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Chinook Salmon EFH - **X**  
Groundfish EFH -  
Coastal Pelagics EFH -  
Highly Migratory Species EFH -

## **MMPA Species (See list at left)**

### **ESA and MMPA Cetaceans/Pinnipeds**

**See list at left and consult the NMFS Long Beach office  
562-980-4000**

MMPA Cetaceans -

MMPA Pinnipeds -

**Lindsay Larsen**

*Environmental Planner*

**D** 1 530 229 3211

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**CH2M**

2525 Airpark Drive

Redding, CA 96001

[www.ch2m.com](http://www.ch2m.com) | [LinkedIn](#) | [Twitter](#) | [Facebook](#)

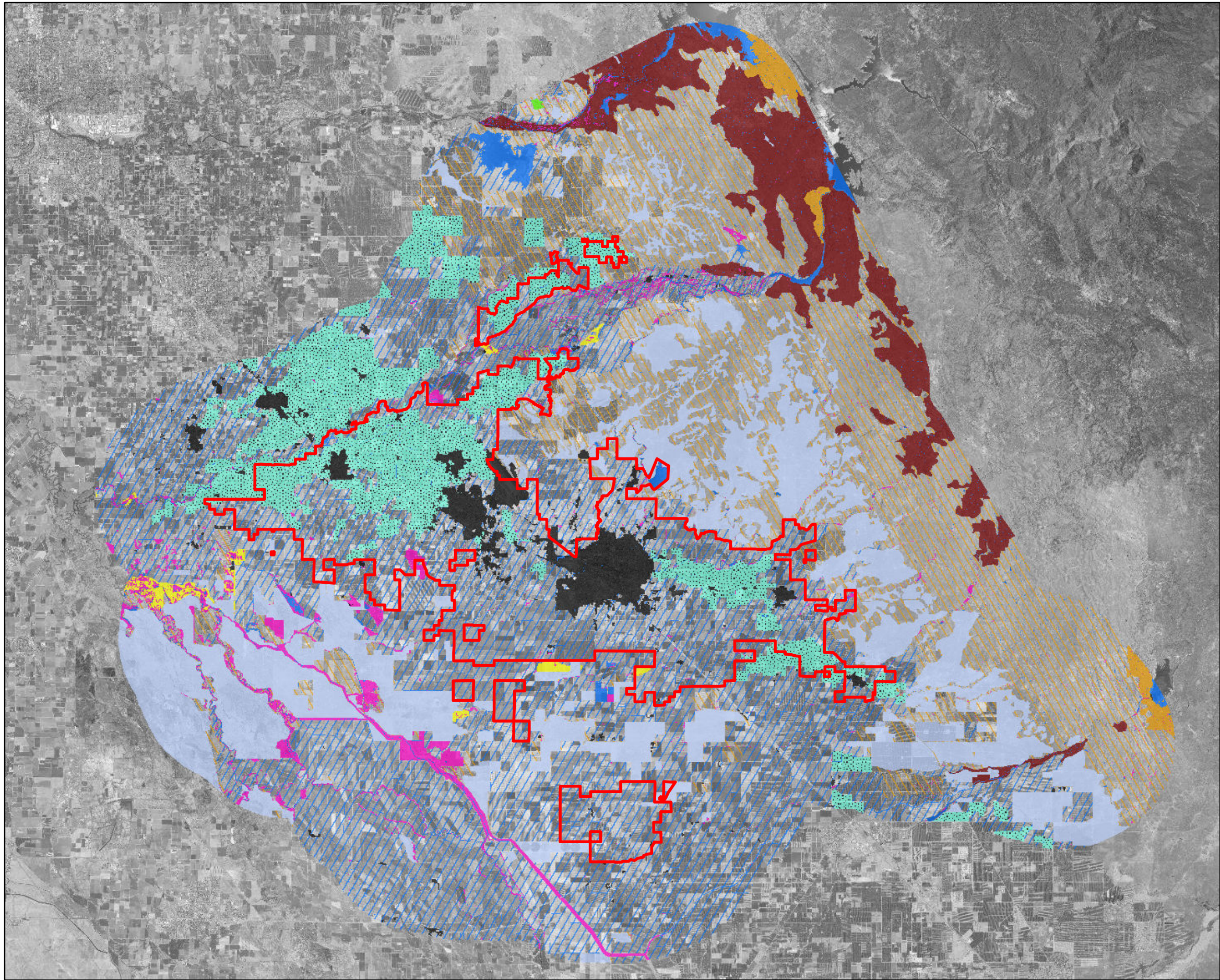
## Larsen, Lindsay/RDD

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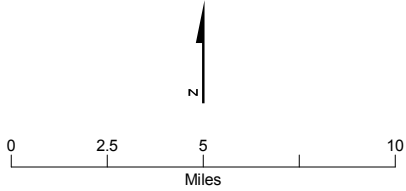
**From:** NMFSWCRCA Specieslist - NOAA Service Account  
<nmfswcrca.specieslist+canned.response@noaa.gov>  
**Sent:** Tuesday, November 14, 2017 3:14 PM  
**To:** prvs=4842ec99b=lindsay.larsen@ch2m.com  
**Subject:** Re: FW: MID PEIR NMFS Species List - Yosemite Lake Quad [EXTERNAL]

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**APPENDIX D**  
**LAND COVER TYPES IN THE MERCED IRRIGATION DISTRICT**  
**WATER RESOURCES MANAGEMENT PLAN**  
**STUDY AREA**



- LEGEND
- MID Service Area
- Land Cover Type**
- Annual Grassland
  - Blue Oak Woodland
  - Blue Oak-Foothill Pine
  - Irrigated Pastures, Row Crops, and Field Crops
  - Open-Water Aquatic Habitats
  - Orchard and Vineyard
  - Urban
  - Valley Oak Woodland
  - Valley-Foothill Riparian
  - Vernal Pool Area
  - Wetlands

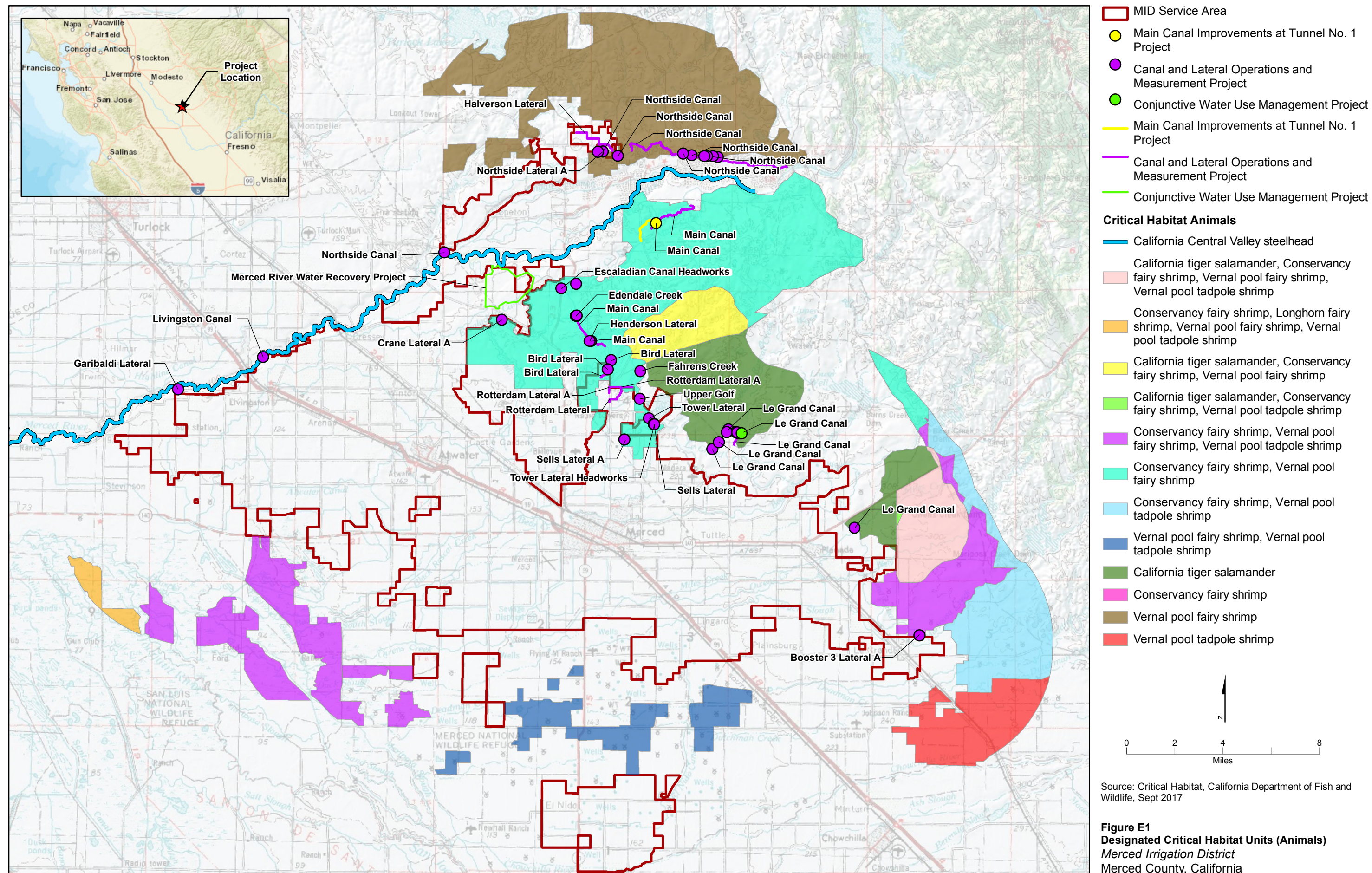


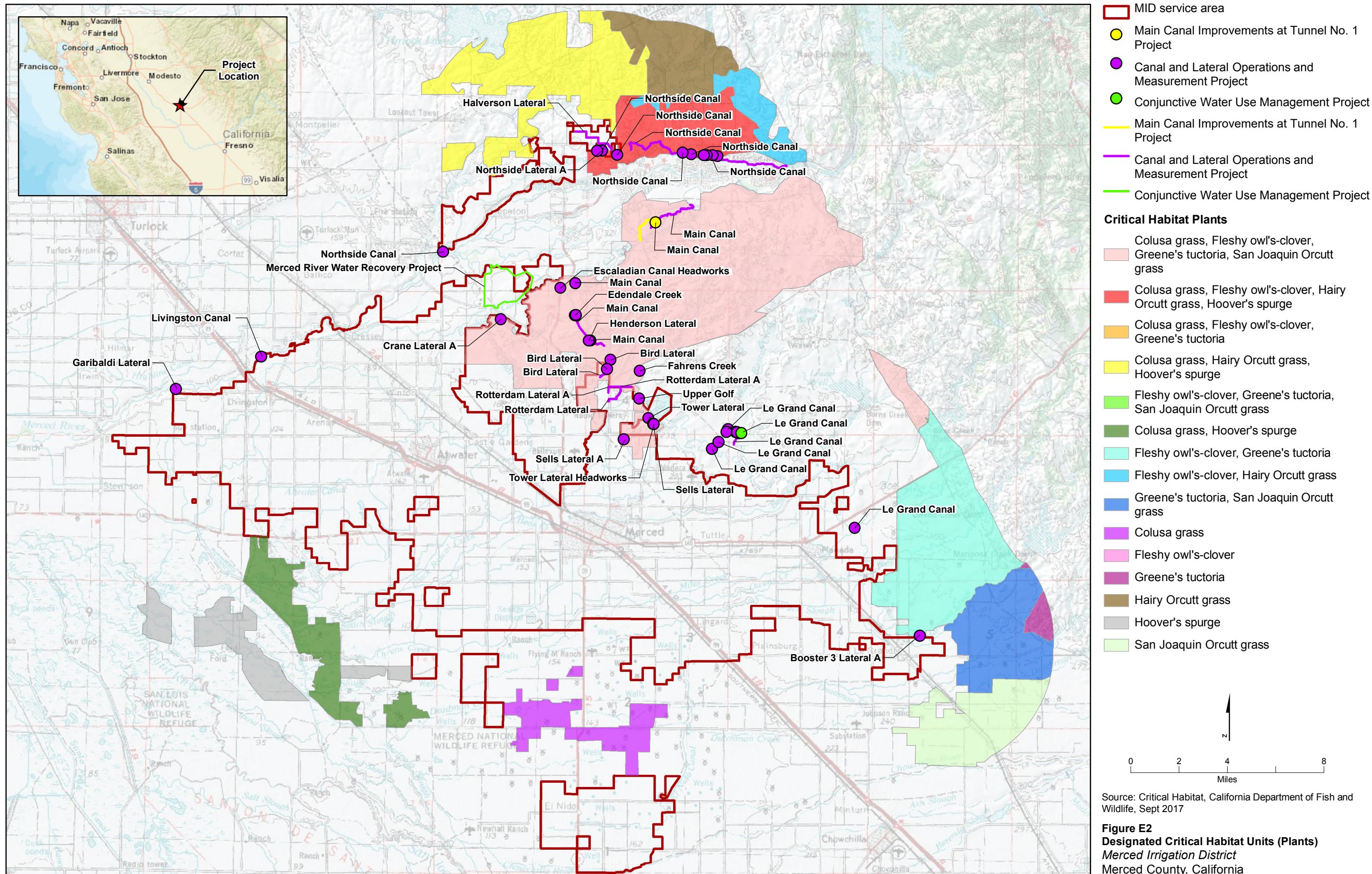
-Open-Water Aquatic Habitat includes Freshwater Pond, Lacustrine, Lake and Riverine habitat types.  
 -Wetlands includes Freshwater Emergent Wetland, Freshwater Forested/Shrub Wetland, and Wet Meadow habitat types.

Source: GAP, [http://www.biogeog.ucsb.edu/projects/gap/gap\\_data\\_reg.html](http://www.biogeog.ucsb.edu/projects/gap/gap_data_reg.html), Sept 2017; NWI, <https://www.fws.gov>, May 2017; Vernal Pool Area, [vernalpools.org](http://vernalpools.org) 2012

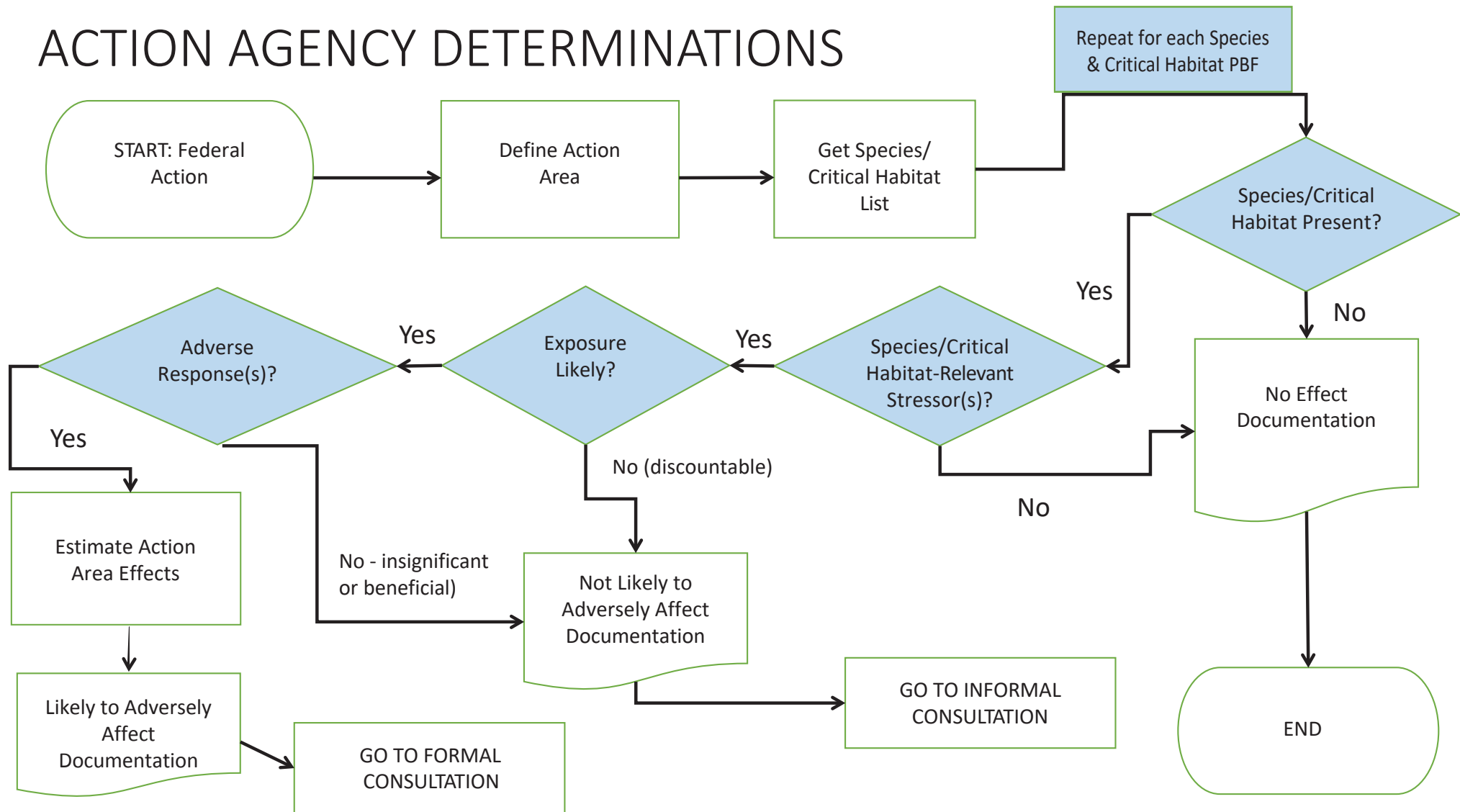
**Figure D-1**  
 Land Cover Types in the Program Area  
*Merced Irrigation District*  
 Merced County, California

**APPENDIX E**  
**DESIGNATED CRITICAL HABITAT UNITS**  
**IN MERCED IRRIGATION DISTRICT**  
**WATER RESOURCES MANAGEMENT PLAN**  
**STUDY AREA**





# ACTION AGENCY DETERMINATIONS



**APPENDIX F**  
**CRITICAL HABITAT DETERMINATIONS AND EFFECTS ANALYSIS**

## **Critical Habitat Determinations and Effects Analysis**

The effect determinations for critical habitat may be no effect, not likely to adversely affect, or likely to adversely affect. The not likely to adversely affect determination can refer to either insignificant and discountable adverse effects or anticipated beneficial effects. A likely to adversely affect determination for designated critical habitat requires formal consultation.

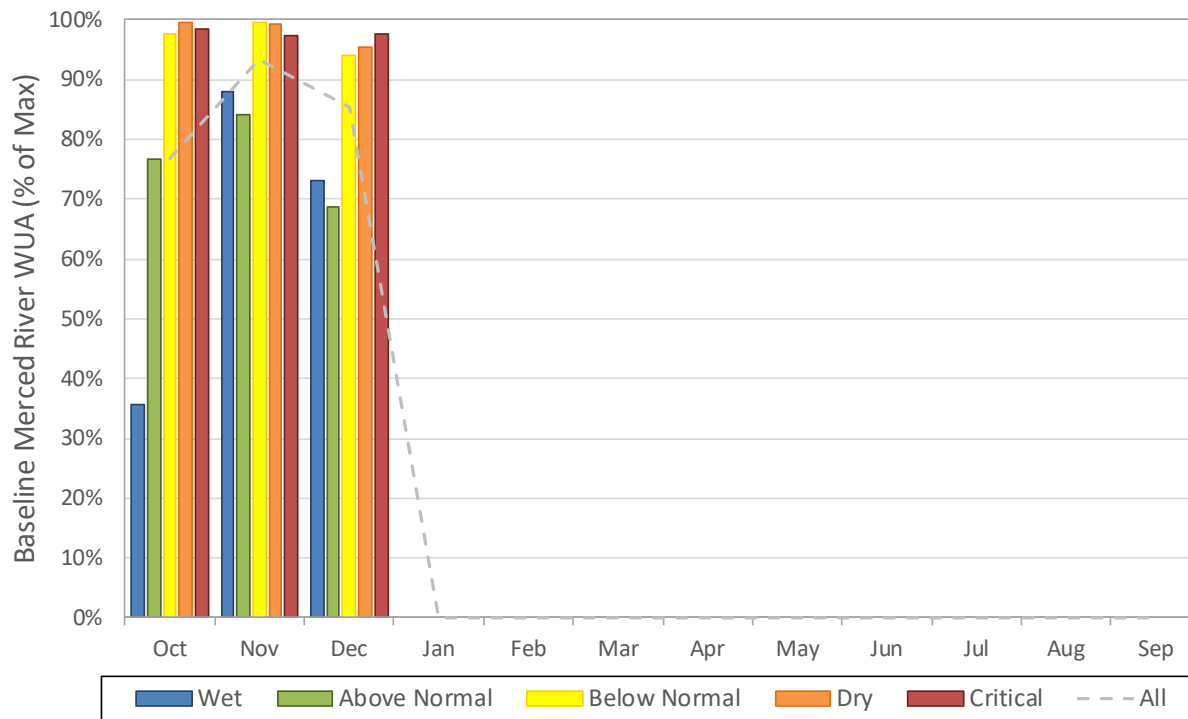
The rationale upon which the critical habitat effect determination is made should reference the “physical or biological features” (formerly “primary constituent elements”) that were the basis for determining the habitat to be critical and why they may or may not be adversely affected (50 CFR 402.02). If the critical habitat contains six “physical or biological features” and only three may be affected by the project, then the effects of the action on each of the three “physical or biological features” should be clearly stated in the rationale. For a no effect determination, none of the “physical or biological features” would be negatively affected by the project. Projects affecting one or more “physical or biological features” will receive a determination of not likely to adversely affect, or likely to adversely affect critical habitat. Projects with likely to adversely affect impacts on at least one “physical or biological feature” will result in a likely to adversely affect determination for critical habitat (see attached decision tree).

A likely to adversely affect determination for critical habitat may or may not merit an adverse modification call by the USFWS or NMFS. The adverse modification is comparable to a jeopardy call for a listed species. An adverse modification is defined as a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those “physical or biological features” that were the basis for determining the habitat to be critical. An adverse modification call is made for a species' critical habitat as it relates to all critical habitat. Adverse modification of critical habitat is not allowed under the ESA and occurs when the habitat characteristics or the necessary habitat elements are changed to such an extent that the habitat no longer functions as critical habitat. A project determined by the NMFS or USFWS to adversely modify designated critical habitat cannot be constructed without modifications in accordance with a reasonable and prudent alternative (RPA).

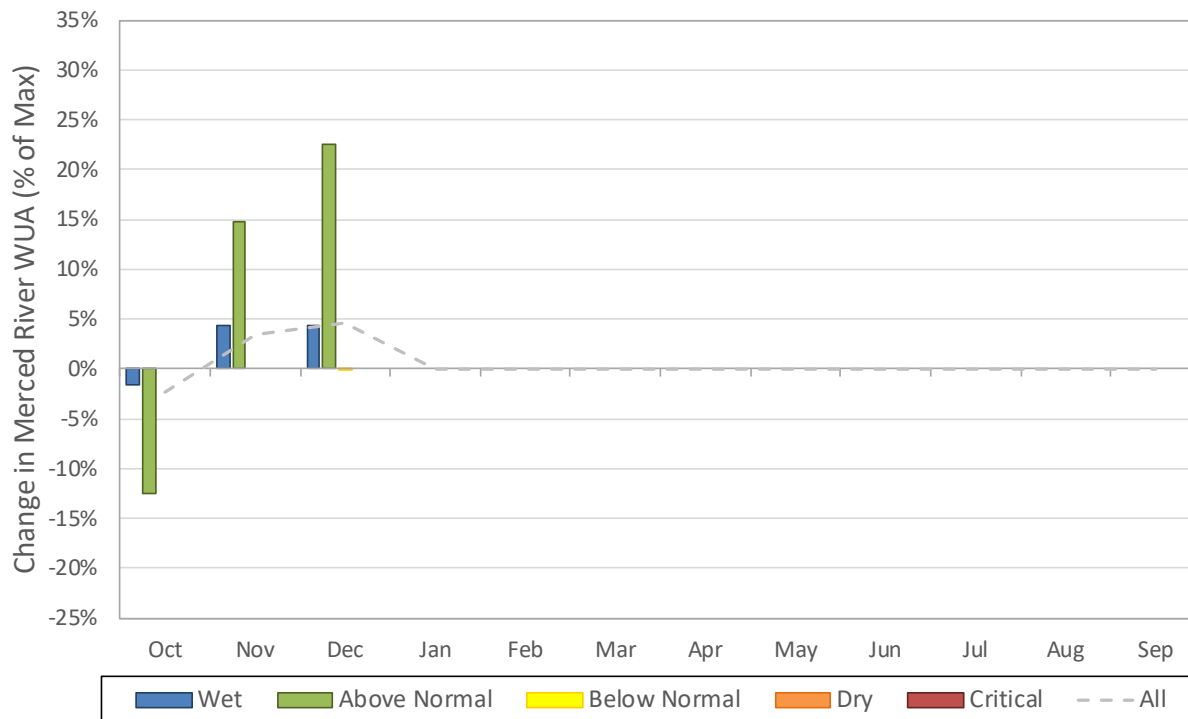
## Weighted Useable Area Plots

Modeling Results of Percent of Maximum  
Weighted Useable Area for Chinook and  
Steelhead as a Result of the Proposed  
Water Transfers

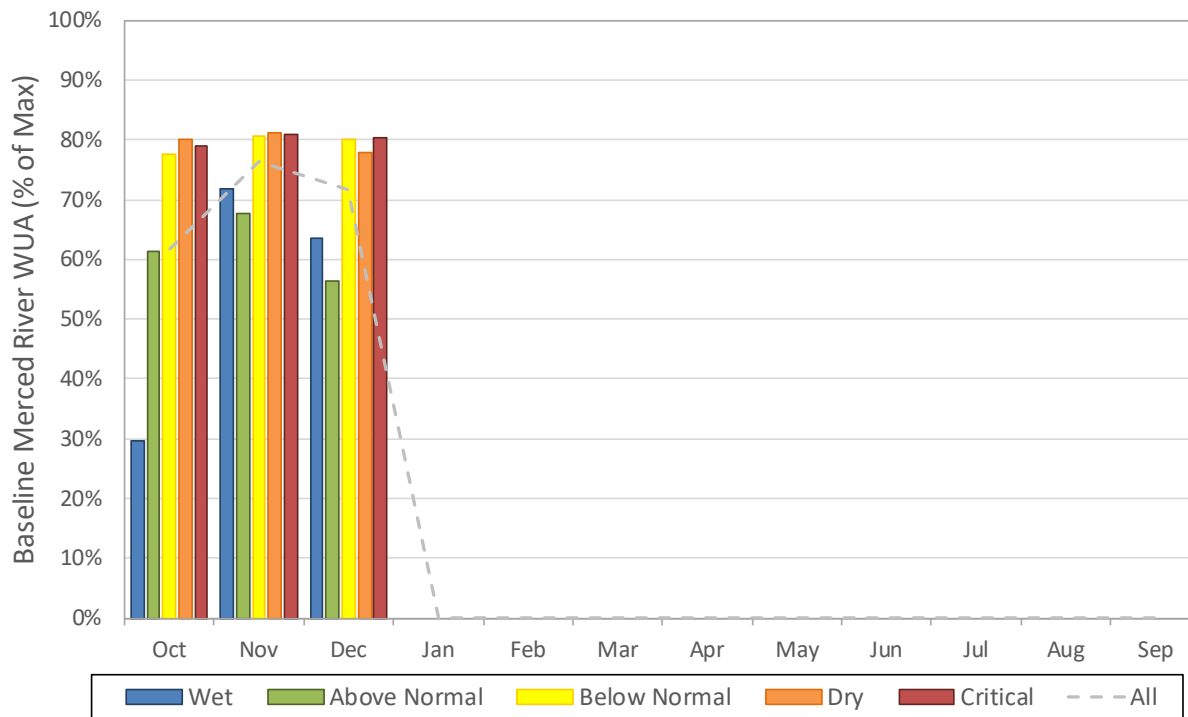
**Figure 1. Chinook salmon percent of maximum WUA for the spawning lifestage from Baseline Operations in Reach 1.**



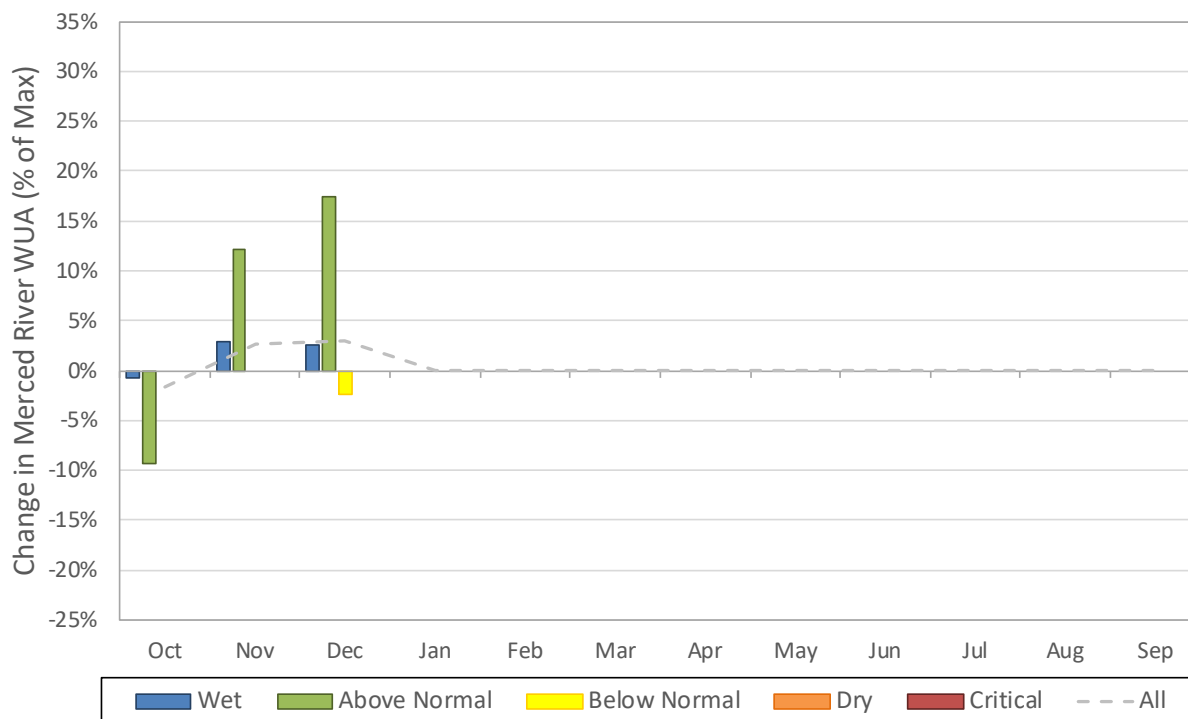
**Figure 2. Chinook salmon percent change of maximum WUA for the spawning lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 1.**



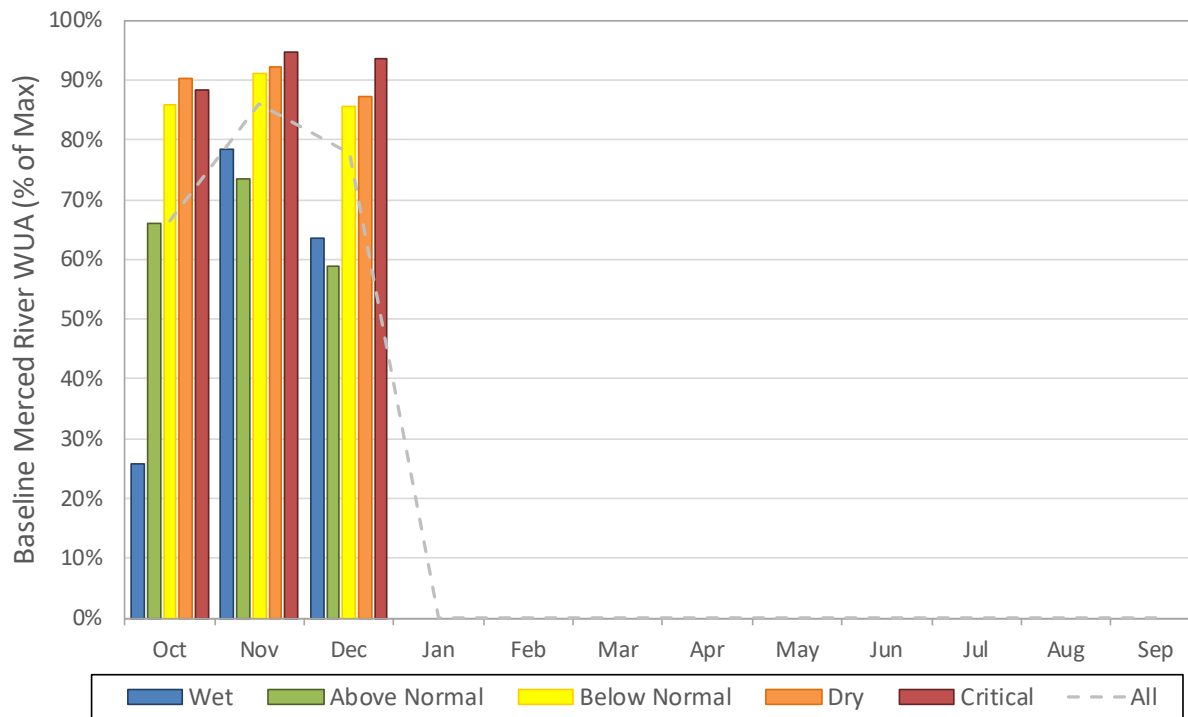
**Figure 3. Chinook salmon percent of maximum WUA for the spawning lifestage from Baseline Operations in Reach 2.**



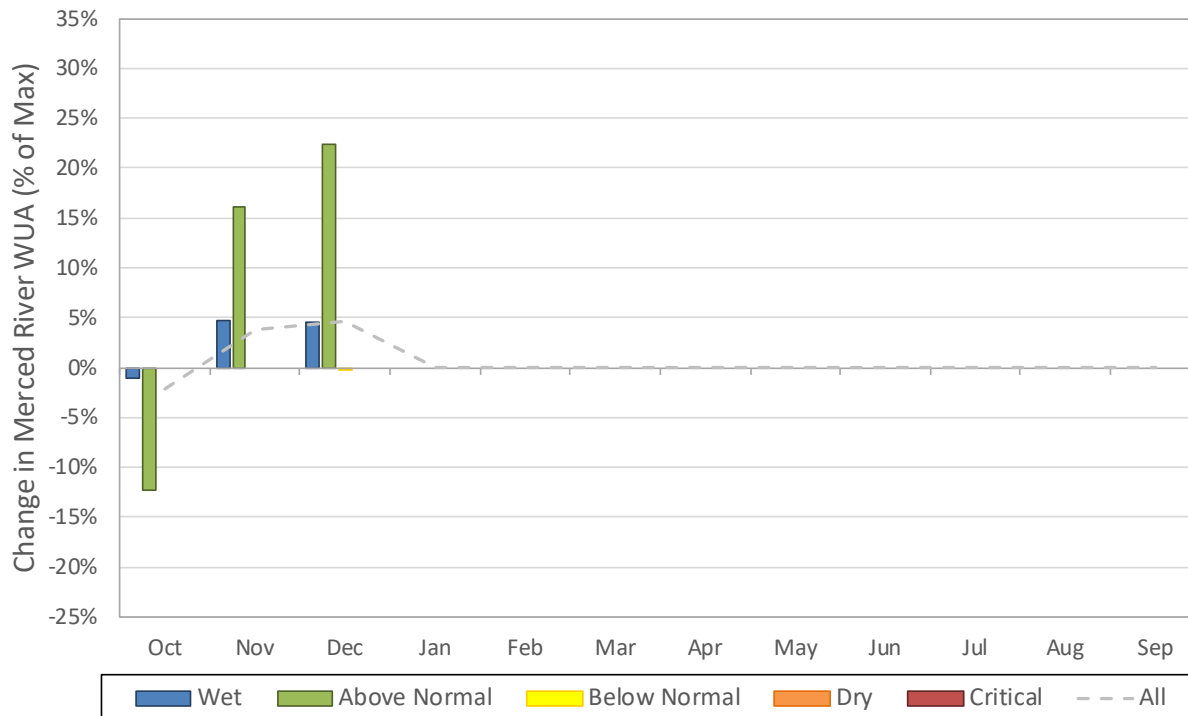
**Figure 4. Chinook salmon percent change of maximum WUA for the spawning lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 2.**



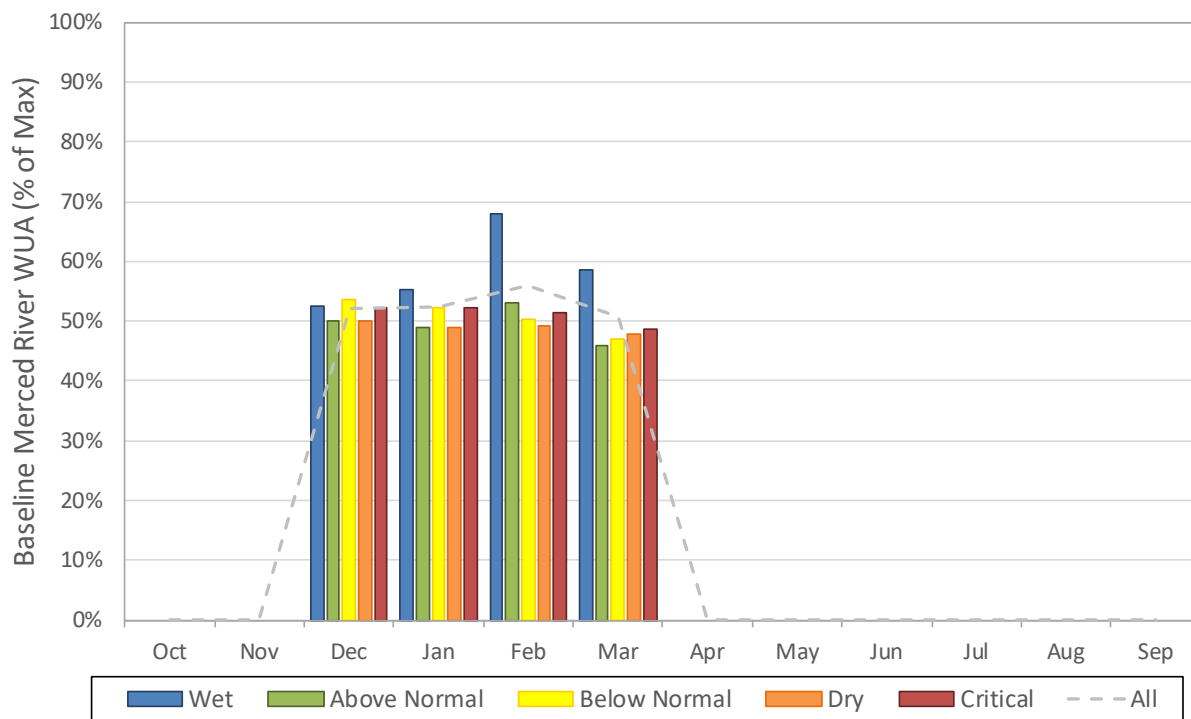
**Figure 5. Chinook salmon percent of maximum WUA for the spawning lifestage from Baseline Operations in Reach 3.**



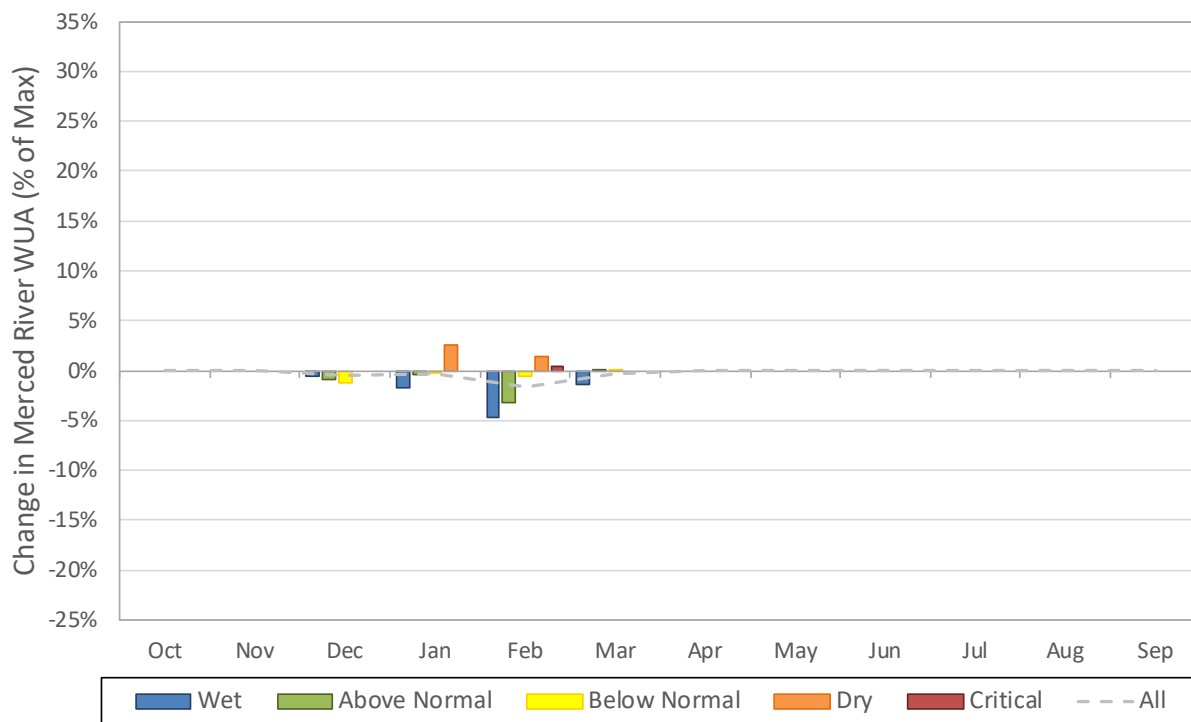
**Figure 6. Chinook salmon percent change of maximum WUA for the spawning lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 3.**



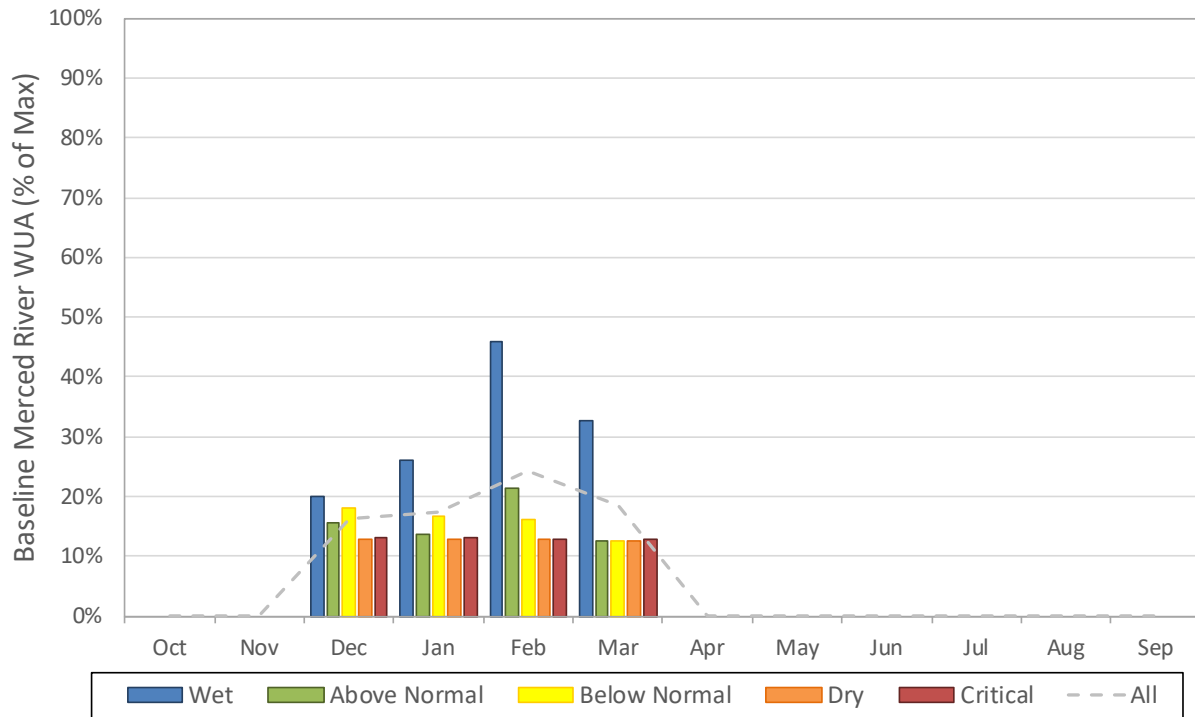
**Figure 7. Chinook salmon percent of maximum WUA for the fry lifestage from Baseline Operations in Reach 1.**



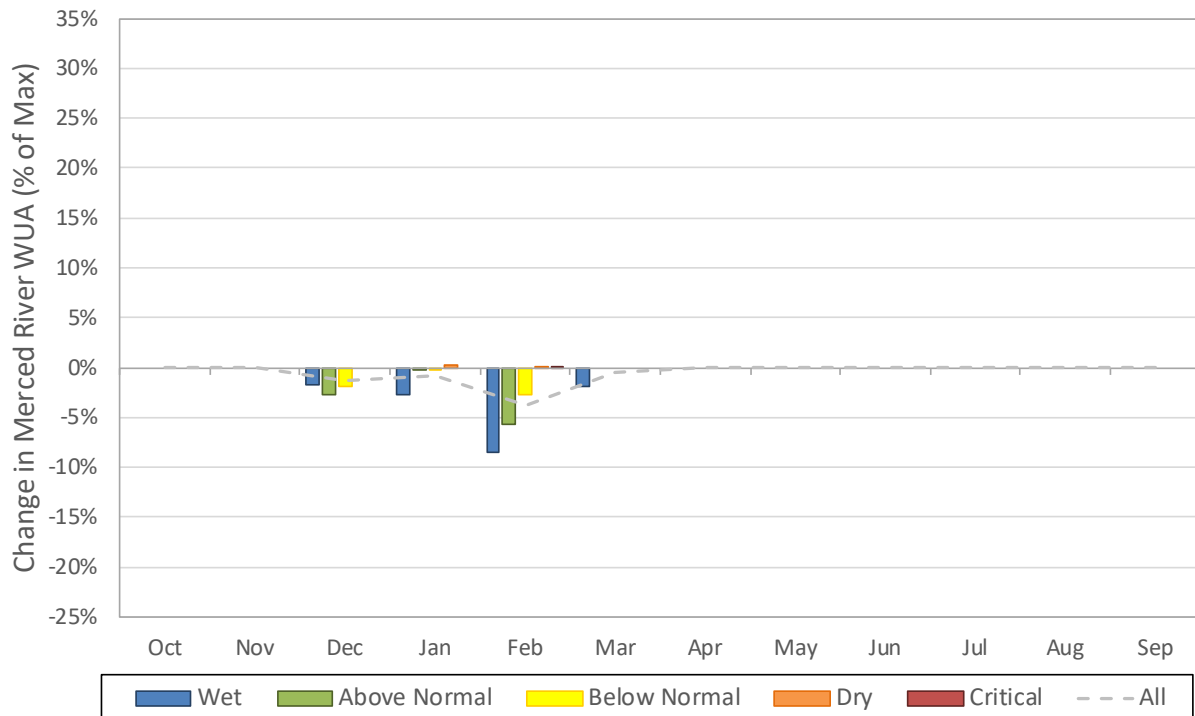
**Figure 8. Chinook salmon percent change of maximum WUA for the fry lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 1.**



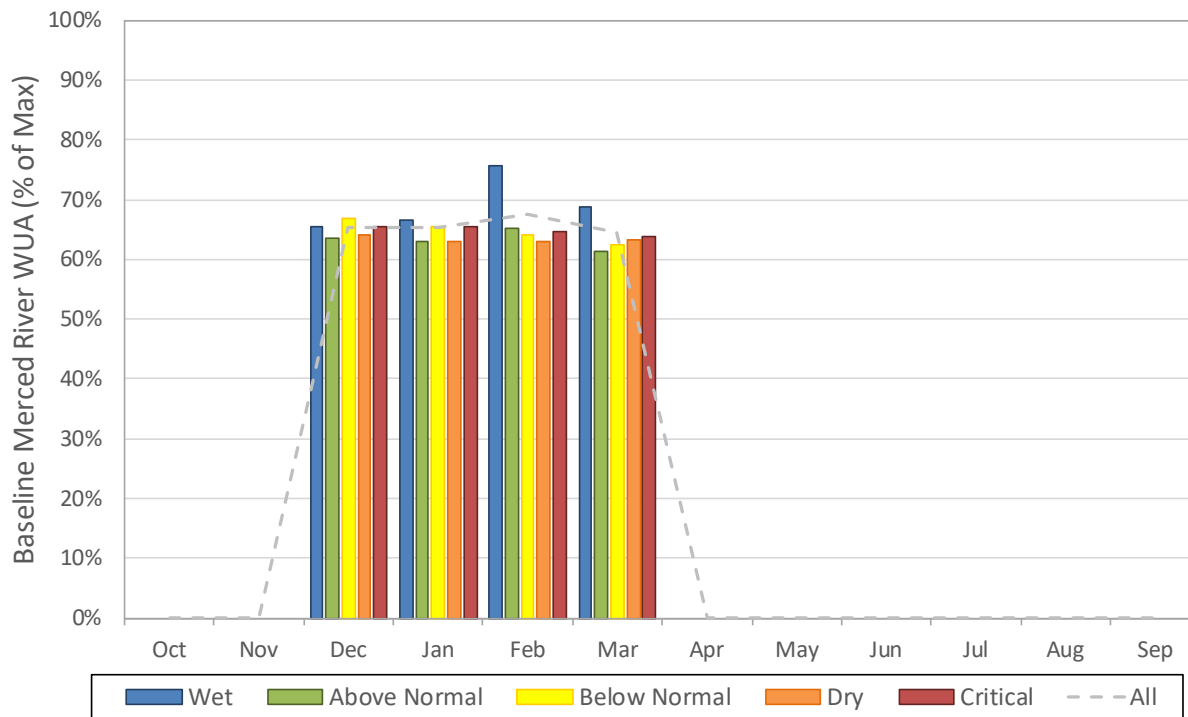
**Figure 9. Chinook salmon percent of maximum WUA for the fry lifestage from Baseline Operations in Reach 2.**



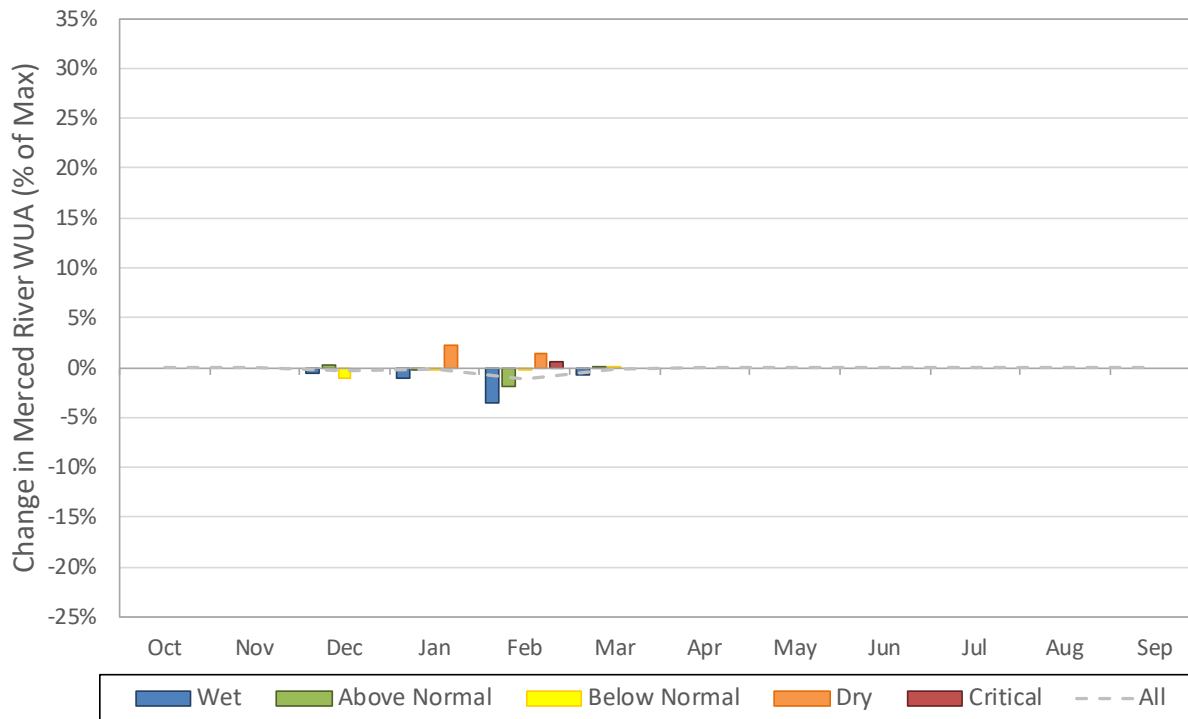
**Figure 10. Chinook salmon percent change of maximum WUA for the fry lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 2.**



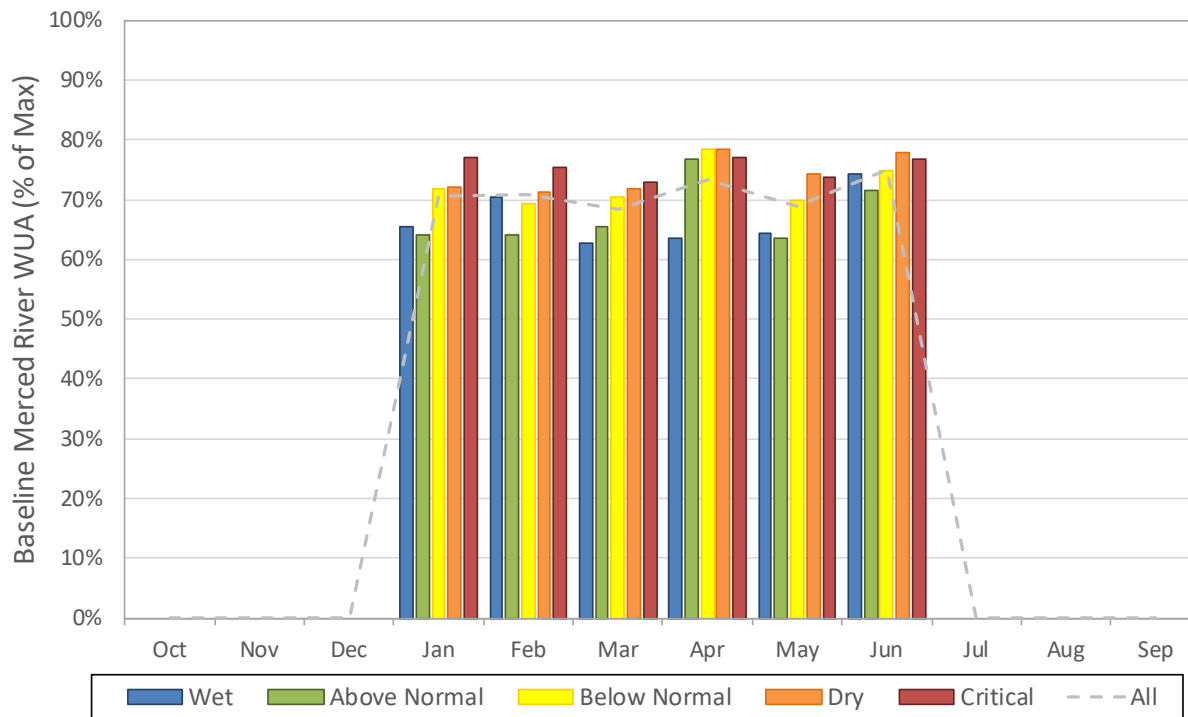
**Figure 11. Chinook salmon percent of maximum WUA for the fry lifestage from Baseline Operations in Reach 3.**



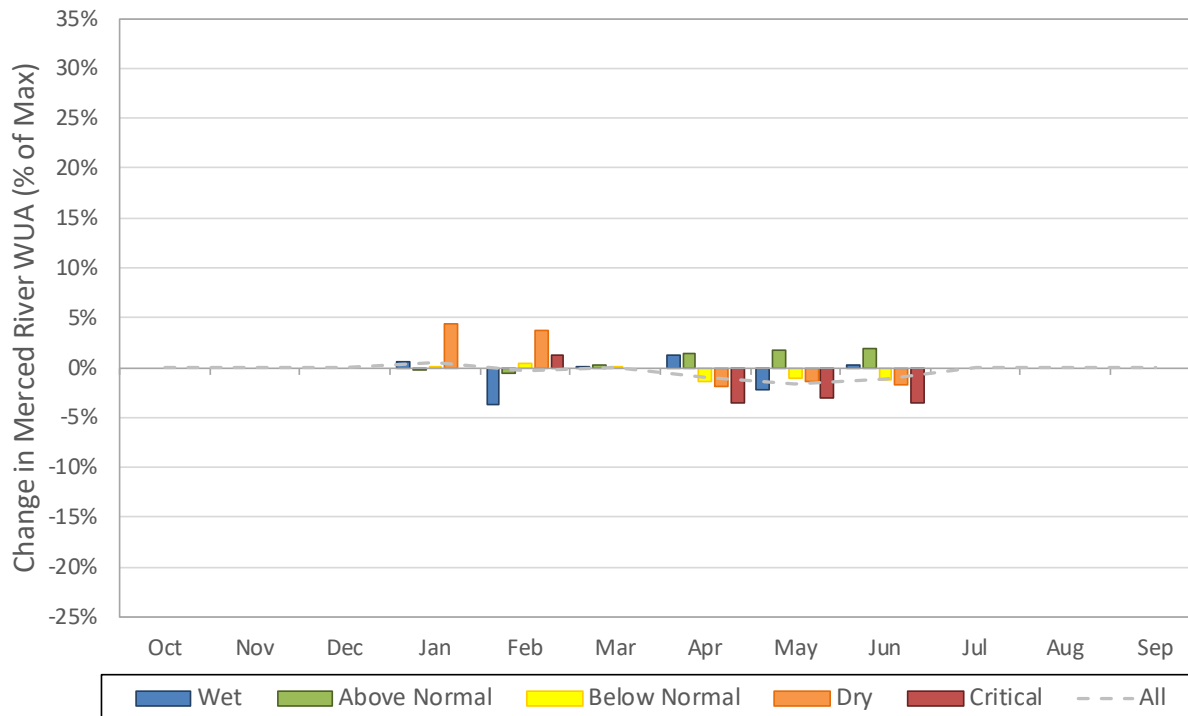
**Figure 12. Chinook salmon percent change of maximum WUA for the fry lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 3.**



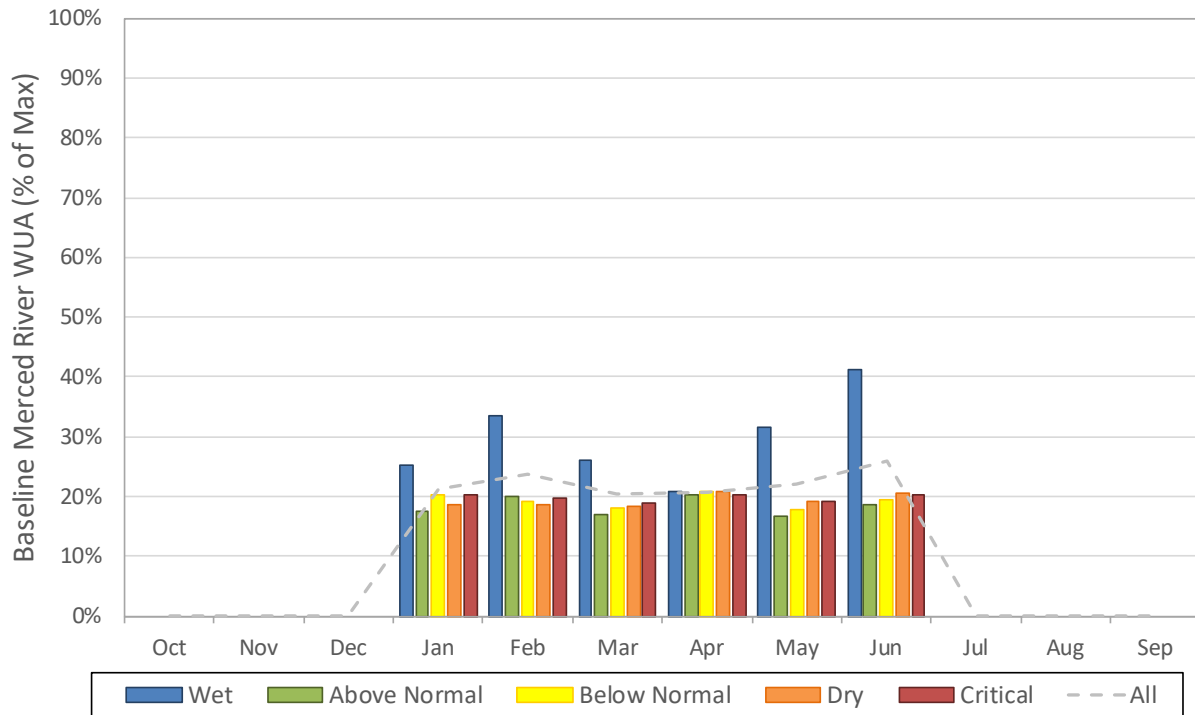
**Figure 13. Chinook salmon percent of maximum WUA for the juvenile lifestage from Baseline Operations in Reach 1.**



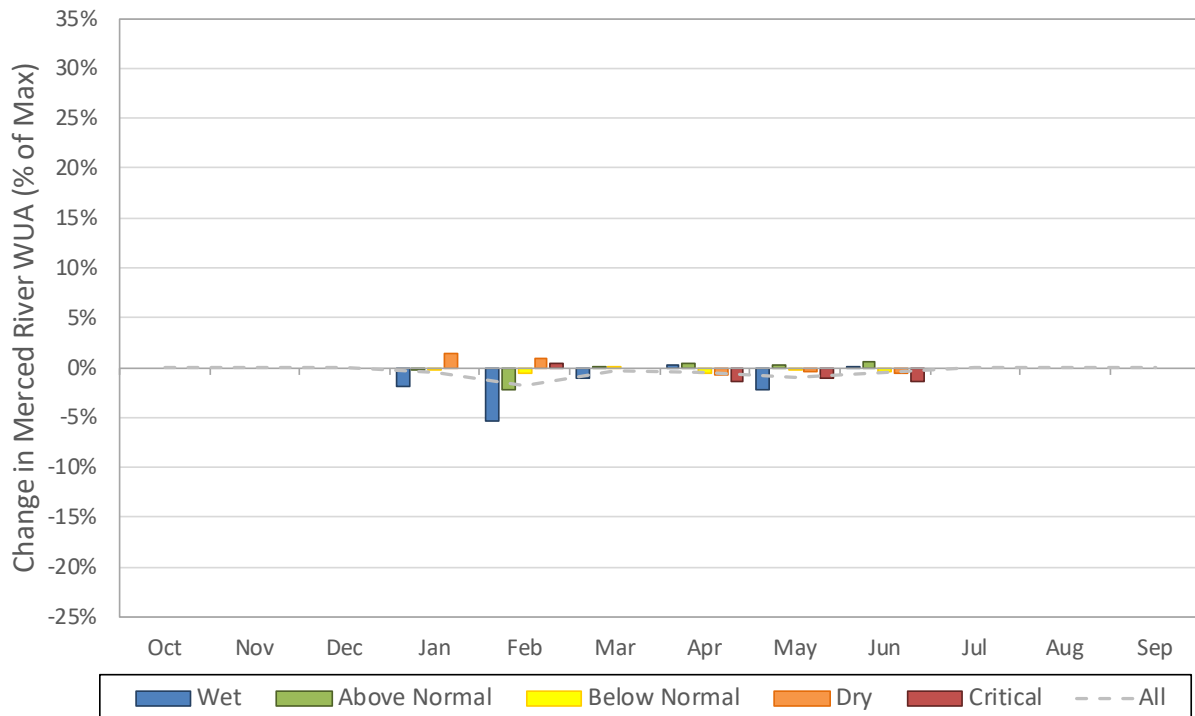
**Figure 14. Chinook salmon percent change of maximum WUA for the juvenile lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 1.**



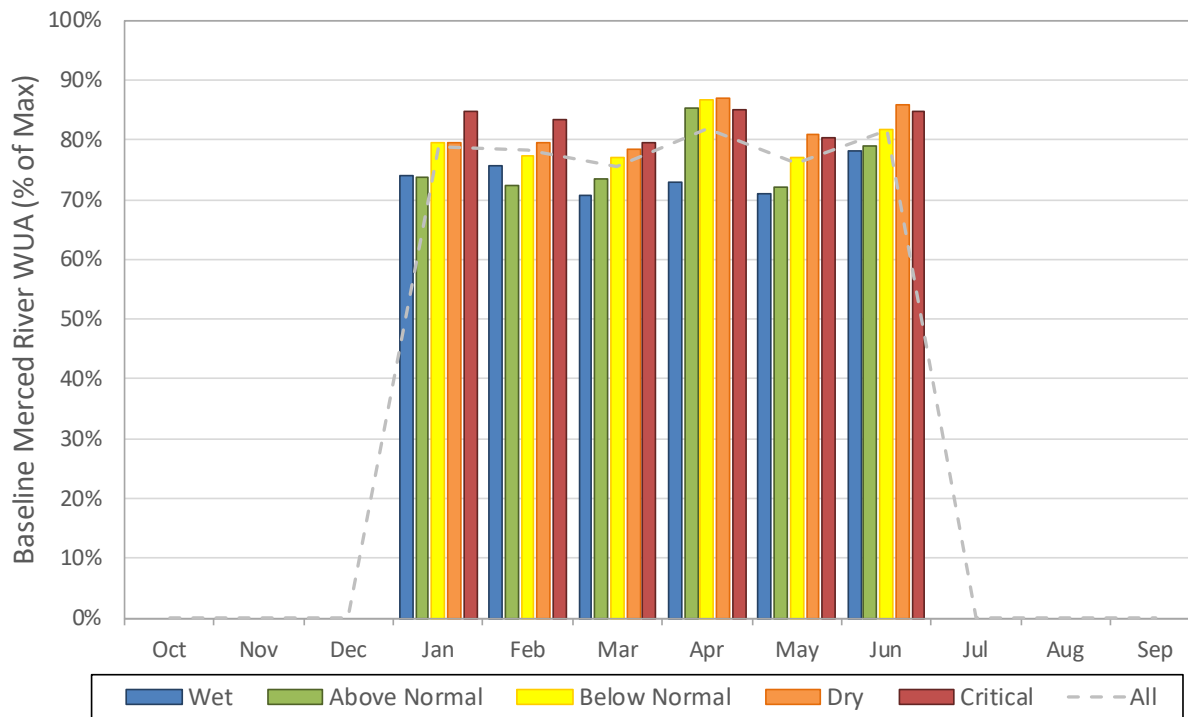
**Figure 15. Chinook salmon percent of maximum WUA for the juvenile lifestage from Baseline Operations in Reach 2.**



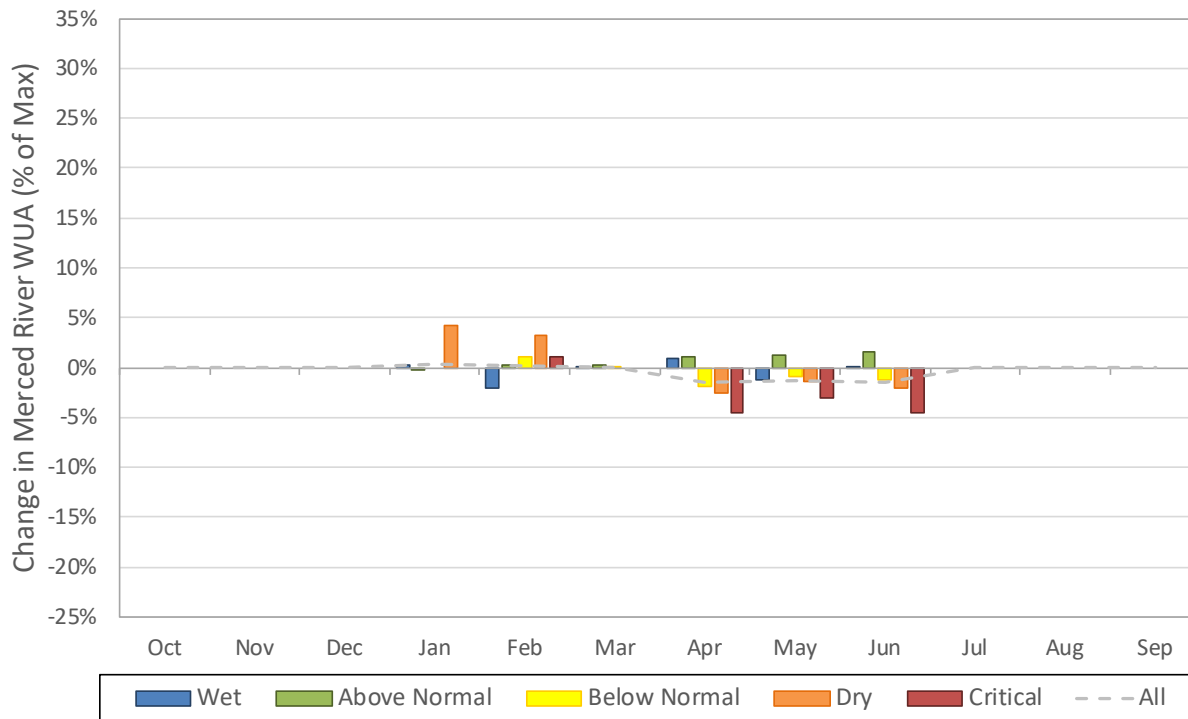
**Figure 16. Chinook salmon percent change of maximum WUA for the juvenile lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 2.**



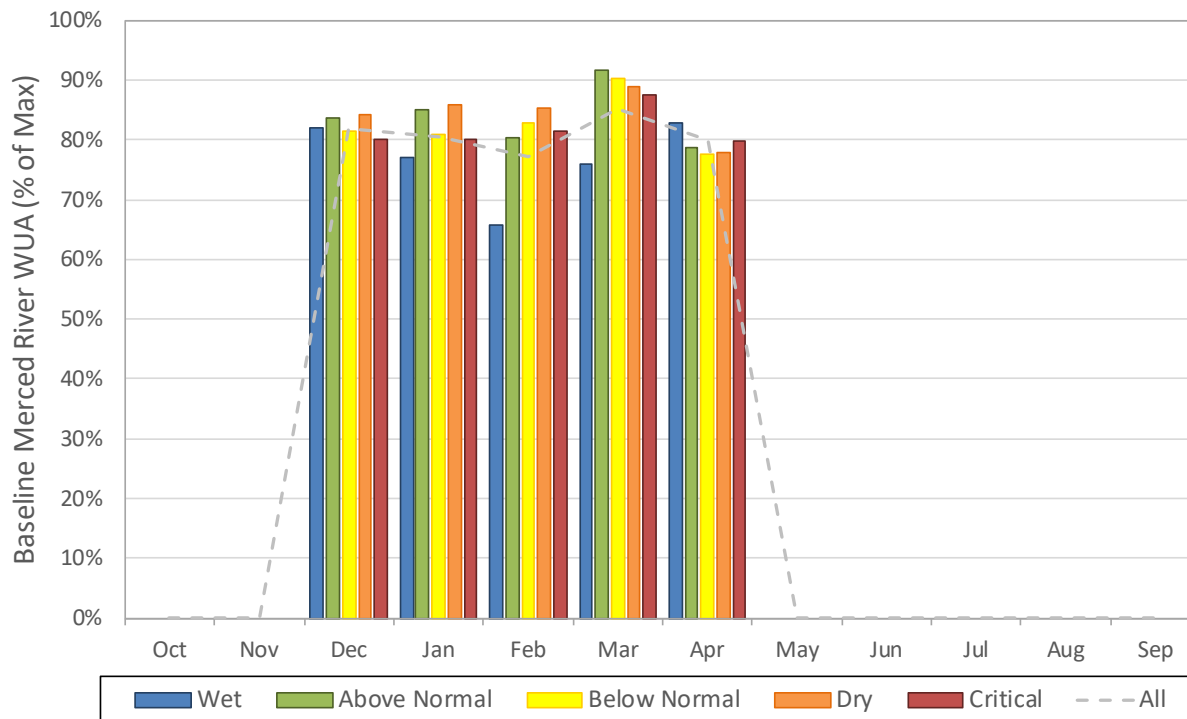
**Figure 17. Chinook salmon percent of maximum WUA for the juvenile lifestage from Baseline Operations in Reach 3.**



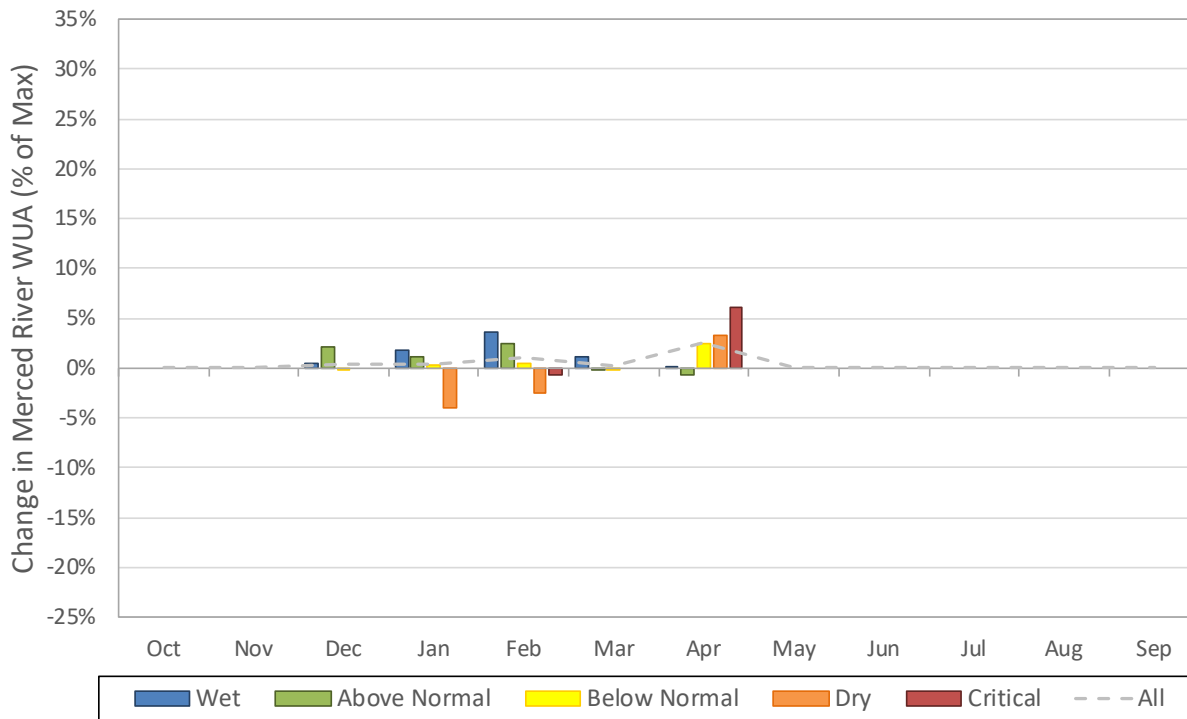
**Figure 18. Chinook salmon percent change of maximum WUA for the juvenile lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 3.**



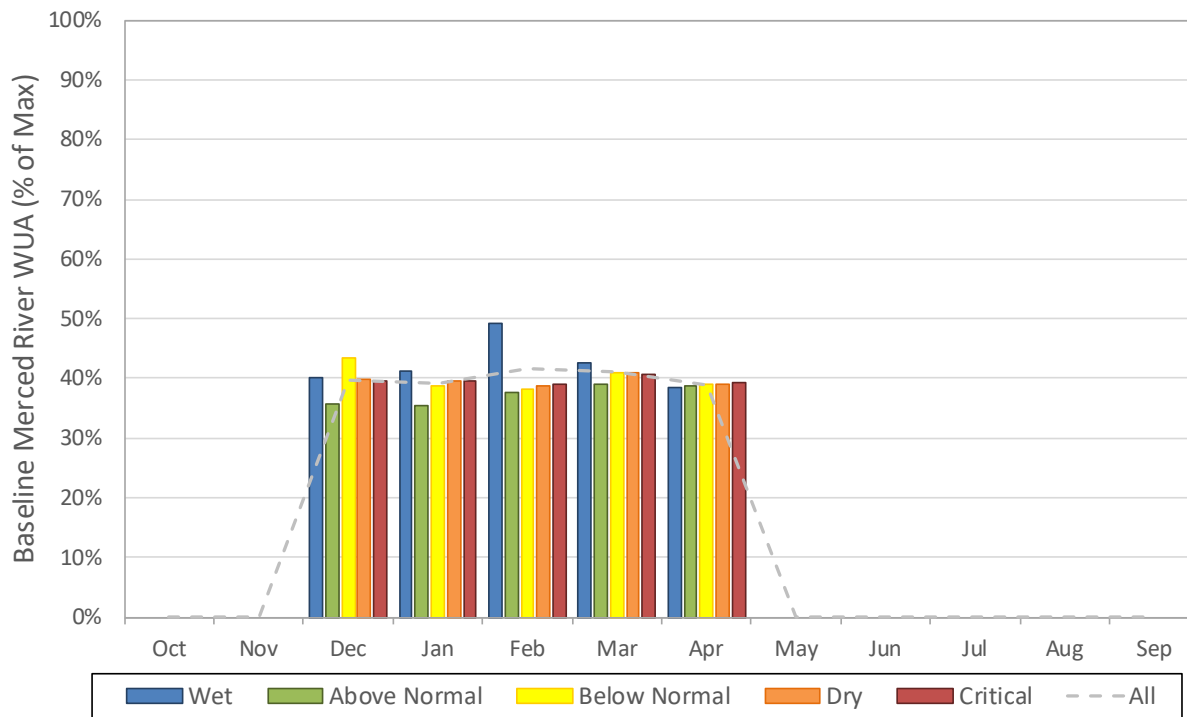
**Figure 19. Steelhead percent of maximum WUA for the spawning lifestage from Baseline Operations in Reach 1.**



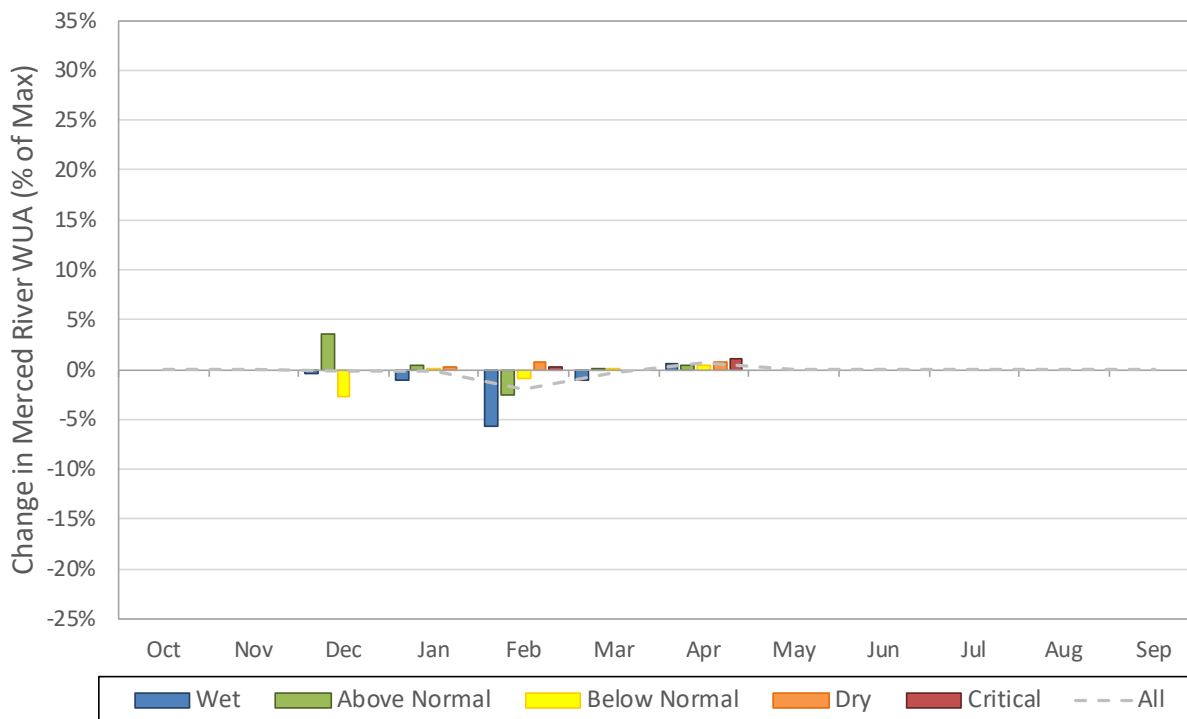
**Figure 20. Steelhead percent change of maximum WUA for the spawning lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 1.**



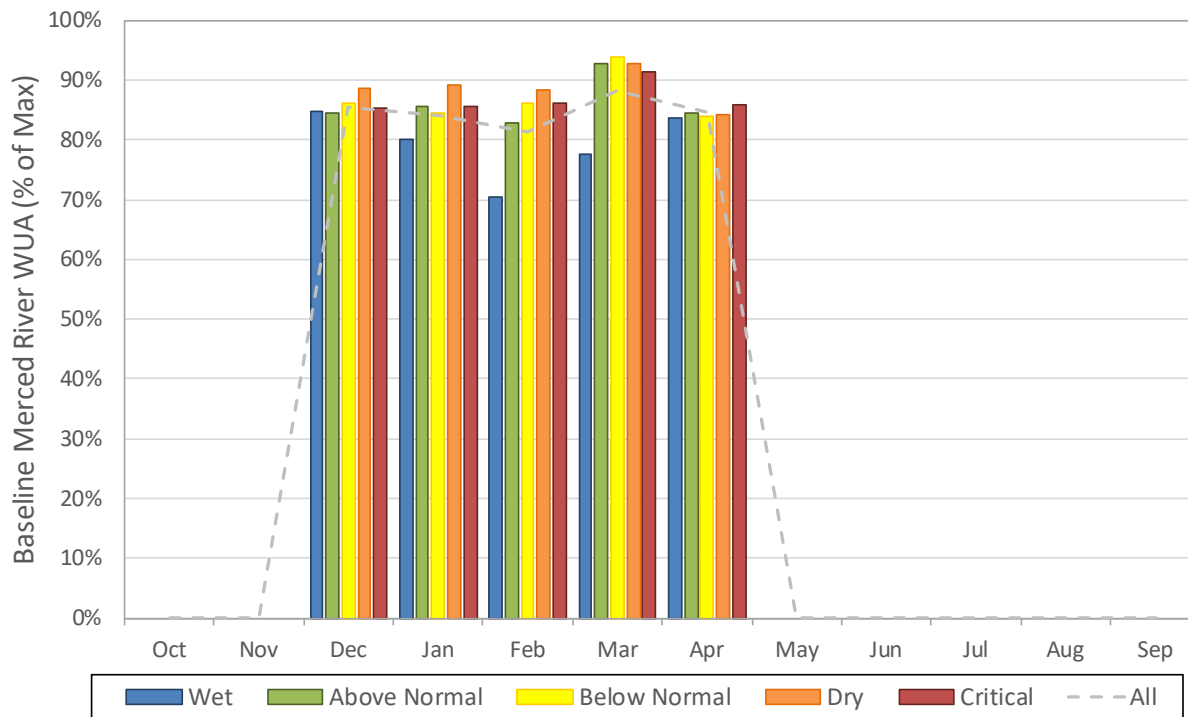
**Figure 21. Steelhead percent of maximum WUA for the spawning lifestage from Baseline Operations in Reach 2.**



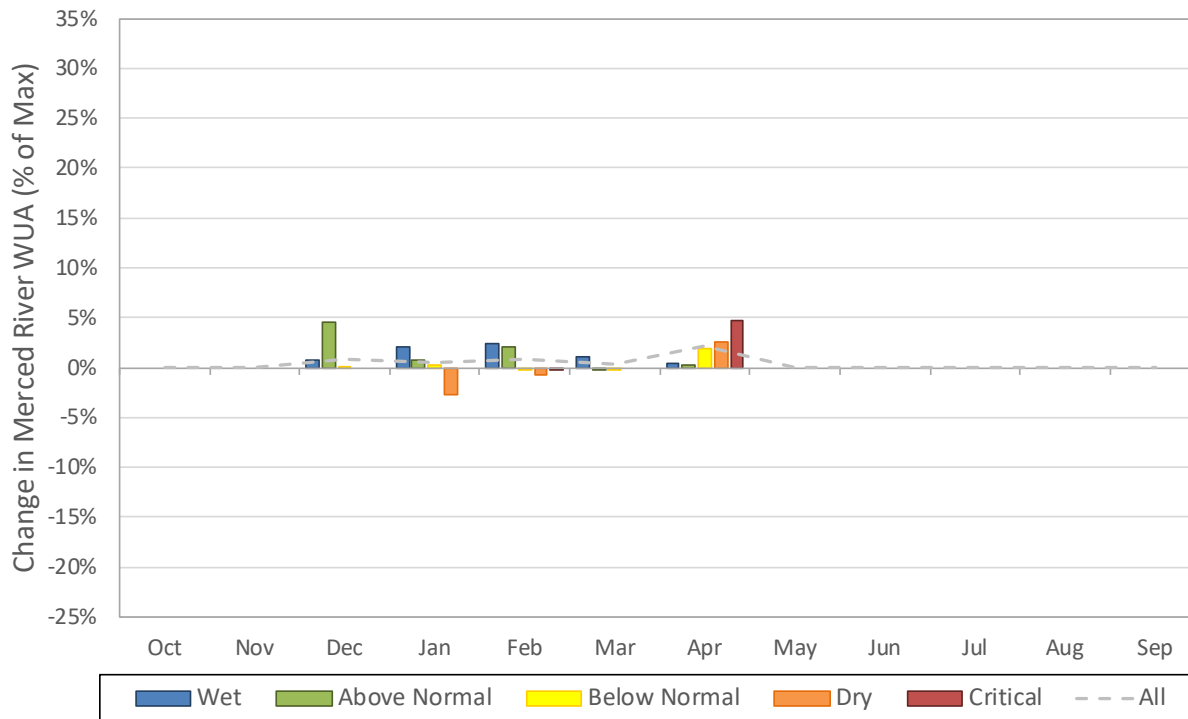
**Figure 22. Steelhead percent change of maximum WUA for the spawning lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 2.**



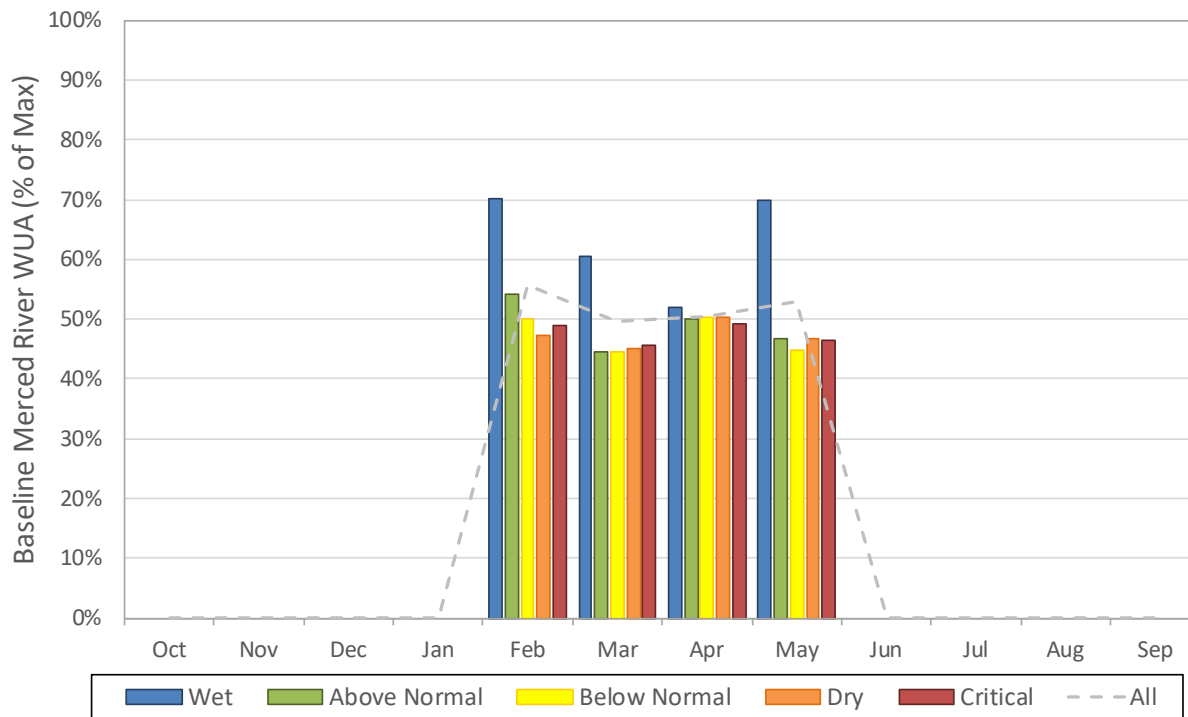
**Figure 23. Steelhead percent of maximum WUA for the spawning lifestage from Baseline Operations in Reach 3.**



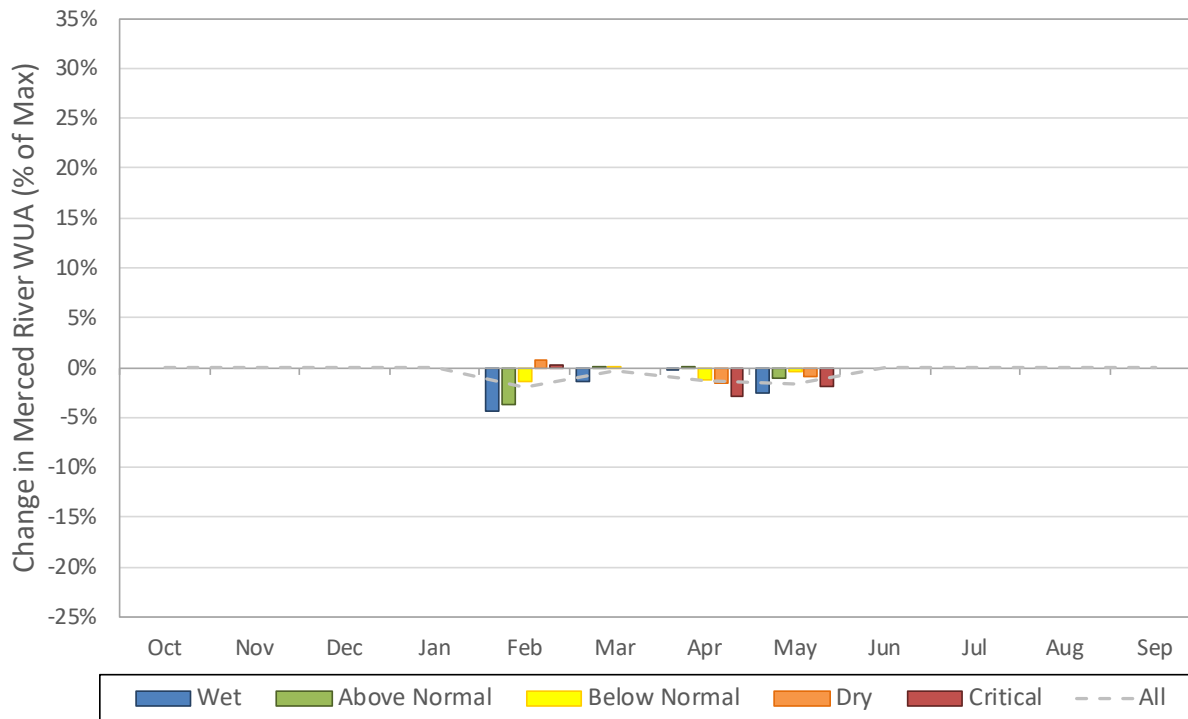
**Figure 24. Steelhead percent change of maximum WUA for the spawning lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 3.**



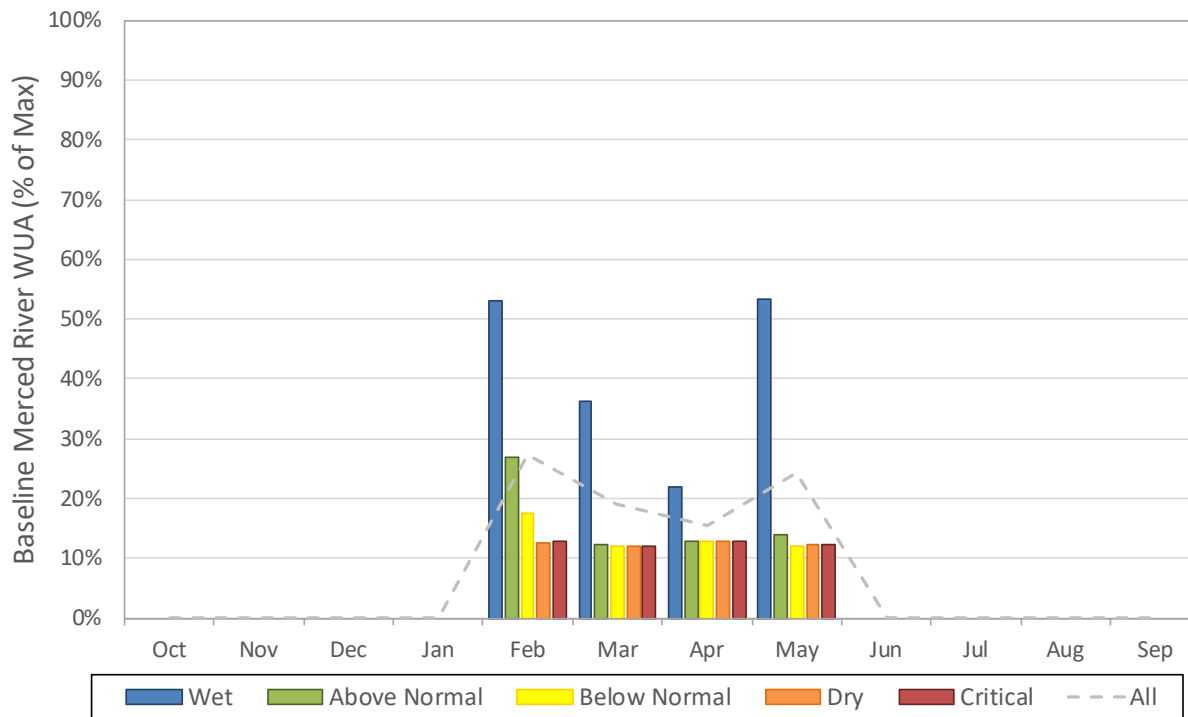
**Figure 25. Steelhead percent of maximum WUA for the fry lifestage from Baseline Operations in Reach 1.**



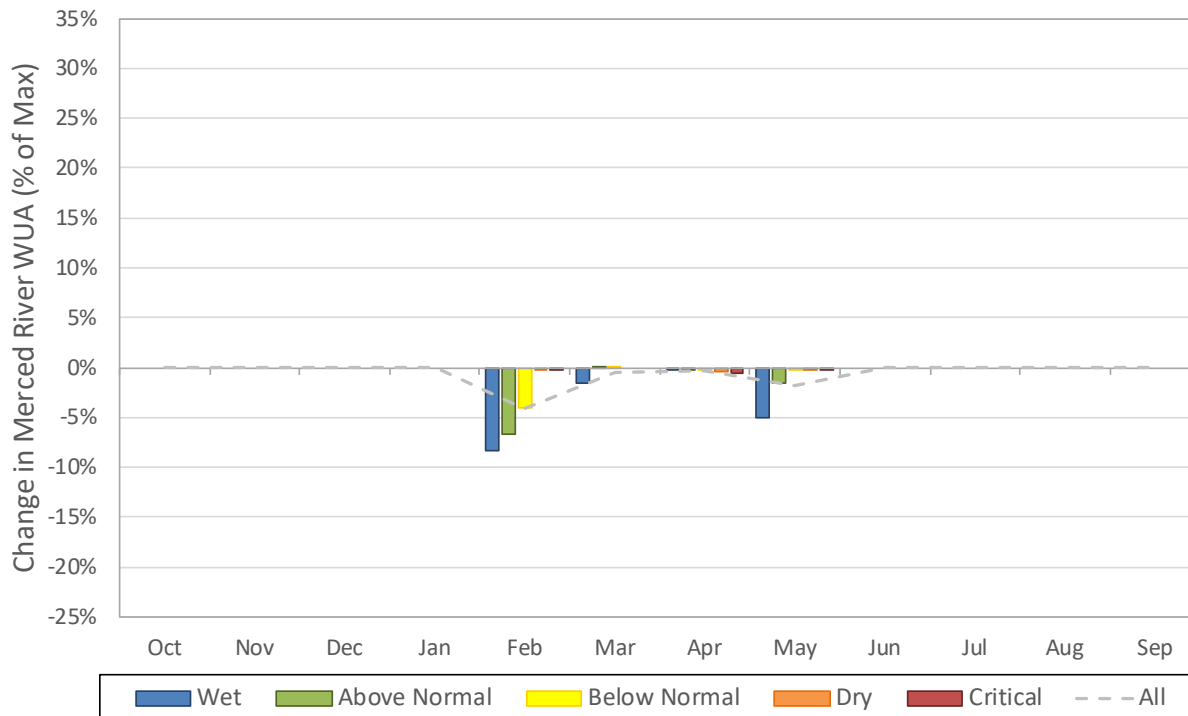
**Figure 26. Steelhead percent change of maximum WUA for the fry lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 1.**



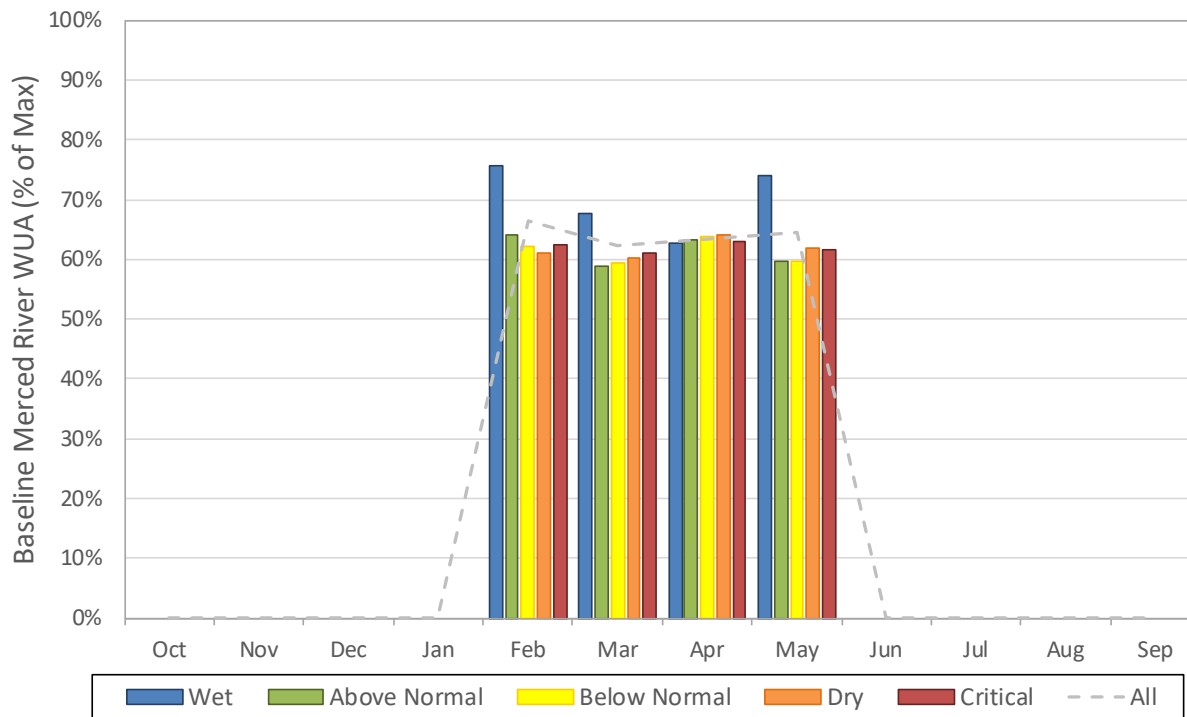
**Figure 27. Steelhead percent of maximum WUA for the fry lifestage from Baseline Operations in Reach 2.**



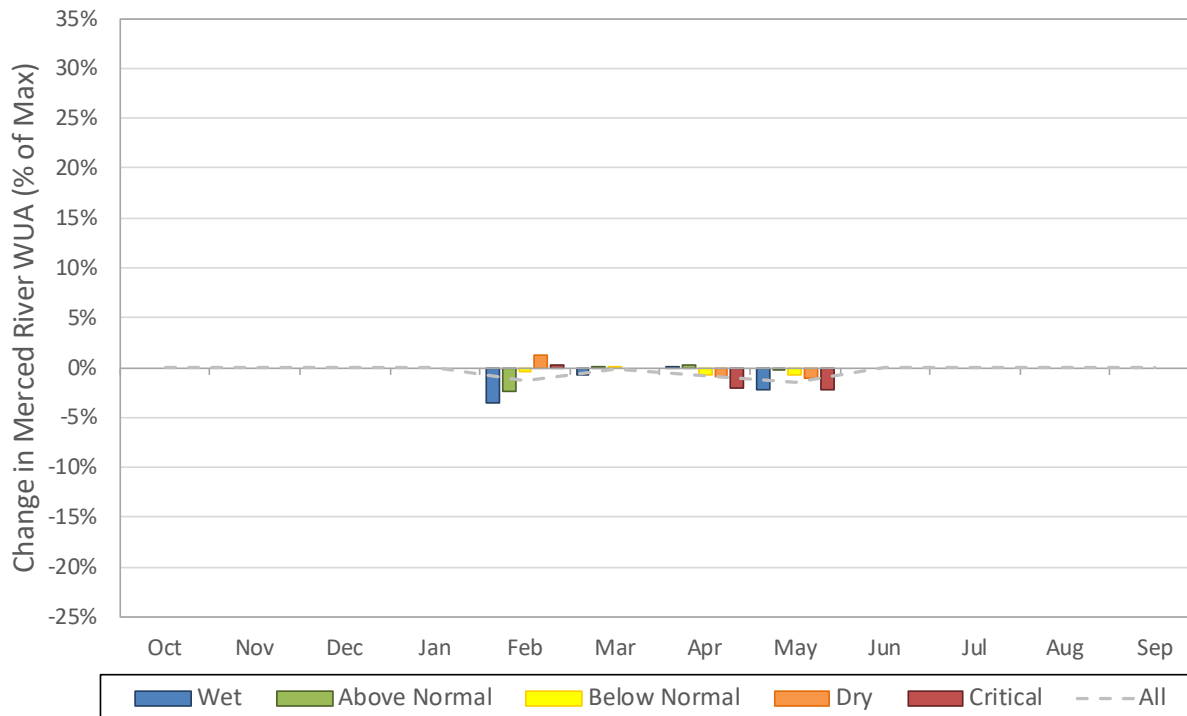
**Figure 28. Steelhead percent change of maximum WUA for the fry lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 2.**



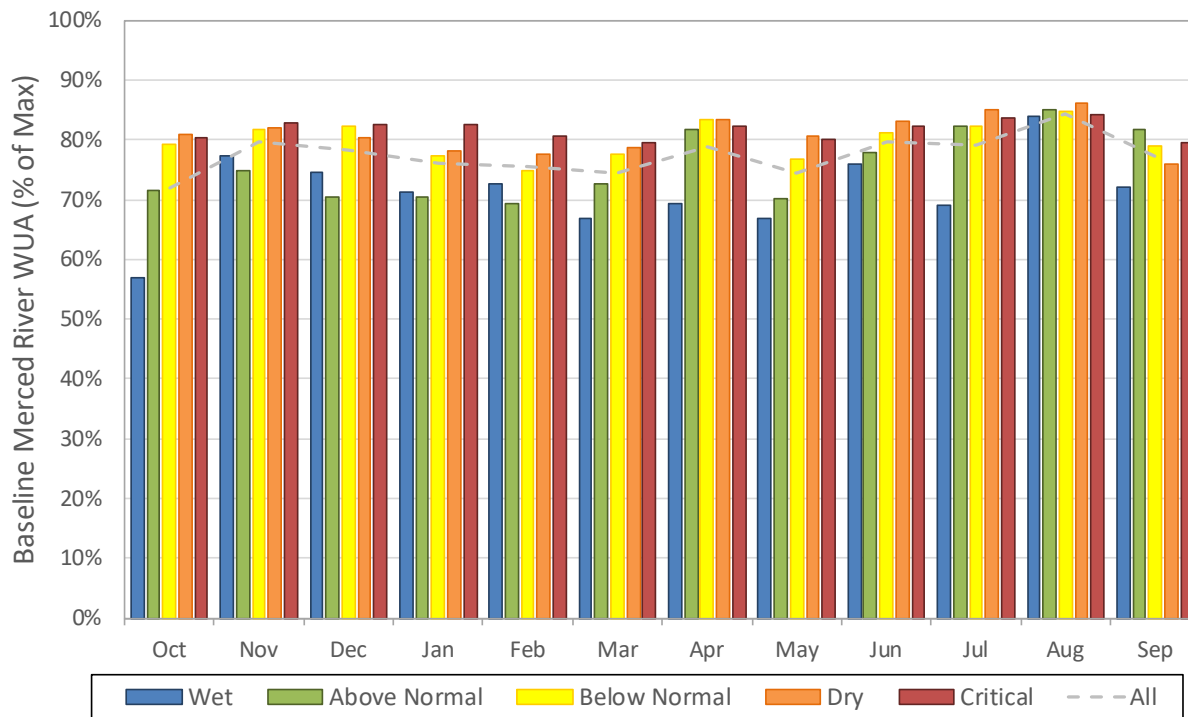
**Figure 29. Steelhead percent of maximum WUA for the fry lifestage from Baseline Operations in Reach 3.**



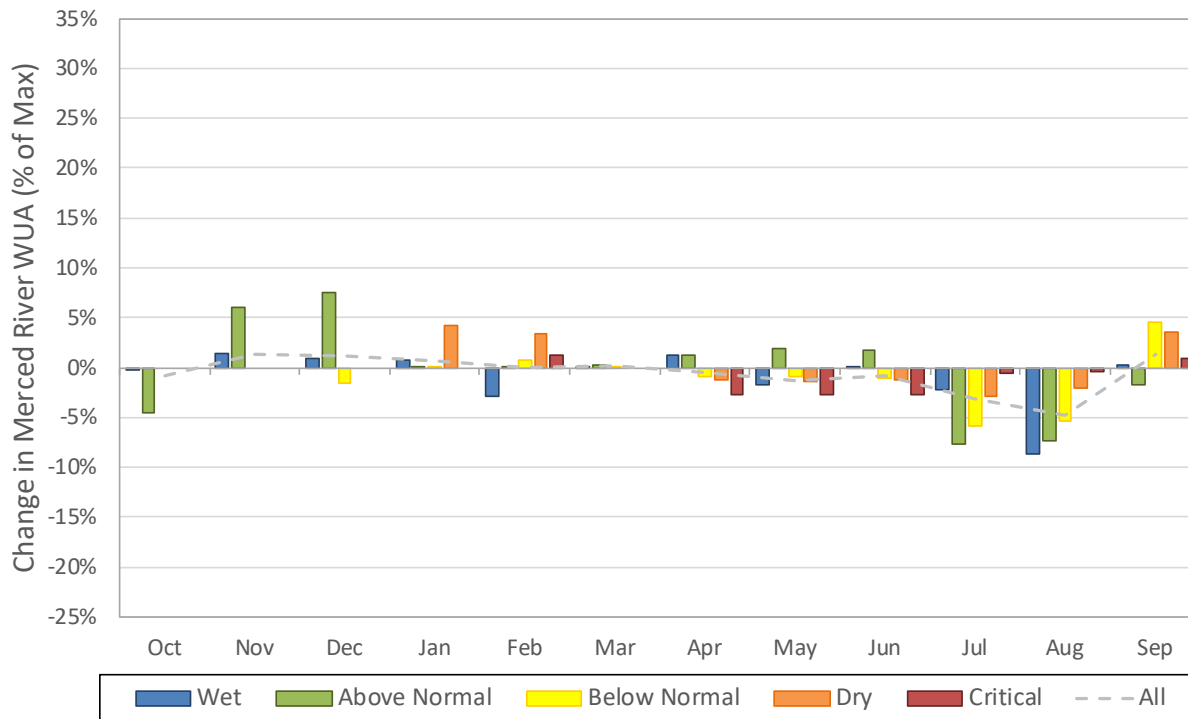
**Figure 30. Steelhead percent change of maximum WUA for the fry lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 3.**



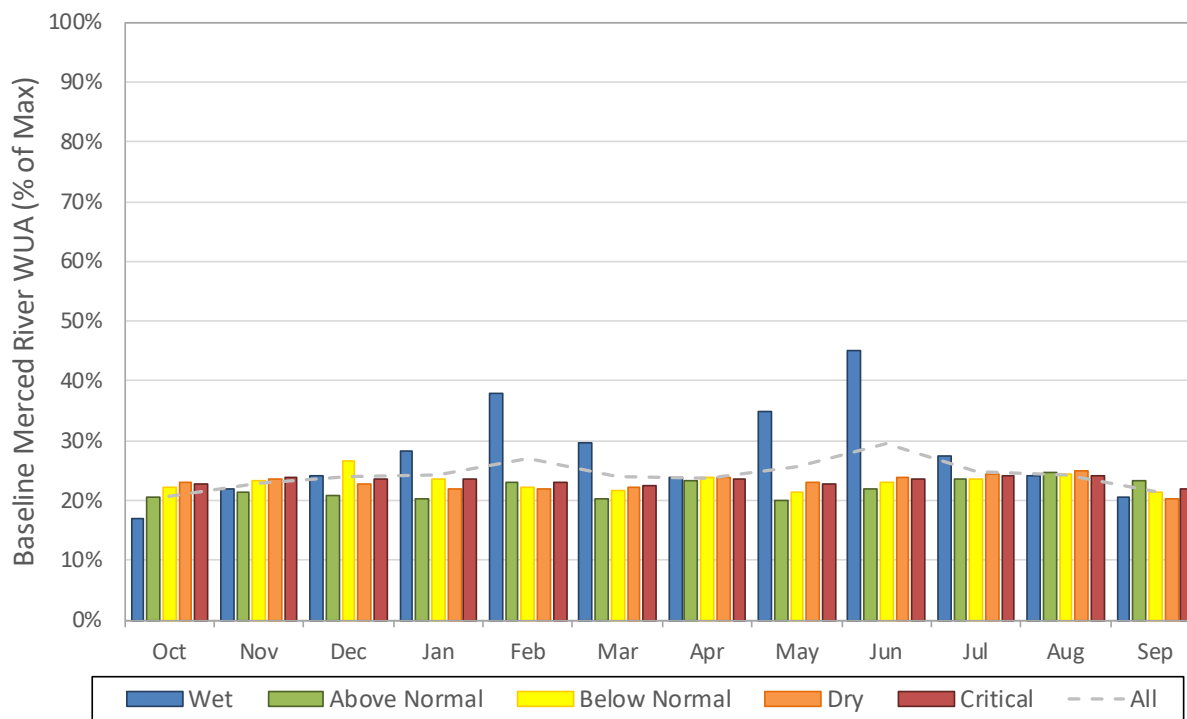
**Figure 31. Steelhead percent of maximum WUA for the juvenile lifestage from Baseline Operations in Reach 1.**



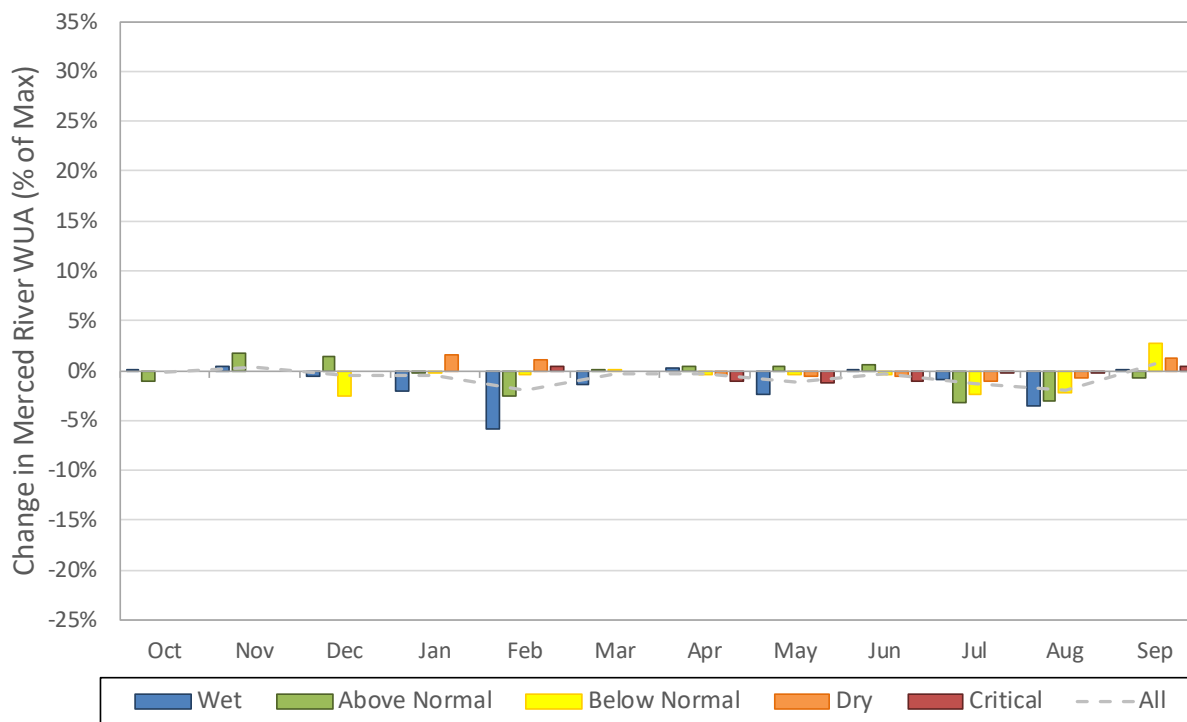
**Figure 32. Steelhead percent change of maximum WUA for the juvenile lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 1.**



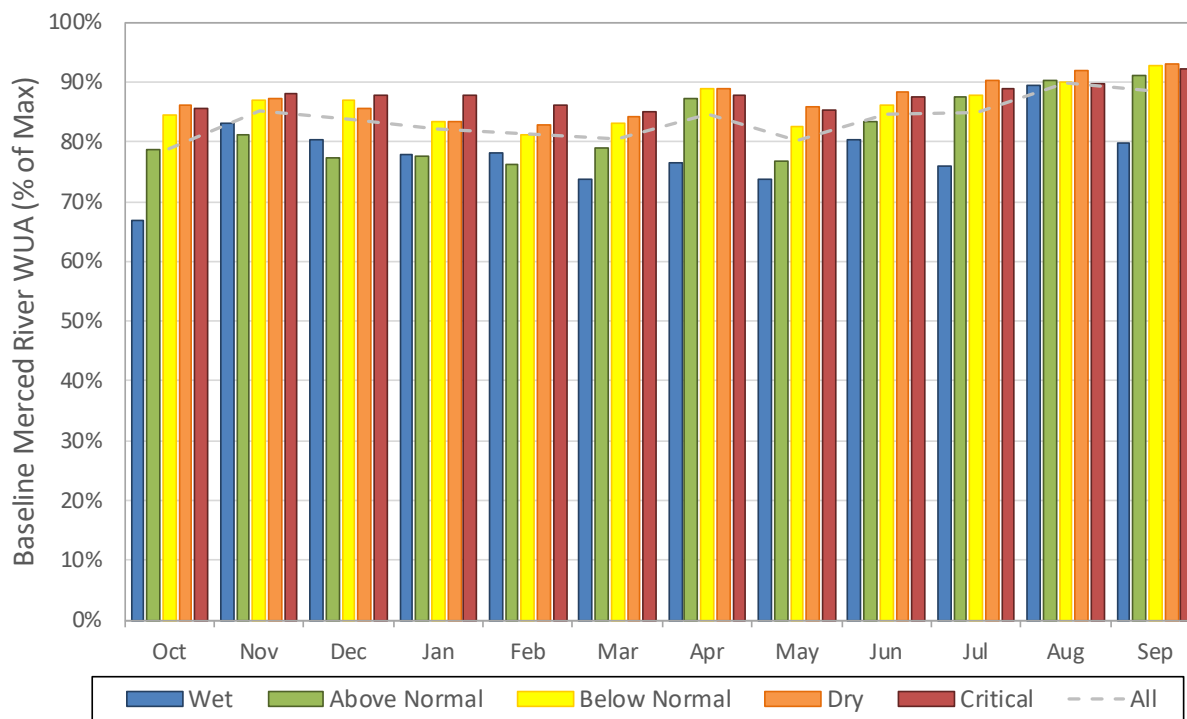
**Figure 33. Steelhead percent of maximum WUA for the juvenile lifestage from Baseline Operations in Reach 2.**



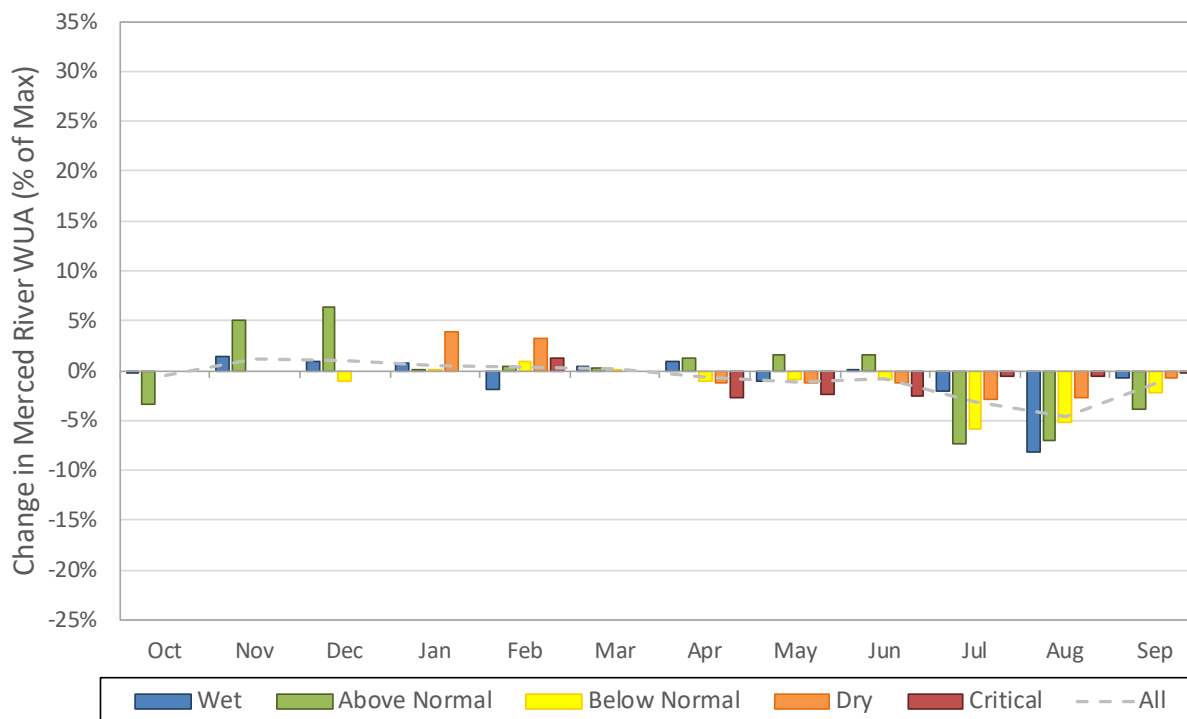
**Figure 34. Steelhead percent change of maximum WUA for the juvenile lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 2.**



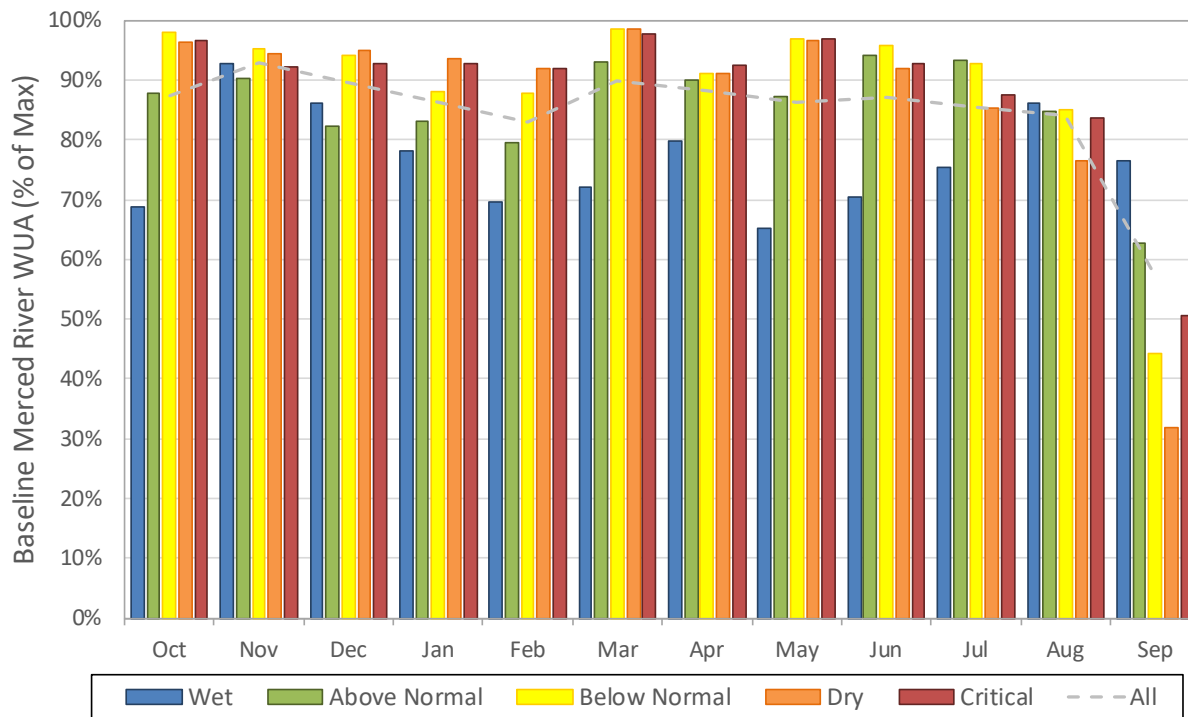
**Figure 35. Steelhead percent of maximum WUA for the juvenile lifestage from Baseline Operations in Reach 3.**



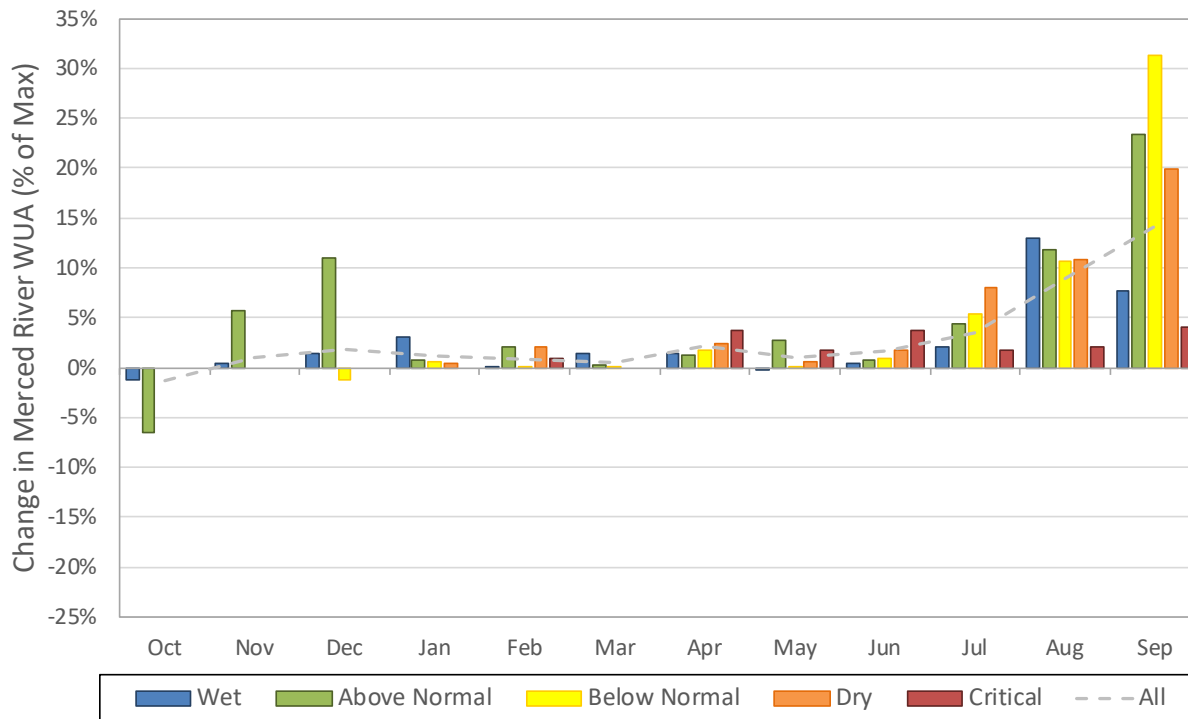
**Figure 36. Steelhead percent change of maximum WUA for the juvenile lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 3.**



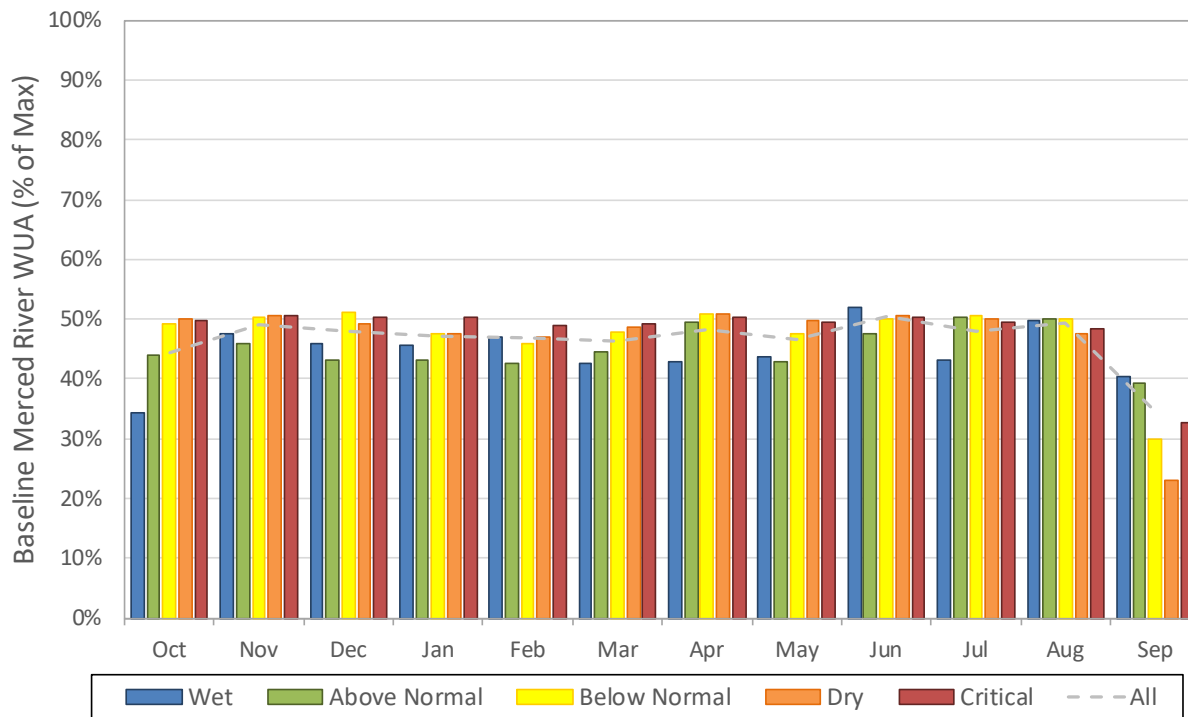
**Figure 37. Steelhead percent of maximum WUA for the adult lifestage from Baseline Operations in Reach 1.**



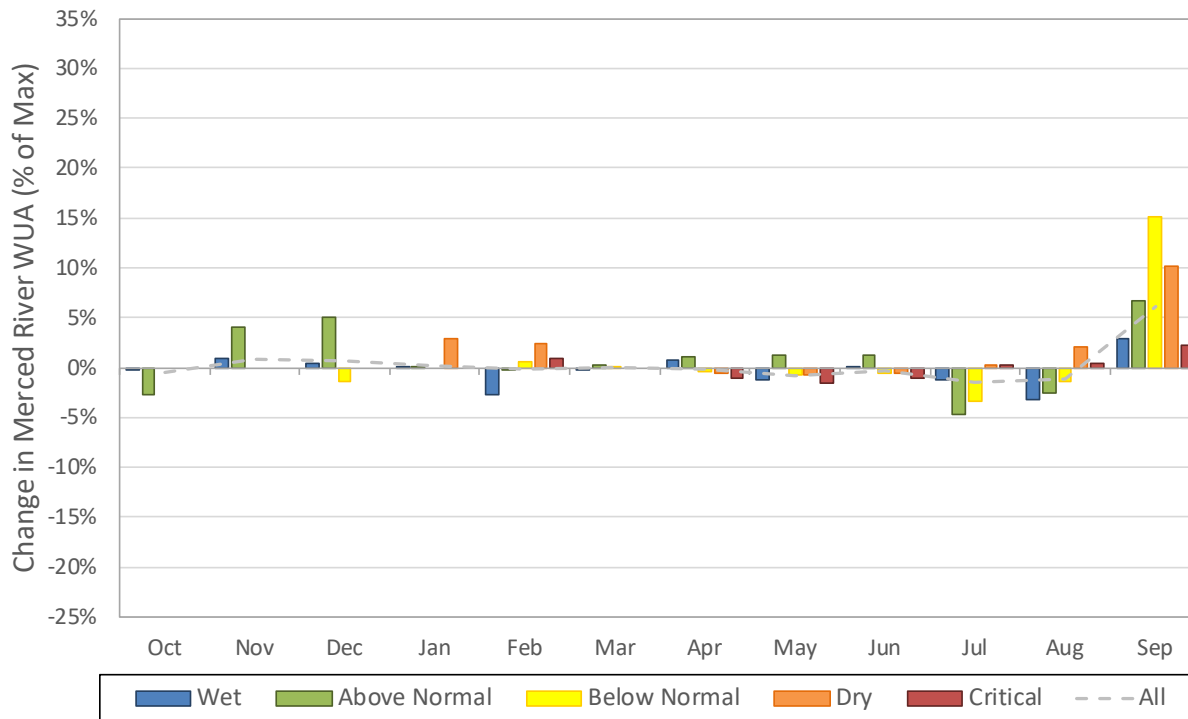
**Figure 38. Steelhead percent change of maximum WUA for the adult lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 1.**



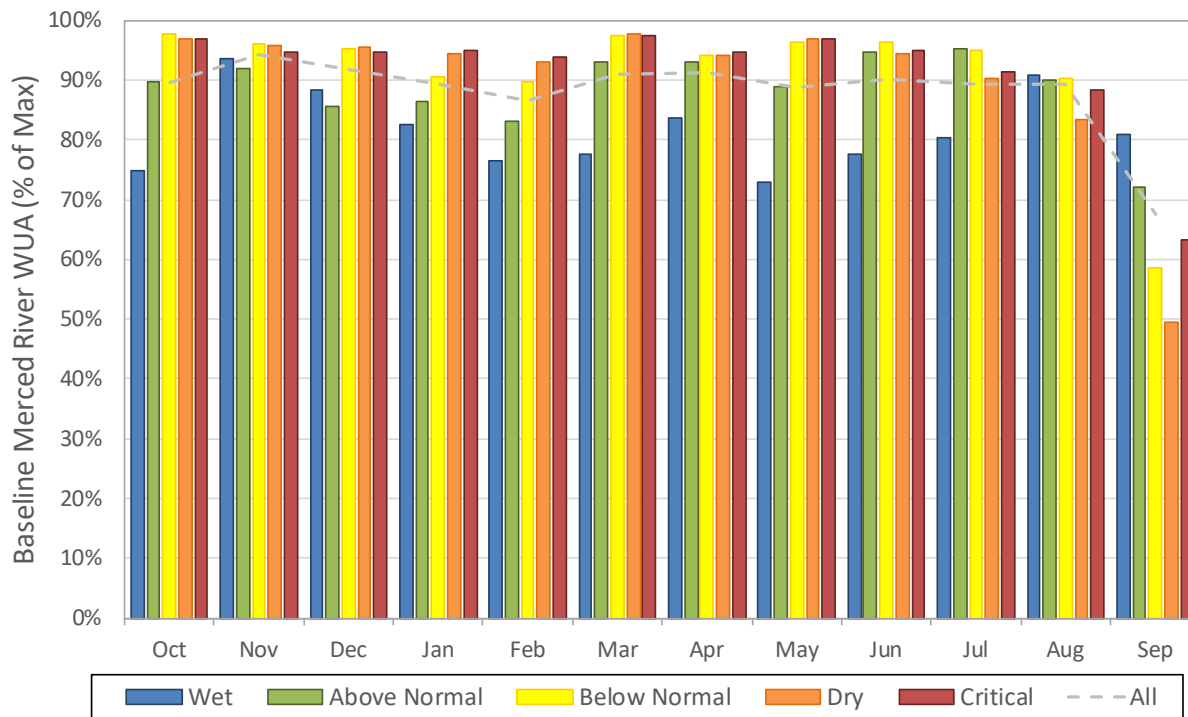
**Figure 39. Steelhead percent of maximum WUA for the adult lifestage from Baseline Operations in Reach 2.**



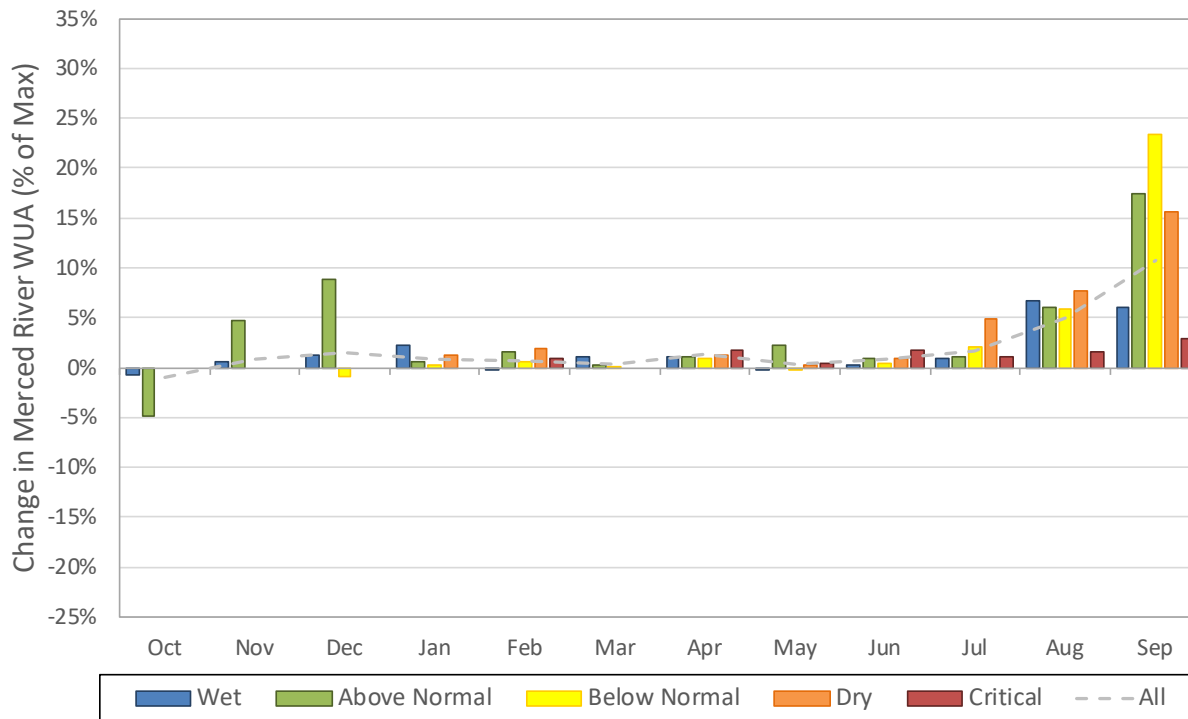
**Figure 40. Steelhead percent change of maximum WUA for the adult lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 2.**



**Figure 41. Steelhead percent of maximum WUA for the adult lifestage from Baseline Operations in Reach 3.**



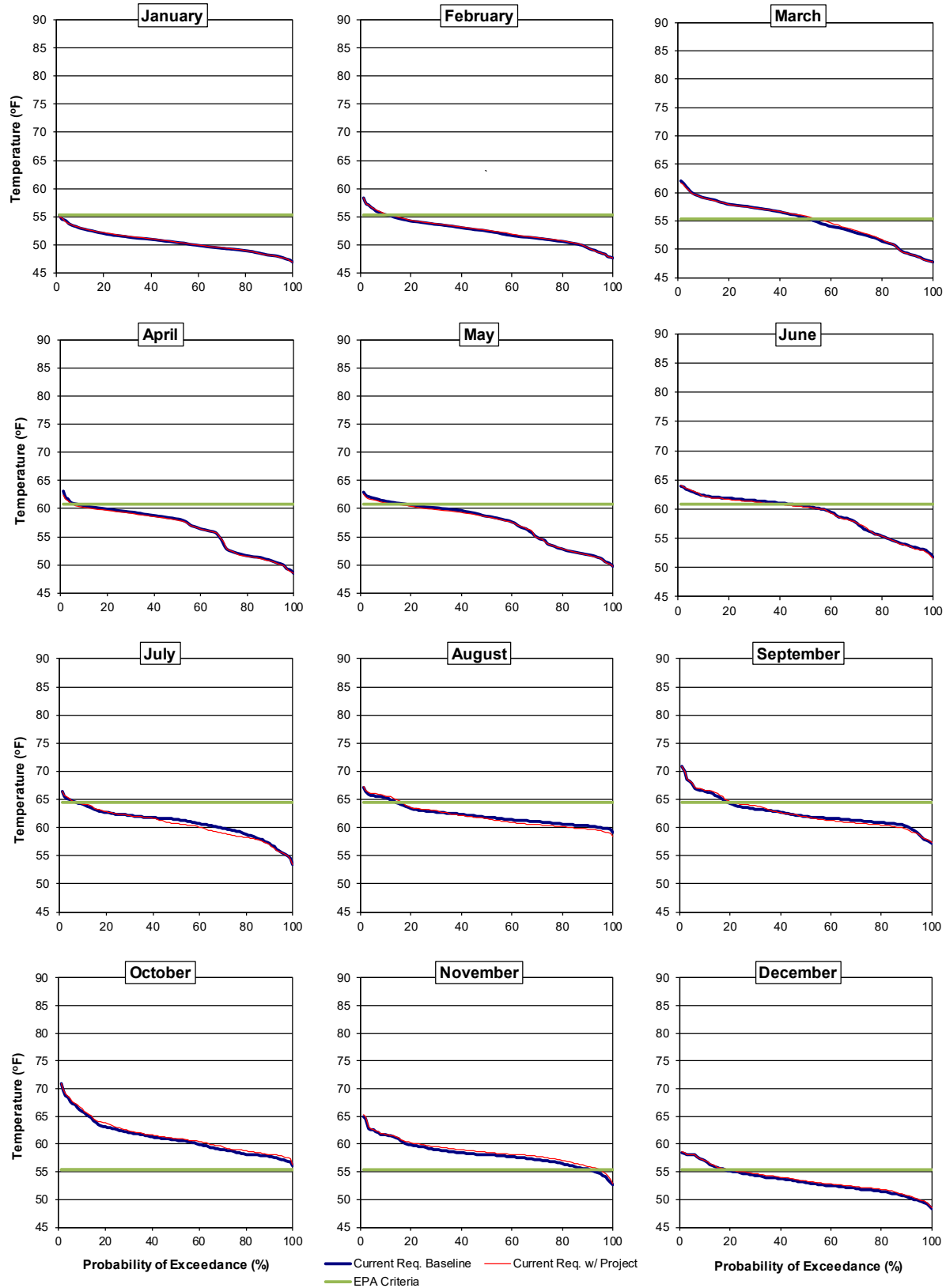
**Figure 42. Steelhead percent change of maximum WUA for the adult lifestage as a result of the Water Transfer Element as compared to the Baseline Operations in Reach 3.**



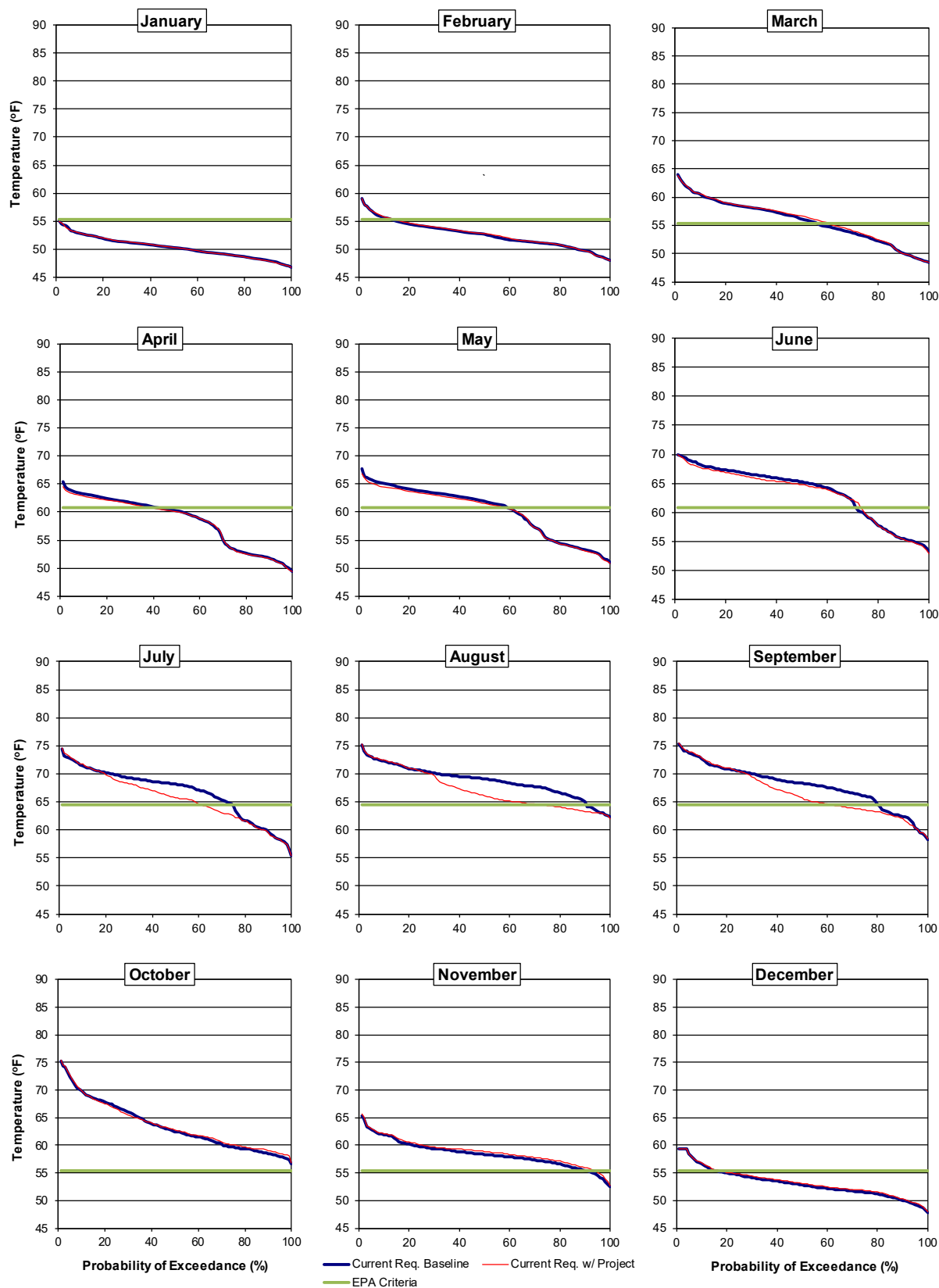
## Water Temperature Exceedance Plots

Monthly Exceedance Probability for 7-Day  
Average of the Daily Maximum (DADM)  
Water Temperature in the Merced River

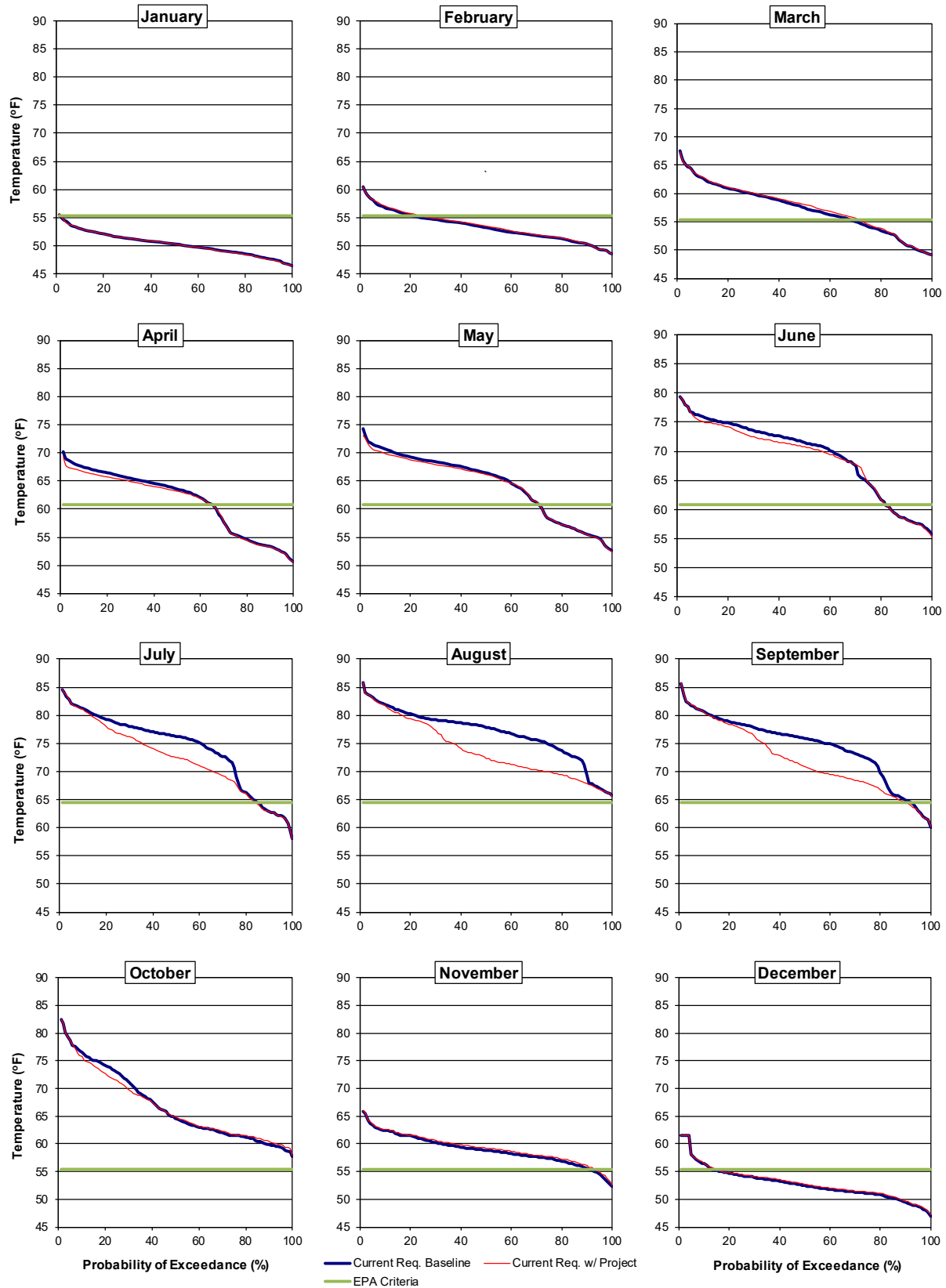
**Figure 1. Monthly Exceedance Probability, Merced River at Crocker-Huffman for 7-DADM Temperature.**



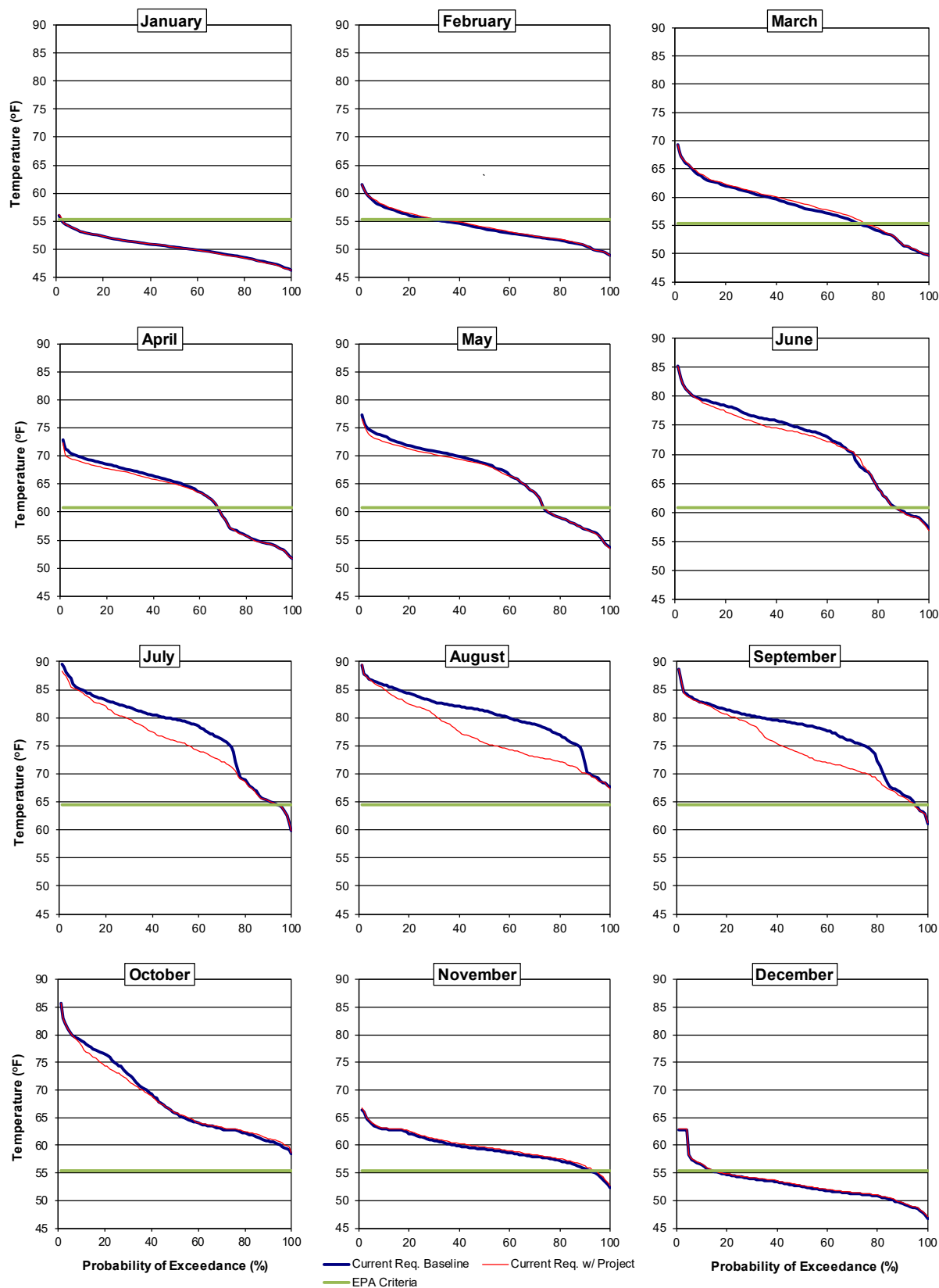
**Figure 2. Monthly Exceedance Probability, Merced River at Snelling for 7-DADM Temperature**



**Figure 3. Monthly Exceedance Probability, Merced River 4 Miles Downstream of Highway 59 Bridge for 7-DADM Temperature**



**Figure 4. Monthly Exceedance Probability, Merced River at Shaffer Bridge for 7-DADM Temperature**



Appendix E  
Cultural Resources Survey and  
Literature Search

# Cultural Resources Review for the Merced Irrigation District Water Resources Management Plan, Merced County, California

PREPARED FOR: Merced Irrigation District

COPY TO: Mark Oliver/CH2M HILL  
Minta Konieczki/CH2M HILL

PREPARED BY: Gloriella Cardenas/CH2M HILL  
Jeremy Hollins/CH2M HILL

DATE: September 20, 2018

## Introduction

This technical memorandum summarizes the findings from the cultural resources archival review and preliminary site visit for the Merced Irrigation District (MID or District) Water Resources Management Plan (WRMP), referred to as the Proposed Program. The preliminary site visit consisted primarily of a built environment “windshield” reconnaissance visit intended to characterize the range and distribution of MID-related built environment resources within the Program Area constructed more than 45 years ago, as well as the general setting of the resources and environs.

This review was completed by CH2M HILL archaeologist Gloriella Cardenas and architectural historian Jeremy Hollins; both meet the qualifications in the Secretary of the Interior’s Professional Qualification Standards.

This assessment includes a review of previous studies, observations from a reconnaissance visit of the Program Area on June 13 and 14, 2018, and management recommendations for additional study.

Attachment 1 contains the Program Area map. Attachment 2 contains representative photographs of MID-related resources and its immediate vicinity.

## Project Description

MID developed and intends to implement an integrated and forward-looking WRMP, which is a strategic plan based on achieving a set of goals including ensuring the continued protection of MID’s water rights in a financially sound manner to support the region’s agricultural economy while promoting the sustainable management of its groundwater resources. The WRMP evaluated a number of needs and options including infrastructure improvements, land use projections, future surface and groundwater demand and use, and associated financial implications. As part of the WRMP development and evaluation of alternatives, the “Balanced Approach Alternative” was selected as the District’s preferred approach given it best aligned with MID’s goals and provides maximum flexibility for future decision making. The Balanced Approach Alternative, in addition to other proposed activities that further support the District’s overall goals (such as lining unlined canals, constructing an in-river pumping facility downstream of Shaffer, and relocating existing open channel canals or pipelines from the center of various properties to the perimeter), is explained in the WRMP.

Implementation of the Proposed Program would include projects and actions within the five elements identified in the WRMP (CH2M HILL, 2019):

- System improvements – various projects to allow for full implementation of the capital improvement projects, modernization of the system, and actions/projects required to meet regulatory requirements
- Class II to Class I conversion – one-time conversion of customers desiring conversion while not expanding the service area
- Annexations – no annexations will be considered
- Water transfers – transfers of water when District water is available to assist in meeting in-basin or out-of-basin demands
- Water rates – water rates within current Proposition 218 authority sufficient to support proposed system improvements given assumed water transfer revenue

## Environmental Setting and Current Land Use

Merced County is a generally rural, agricultural county with a population density of 132.2 people per square mile, well below the state average of 249 inhabitants per square mile (U.S. Census Bureau, 2017). Most of the county is designated for agriculture.

The Program Area is in a predominantly agricultural setting with a few residences, where existing natural habitats have been largely displaced by agricultural and associated activities, such as row crops, vineyards, and orchards. Other major land uses include cattle grazing and ranching areas. As depicted on historic maps from the nineteenth and early twentieth centuries, flood events have caused changes in the terrain and in the courses of streams, creeks, and other waterways.

The Program Area is located within the San Joaquin Valley portion of the Great Valley Geomorphic Province, which is a northwest-trending valley bordered by the Sierra Nevada Mountains to the east and south, the Coast Ranges to the west, and the Klamath Mountains to the north (EDAW, 2009). This province consists of a deep, sediment-filled, asymmetric structural trough that extends over 400 miles from north to south and averages 50 to 80 miles wide. The trough has been filled with a thick sequence of predominantly alluvial sediments ranging in age from Jurassic to Recent (Sacramento Area Council of Governments, 2012).

## Geology

The Program Area is located on the southeastern side of the Great (Central) Valley Physiographic Province. The Great Valley is a relatively flat alluvial plain approximately 400 miles long and 50 miles wide that trends northwest to southeast (Fenneman, 1931). It is a structural trough that evolved from the late Jurassic Period to the Paleocene (150 to 40 million years ago [mya]).

Sediments in the area were derived from the neighboring Coast Ranges and the Sierra Nevada Mountains. By the late Pliocene (2 to 3 mya), subaerial depositional conditions prevailed, and Sierra Nevada-derived sediments were deposited in the basin east of the valley axis. The size and elevation of the Sierra Nevada Mountains relative to the Coast Ranges dictate that the alluvial fans from the Sierra are vastly larger than those from the Coast Ranges; and therefore, they dominate the geology of the Great Valley.

The current ground surface sediments are primarily from the Holocene Epoch; however, various formations from the Pleistocene Epochs are also present.

Cultural resources deposits are supported primarily in Holocene formations due to the age of the formation and known human occupation in the area. Holocene sediments are considered to be recent in

geological terms, generally less than 10,000 years old. Holocene alluvium consists of sand, silt, and gravel associated with floodplains and low terraces.

## Cultural Context

In Central California, cultural resources minimally represent 12,000 years of prehistory. Archaeologists have reconstructed general trends of prehistory in the Central Valley of California, which extends to the Siskiyou Mountains in the north and as far south as the Tehachapi Mountains (Rosenthal et al., 2007).

Since the first inquiry regarding Native American cultural groups, numerous classifications and chronological models have been created for California. For Central California, the classification for three cultural horizons for this region was incorporated as part of the Central California Taxonomic System. Below is a brief summary of the cultural periods for the MID region.

### Prehistoric Background

The earliest sites in Central California are Fluted Point Tradition and Western Pluvial Lakes Tradition sites at Tracy, Tulare, and Buena Vista Lakes. These sites are few in number and remain undated by scientific means, but the assemblage types indicate probable ages of 11,500 to 7,500 years (Moratto, 2004). For the entire Central Valley region, there exists to date only three known sites from the early Paleoindian Period (California Energy Commission, 2010). Overall, evidence for Paleoindian occupation in the Central Valley is currently limited and has many gaps. The archaeological record requires additional data to better understand this chronological sequence.

### Historic Background

Recorded history in Central California divides into three periods: the Spanish Period (1769–1821), the Mexican Period (1821–1848), and the American Period (1848–present).

The Spanish Period spans 1769 to 1822, beginning with the founding of the first mission, the Mission San Diego de Alcalá in 1769. The first recorded exploration of the southern San Joaquin Valley was in 1772, by Pedro Fages, whose written record describes the Valley as “a labyrinth of lakes and tulares in the middle of a great plain” (Smith, 2004). The primary purpose of the Fages expedition was to find an overland route to Point Reyes. The Spanish Anza Expedition of 1775 gave the name to Lake Merced under the Spanish moniker *Nuestra Señora de la Merced*. The next important exploration was led by Lieutenant Gabriel Moraga in 1806. Moraga traveled from San Juan Bautista to the interior to survey for a suitable location to construct a mission (Muñoz et al., 1946). It was during this expedition that Father Francisco Garcés first documented in greater detail the valley, with observations regarding native villages, wildlife, and the general environs. Additional explorations by Moraga in 1808 and 1810 failed to procure a suitable mission site (Cook, 1960).

Spanish colonial occupation of Alta California ended with the 1821 Mexican takeover. Between 1833 and 1845, the Mexican government began awarding large land grants in the Sacramento-San Joaquin Valley region.

John Marshall’s gold discovery in January 1848 triggered the migration boom of thousands of eastern United States and European settlers to come to California. During the 1850s, people began settling in the Central Valley after realizing that they could make a better living supplying mining camps with meat, horses, and other provisions, than by mining.

Later, in 1855, Merced County was formed and kept its Spanish-given name (Gudde, 1969). The mining boom of the 1850s drove prospectors through the area as a travel corridor to the Sierra Nevada Mountains (Arrington, 2009). Although some settlers remained in the region, with small communities springing up alongside waterways, constant floods punctuated with droughts prevented sustained continued occupation. Because of flood damage and destruction, the Program Area does not appear to

have maintained long periods of agricultural or farm use, until large-scale irrigation occurred in the late nineteenth century.

Following the Gold Rush, prospectors started mining other minerals in Merced County, including large quantities of copper, and the area's rivers and tributaries were used for dredge mining. The City of Merced was founded in 1872 as a result of the mining boom, and after the Central Pacific Railroad's arrival, agricultural-related businesses grew, using the railroad for freight transport. Merced replaced Snelling as the county seat, and a courthouse was built in 1875 (Outcalt, 1925).

MID began with the Robla Canal Company, which was acquired by the Farmers Canal Company in 1873, and later was purchased by banker and railroad magnets C.H. Huffman and Charles F. Crocker, who founded the Merced Canal and Irrigation Company in 1888 (MID, 2017). Losses in profitability led to the sale of this system. With the Merced County Farm Bureau taking point, the campaign to form an irrigation district began, and MID was founded in 1919 (MID, 2017).

The District quickly expanded past Huffman and Crocker's holdings, and by 1921, planning was underway on the original Exchequer Dam (eventually replaced by 1967 with the current New Exchequer Dam). The original dam was completed in 1926, and President Calvin Coolidge celebrated the event by presenting MID with a pressed ceremonial key. Following World War II, the District rapidly expanded its water and power holdings, leading to an increased network of canals and ditches, and new and renovated dams and lakes including the McSwain Dam, Lake McClure, and Yosemite Lake (McSwain, 1977).

Improved irrigation allowed a reduction in landholdings and formed the basis for new industries. Large ranches from the late 1800s were broken into smaller parcels for dairies, orchards, vineyards, and row crops. These were better suited to farmers able to devote a few acres and put considerable effort into them rather than putting effort into large grain fields.

## Literature Search

A cultural resources records search of the Program Area was conducted by the Central California Information Center (CCIC) of the California Historical Resource Information System. CCIC houses all records of known cultural resources in Merced, Alpine, Stanislaus, San Joaquin, Calaveras, and Tuolumne Counties, as well as records of National Historic Landmarks, California Historical Landmarks, General Land Office (GLO) plats, National Register of Historic Places (NRHP), California Register of Historical Resources (CRHR), and other historical archives and information. The area of the records search coincided with MID, which covered all or parts of 19 U.S. Geological Survey (USGS) 7.5-foot topographic quadrangles: Arena, Atwater, Bliss Ranch, Cressey, El Nido, Gustine, Le Grand, Merced Falls, Planada, Sandy Mush, Santa Rita Bridge, Snelling, Stevinson, Turlock, Turlock Lake, Turner, Ranch, Winton, and Yosemite.

A total of six previously recorded historic-period resources are within the Program Area; site records were provided for all recorded cultural resources. Table 1 summarizes the resources located within the Program Area and NRHP/CRHR eligibility recommendations by previous cultural resources investigators.

Fourteen previous cultural resources investigations have been conducted covering an approximate 10 percent of the Program Area. Of these studies, only three have been conducted within the last 10 years, making the other investigations no longer sound and warranting new study. This review has resulted in a finding that most of the Program Area has not yet been subjected to intensive, systematic cultural resources surveys. Therefore, many additional unidentified cultural resources, including prehistoric and historic archaeological sites, historic buildings and structures, and other cultural properties and historical districts, are undoubtedly present. Other known cultural resources might not have been incorporated into the CCIC database.

Table 1. Cultural Sites within the Program Area

Site Number	Site Type	Site Description	NRHP or CRHR Evaluation/Year
P-24-000697	Historic	Yamato Colony	Eligible for CRHR/1980
P-24-001882	Historic	Merced Lateral	Not eligible/2000
P-24-001883	Historic	Robinson Lateral	Not eligible/2000
P-24-001887	Historic	Le Grand Canal	Not eligible/2000
P-24-001895	Historic	Lake Yosemite Regional Park	Eligible for NRHP/2009
P-24-001909	Historic	Merced Irrigation District	Proposed eligible for NRHP/2010

Source: CHRIS CCIC, 2017.

The CCIC also noted that many canals, laterals, and other historic features shown on the CCIC site record maps have not yet been recorded or evaluated.

## Historic Map Review

A GLO survey plat for 1854 of the Program Area was provided by CCIC. The plat depicts land surveys resulting in USGS sections; however, little to no land development had yet occurred (GLO, 1854). The significance of GLO plats to modern cultural resources management in California is that the plats, which often date to the earliest years of the Gold Rush, record many historical sites and features that were existent in those times; and they often identify the owner of such sites and features. These sites and features might still be discernible by a professional archaeologist, which potentially enables archaeologists and historians to correlate archaeological features and structures to specific people, dates, and events in history.

Based on this review, it was surmised that prior to extensive development of the irrigation system, the general area was largely in disuse and lacked development; and maps indicate the presence and ubiquity of unnamed creeks throughout the Program Area and its vicinity (GLO, 1854; USGS, 1914; USGS, 1918). The 1914 historic Merced and 1918 historic Planada USGS maps are the first to show land use in the form of private property, roads (historic Merced and Snelling Roads), Merced Hospital, utilities, railroads, schools, Bellevue Ranch, canals, pipelines, and other elements of the Merced and Planada communities.

## Defining Cultural Resources

In evaluating a project's potential to adversely affect cultural resources, the analysis focuses on whether impacts will occur on historical resources or unique archaeological resources. Historical properties are those listed on or eligible for listing on the NRHP (36 *Code of Federal Regulations* [CFR] 800.16(l)(1)). A property may be listed on the NRHP if it meets any of the criteria provided in the NRHP regulations (36 CFR 60.4) and retains integrity. Typically, properties must also be at least 50 years old, unless the property possesses exceptional significance (36 CFR 60.4(d)).

Determining the NRHP eligibility of a site or district is guided by the specific legal context of the site's significance, as set out in 36 CFR 60.4 (see below). The National Historic Preservation Act authorizes the Secretary of the Interior to maintain and expand a national register (the NRHP) of districts, sites, buildings, structures, and objects of significance in American history, architecture, archaeology, engineering, and culture. A property may be eligible for listing in the NRHP if it meets the criteria for evaluation defined in 36 CFR 60.4, as follows:

*The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:*

- A. Are associated with events that have made a significant contribution to the broad patterns of our history;*
- B. Are associated with the lives of persons significant in our past;*
- C. Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; and*
- D. Have yielded, or may be likely to yield, information important in prehistory or history.*

CEQA offers directives regarding impacts on historical resources and unique archaeological resources. The CEQA Guidelines define a "historical resource" to include more than one category of resources. The first category is "resource(s) listed or eligible for listing on the California Register of Historical Resources (CRHR)" (*California Code of Regulations* [CCR] Section 15064.5(a)(1); see also PRC §5024.1 and §21084.1.). A historical resource may be eligible for inclusion in the CRHR, as determined by the State Historical Resources Commission or the lead agency, if the resource:

- 1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; or
- 2. Is associated with the lives of persons important in our past; or
- 3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
- 4. Has yielded, or may be likely to yield, information important in prehistory or history.

In addition, a resource is presumed to constitute a "historical resource" if it is included in a "local register of historical resources" unless "the preponderance of evidence demonstrates that it is not historically or culturally significant" (CCR §15064.5(a)(2)).

CEQA and the CEQA Guidelines also require consideration of unique archaeological sites (PRC §21083.2, 14 CCR 15064.5). A "unique archaeological resource" is defined in CEQA (PRC §21083.2(g)) as:

*"...an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:*

- (1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.*

*(2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.*

*(3) Is directly associated with a scientifically recognized important prehistoric or historic event or person."*

Additionally, with the introduction of Assembly Bill 52 on September 27, 2016, CEQA adopted modifications to Appendix G to address tribal cultural resources. Tribal cultural resources are defined as follows:

- Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either determined to be eligible for inclusion in the California Register of Historical Resources or are included in a local register of historical resources, as defined in §5020.1(k) and PRC 21074.
- A resource determined by the lead agency, at its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in §5024.1(c). These would be a cultural landscape that meets the criteria of subdivision is a tribal cultural resource to the extent that the landscape is geographically defined in terms of the size and scope of the landscape, a historical resource, a unique archaeological resource, or a "non-unique" archaeological resource, as defined in §21084.1 and §21083.2.

## Program Area Reconnaissance Site Visit

A preliminary site visit was conducted by CH2M HILL on June 13 and 14, 2018, for the purpose of gathering a preliminary characteristic of the Program Area. The preliminary site visit consisted primarily of a built environment "windshield" reconnaissance visit intended to characterize the range and distribution of MID-related built environment resources within the Program Area constructed more than 45 years ago, as well as the general setting of the resources and environs.

The primary land use of the area was observed to be agricultural in nature within southeastern, southwestern, and northwestern quadrants of the Program Area; the northeast appeared to be dominated by ranching and secondarily by recreation. The northeastern quadrant, near the community of Snelling, contained visible, abandoned mining activities as well as railroad features that are no longer in use. Evidence of homesteading and older ranching activities were observed in the immediate vicinity of the Proposed Program.

In addition, numerous historic-era irrigation and power-related resources were identified within the Program Area that are associated with MID. These resources included a variety of irrigation property types constructed throughout the early to mid-twentieth century. Ultimately, they can be categorized as major and minor features, as listed below.

### Major Features

- Concrete-lined and unlined canals, laterals, drains, and ditches (for example, El Nido, Edendale, Northside, and Main Canals; Henderson and Bradley Laterals; Six Mile Drain)
- Dams and powerhouses (for example, McSwain, Crocker-Huffman, and New Exchequer Dams)
- Lakes and control towers (for example, Yosemite Lake, Lake McClure)
- Water Tunnels (for example, Main Canal Tunnel No. 1)
- Flumes (for example, Main Ashe Flume)
- Pipelines

### Minor Features

- Flow control devices
- Pumping structures
- Gates
- Weirs
- Headboxes and intake structures

Although much of the Program Area is within agricultural, residential, and other use areas, areas that have not been subject to development or disturbance remain. All of Merced County contains a large network of artificial and natural waterways marking the region rich for natural resources, of specific importance to prehistoric land use for Native Americans.

Attachment 2 contains representative photographs of MID and the immediate vicinity.

### Potential for Buried Archaeological Resources

The potential of an area to contain buried resources can often be assessed by an examination of an area's topography, soil types, and proximity to water. Buried sites are found in many contexts, especially alluvial fans and stream terraces. Buried sites are more likely in certain locations near water courses where deposition is deep or where previous studies have shown there is a higher density of sites or where there is ongoing deposition. All of these conditions were taken into account to assess the sensitivity for sub-surface archaeological deposits.

Merced County has been largely used for agricultural activities; secondary or lesser land use has included mining, recreation, residential, and infrastructure. The prehistoric conditions of the study area would typically contribute to a moderate sensitivity for the presence of buried, intact cultural resources. Because ground-disturbing activities would be conducted not only in known disturbed zones but within native, undisturbed sediments, there is a moderate probability for affect potential buried, intact archaeological resources.

### Management Considerations

The primary goal of a pedestrian survey is to identify any cultural resources located within the project sites associated with implementation of the Proposed Program so that effects of the Proposed Program can be assessed. To accomplish this goal, background information must be examined and assessed, and a field survey must be conducted to identify cultural remains. The fundamental goals of an intensive pedestrian survey are to identify and document previously unrecorded cultural resources and analyze cultural materials, not only to better characterize potential project effects, but also to attempt to confirm or elaborate on our current understanding of the prehistory and history of the region. From a management perspective, the ability of specific resources to address research questions provides a basis to evaluate CRHR and NRHP eligibility.

The Program Area has not been subject to formal cultural pedestrian surveys. Review of the literature search results provided by CCIC resulted in less than 10 percent of the Program Area having been subject to previous cultural resources investigations; only three of these studies have been conducted within the last 10 years, making the remaining studies no longer sound and warranting resurvey. Review of the archival materials and historic maps has resulted in a high potential for historic-period archaeological resources. Reviews of the records search results, previous work in the study area and vicinity, and a historical map check indicated that cultural resources within the study area likely to be encountered are mining, railroad, historic structures and buildings related to farming, irrigation, agriculture, and residential activities. Geological review indicates there is a moderate to high sensitivity for buried archaeological resources.

CH2M HILL recommends that intensive pedestrian surveys be conducted for architectural and archaeological resources when ground disturbance will occur within previously undisturbed areas and if adequate surveys have not been completed within the past five years. Additionally, potential impacts should be assessed prior to any project construction taking place, as appropriate, in accordance with CEQA regulations.

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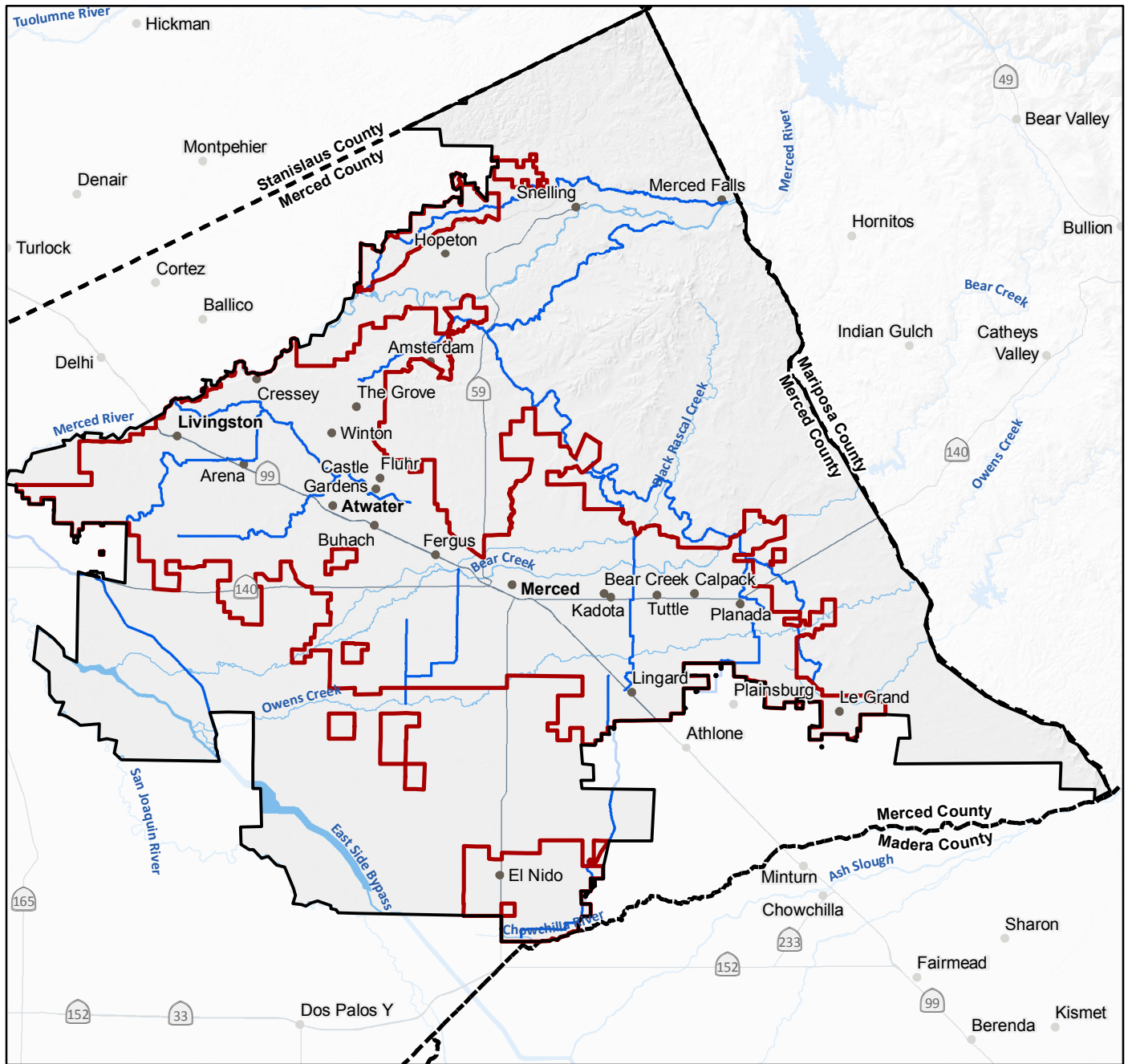
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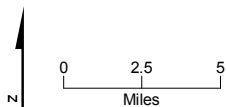
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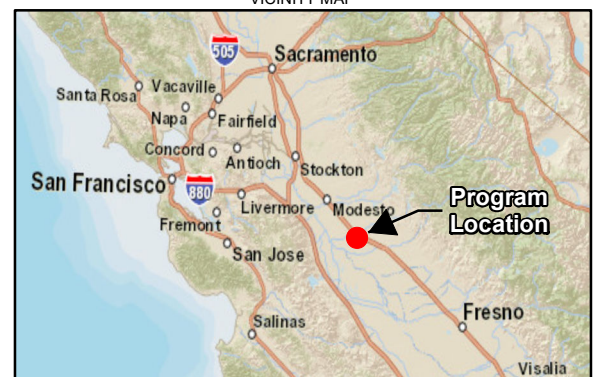
Attachment 1  
Program Area Map



- LEGEND**
- MID Program Area
  - MID Service Area
  - County
  - Canal
  - Natural Drainages
  - Major River



VICINITY MAP



**ATTACHMENT 1 PROGRAM AREA AND MID SERVICE AREA**  
**MERCED IRRIGATION DISTRICT**  
**WATER RESOURCES MANAGEMENT PLAN**  
**PROGRAMMATIC ENVIRONMENTAL IMPACT REPORT**  
**MERCED COUNTY, CALIFORNIA**

## Attachment 2

# Representative Photographs

# Representative Photographs of MID and Immediate Vicinity



*Photograph 1. Lake McClure and New Exchequer Dam spillway, view north.*



*Photograph 2. Overview of mining activities and tailings in the northeastern quadrant of MID region, view southeast.*



*Photograph 3. Northside Canal, wooden flume segment, view east.*



*Photograph 4. Possible mill ruins at Main Canal, view southwest.*



*Photograph 5. Main Canal tunnel exit, view east.*



*Photograph 6. At Golf Road and Old Lake Road, a historic-period lined ditch, non-MID facility, view north.*



*Photograph 7. Hayden Road, view north.*



*Photograph 8. Le Grand Canal, view west.*



*Photograph 9. Planada Canal Headworks view south.*



*Photograph 10. Access road within active fields, view northeast.*



*Photograph 11. Powerhouse at New Exchequer Dam, view west.*



*Photograph 12. Control house at New Exchequer Dam and Lake McClure, view east.*



*Photograph 13. Main Canal Headgate, view southwest.*



*Photograph 14. Lake Yosemite Tower, view north.*



*Photograph 15. Booster 1 at Le Grand Canal.*

## Appendix F

# Groundwater Modeling Methodology

# C2VSim Groundwater Model

## Model Overview

The California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) is developed, maintained, and regularly updated by the California Department of Water Resources. C2VSim is an integrated surface water/groundwater numerical flow model application based on the finite element modeling platform IWFM (integrated water flow model). The IWFM model simulates the movement of water through a series of linked simulation modules accounting for surface agricultural processes, as well as groundwater and surface water flow systems. The C2VSim model includes monthly historical stream inflows, surface water diversions, precipitation, land use, and crop acreage data from October 1973 through September 2015. The model simulates the historical response of the Central Valley's groundwater and surface water flow system to historical stresses, and can also be used to simulate response to projected future stresses. Currently, two versions of this model are available for use: the coarse finite element grid model, C2VSim-CG with 1,392 elements and the fine finite element grid; and C2VSim-FG with over 35,000 elements. For both versions, the elements are grouped into 21 water budget subregions. Hydrologic parameters were calibrated on the coarse grid to match observed surface water flows, groundwater heads, groundwater head differences between well pairs, and stream-aquifer interaction for the period September 1975 through October 2003. The fine grid model includes the same parameterization as the coarse grid, but parameters and input datasets were re-projected onto the fine grid (no recalibration at the fine-grid scale was performed at the time of this project).

More information on this model application can be found at <https://data.cnra.ca.gov/dataset/c2vsimfg-beta-model>.

## Model Adaptation for Groundwater Resources Impact Analysis

To assess potential effects on groundwater resources from the implementation of the Proposed Program, the C2VSim-FG model was used and run for the 1973–2014 timeframe. This model was reconfigured to effectively “turn off” the root zone processes and replace the deep percolation, seepage, and agricultural pumping rates with values from the Water Balance Model (WBM).

Of the 21 subregions in C2VSim, the extent of Merced Irrigation District's (MID's or District's) service area covers portions of subregions 12 and 13 (Figure 1). Therefore, modifications to the model were only conducted on these two subregions, with the remainder of the model remaining unchanged for this groundwater modeling effort. The model revisions are summarized on Figure 2. Additional modifications were made to account for changes in the stream budgets as a result of modifying root zone processes in subregions 12 and 13. Runoff and irrigation return flow portions of the stream budget were modified as a result of turning precipitation to zero and by removing the irrigated lands processes of the model in subregions 12 and 13. To rectify the stream budget issue, a net stream inflow value was calculated based on extracted stream budgets from the original C2VSim-FG model. Net inflow estimates were added to the modified model to add back in the missing terms of the water budget related to the simulation of stream flows. The intent is to preserve the original stream budgets, and resulting simulated heads, from the C2VSim-FG model prior to implementation of conditions associated with the Proposed Program.

For this evaluation, the C2VSim models were essentially run in a “superposition” analysis mode with the purpose of evaluating forecast changes in groundwater elevations. Even though the total deep percolation, seepage, and agricultural pumping rates from the WBM likely varied from original values in the C2VSim-FG model and did not include flux terms from nonagricultural lands within the modified grid

elements, this analysis is only used to estimate the net change in groundwater conditions between alternatives, and not for estimation of absolute values of groundwater fluxes and heads resulting from implementation of a particular alternative. With this assumption and constraint, the modified model configuration conforms to the requirements of a “superposition” analysis that is suitable for evaluating net changes in groundwater elevations among Existing Conditions, the Proposed Program, and the No Program Alternative.

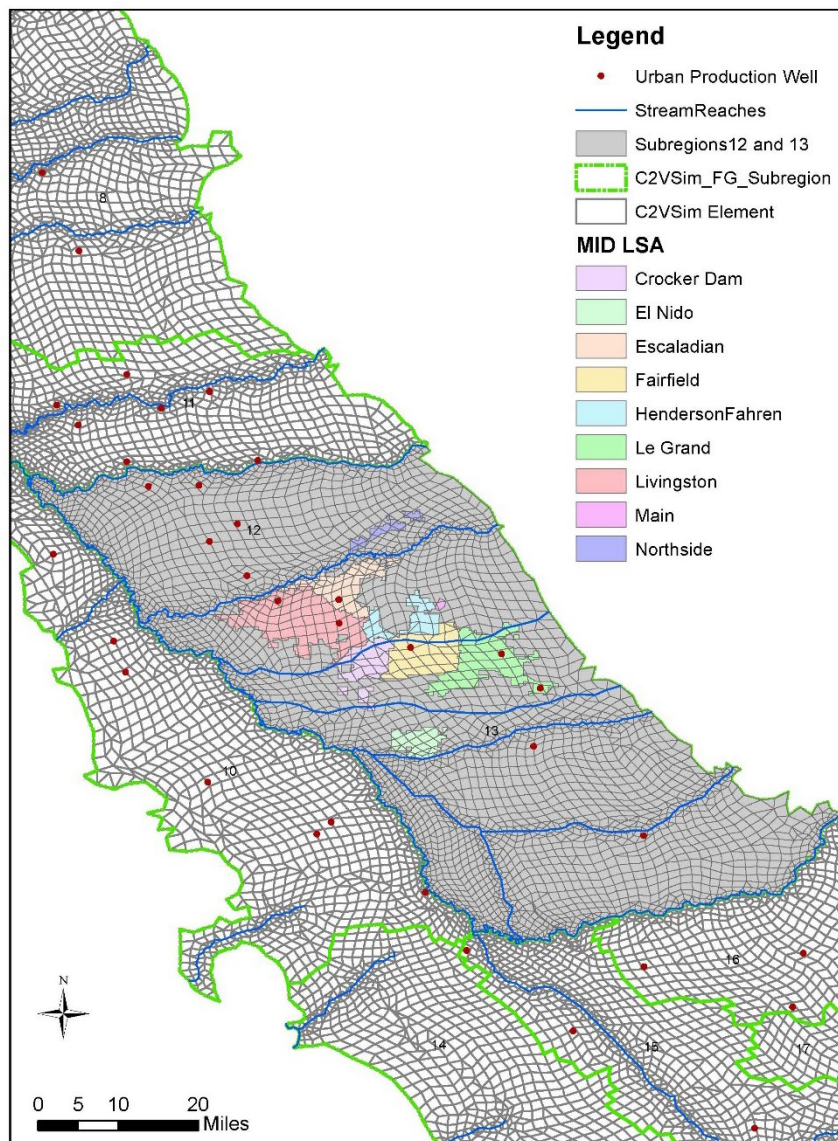


Figure 1. C2VSim-FG Elements, Subregions, and Merced Irrigation District Lateral Service Areas

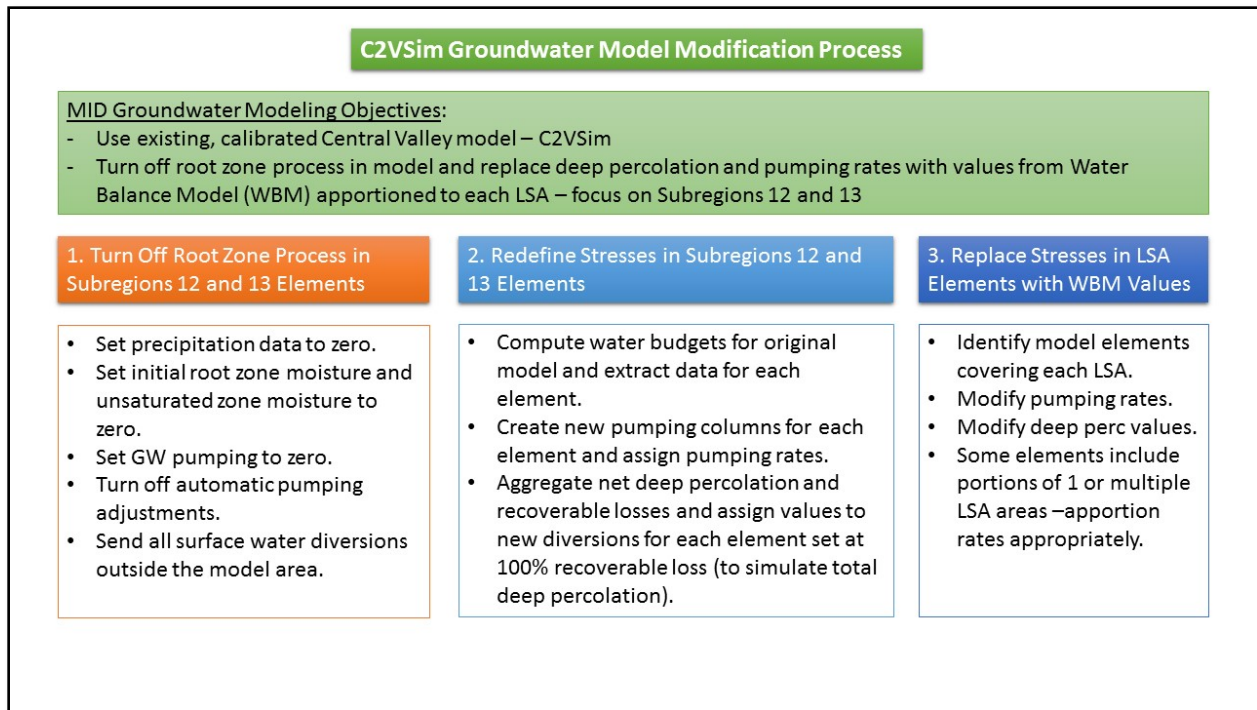


Figure 2. C2VSIM-FG Model Modification Process

## Model Assumptions for Simulated Alternatives

The C2VSIM-FG model application was configured to perform three model simulations to compare the results from Existing Conditions to the Proposed Program, and the Proposed Program to the No Program Alternative. The Proposed Program and No Program Alternative are simulated with projected 2040 land use and contain additional assumptions as briefly summarized below.

### Common Elements to the Proposed Program and No Program Alternative

- 2040 projected irrigated land and water use
- 116,156 acres of irrigated crop lands inside MID water service area

### Proposed Program

- MID provides annual deliveries to 101,979 acres of irrigated lands inside MID water service area
- Class II to Class I water user class conversion over 8,759 acres
- Transfer of 18,200 acre-feet per year (AFY) to other existing groundwater users outside of MID but inside of the basin (average based on available water supply)
- Transfer of 14,600 AFY to other water users outside of the basin (average based on available water supply)
- Canal seepage rates reduced by 17,900 AFY compared to the No Program Alternative
- Uncaptured spills reduced by 6,400 AFY on average compared to the No Program Alternative depending on water year type

## No Program Alternative

- MID provides annual deliveries to 92,800 acres of irrigated lands inside MID water service area

For each model simulation, deep percolation and seepage estimates from the WBM were applied to C2VSim-FG Model Layer 1 (simulated as unconfined) within each Lateral Service Area (LSA) and applicable canal areas. Groundwater pumping estimates from the WBM were applied to C2VSim-FG in both Model Layers 1 and 2, as represented by the original fractional pumping for each layer, specified in the C2VSim pumping specifications input file. The majority of the groundwater pumping occurs in the deeper Model Layer 2 (simulated as confined). Pumping was also distributed over each LSA, as provided by the WBM. Deep percolation and seepage rates, along with pumping rates within each LSA are shown on Figures 3 and 4, respectively. Data are shown as average annual totals over water years 1974–2014.

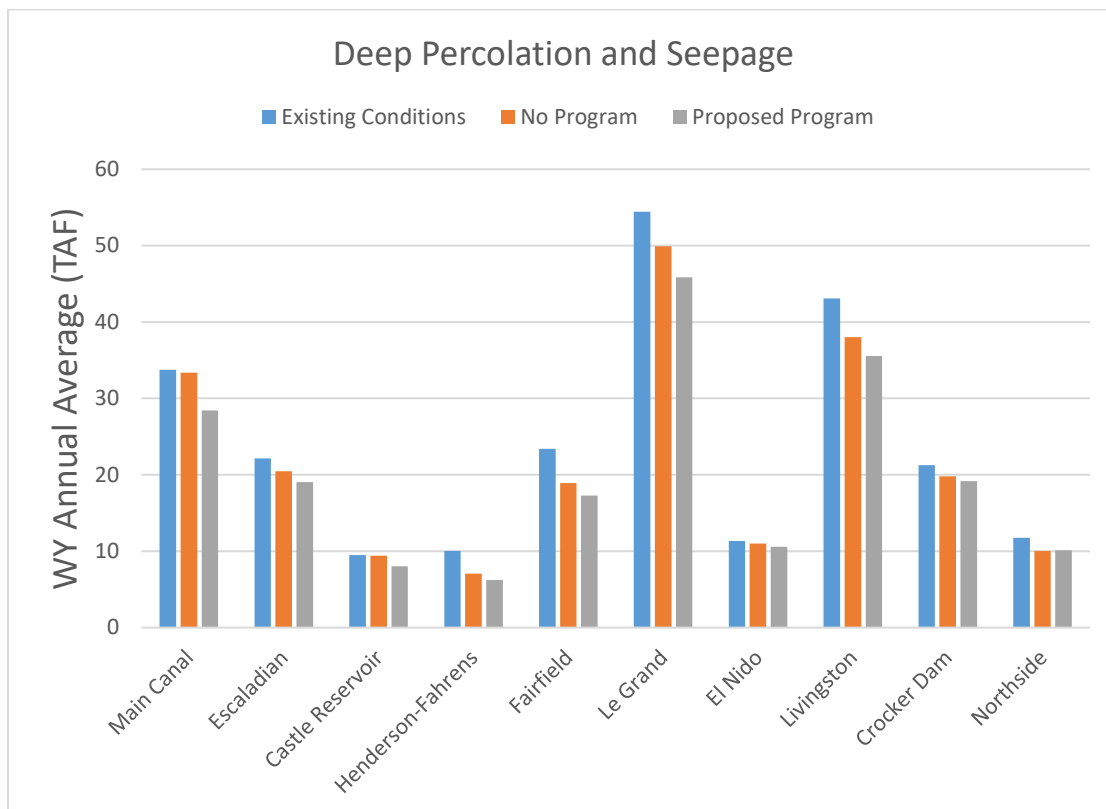


Figure 3. Deep Percolation and Seepage Inputs to C2VSim by Lateral Service Area

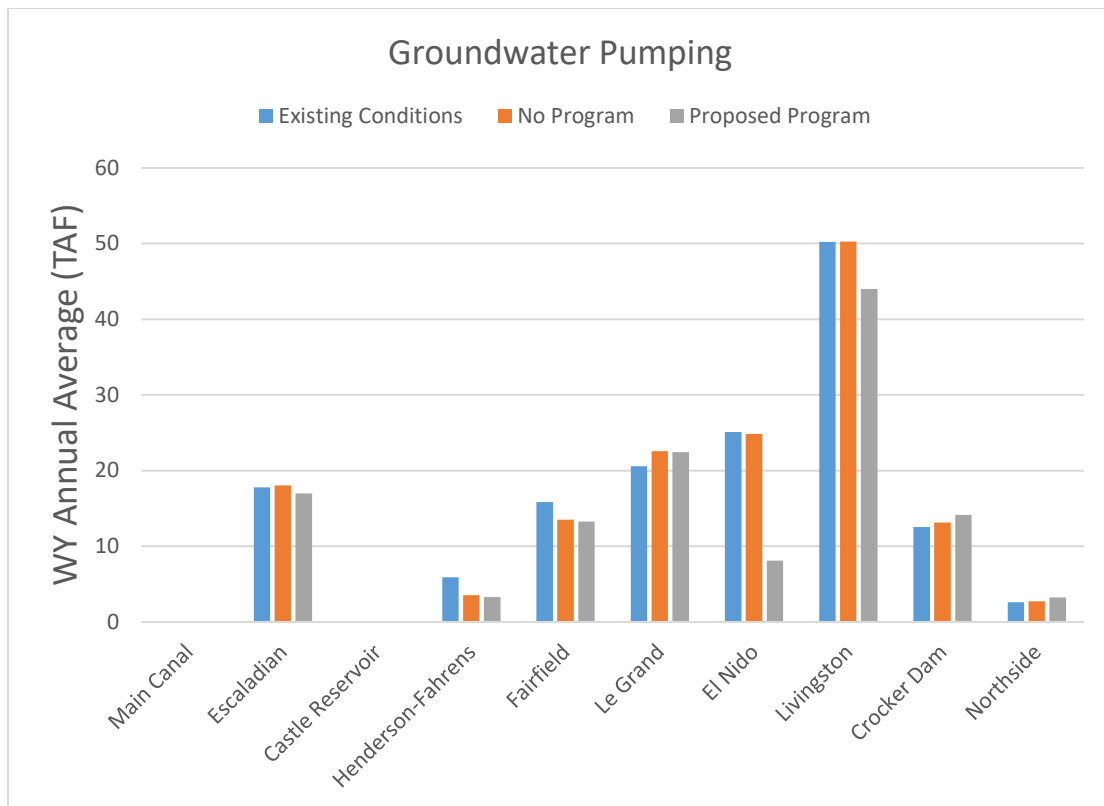


Figure 4. Groundwater Pumping Inputs to C2VSim by Lateral Service Area

Separate model simulations were performed for each alternative, and resulting average groundwater levels were compared for Model Layers 1 and 2. Effectively, simulated water levels from Existing Conditions and the No Program Alternative were subtracted from the simulated water levels from the Proposed Program to assess the changes to groundwater levels due to implementing the Proposed Program. Results for each alternative comparison are shown in the following section.

## Model Results and Conclusions

Differences in the simulated groundwater levels for the Proposed Program with respect to Existing Conditions were compared on a monthly average basis over the entire simulation period (1973–2014) for Model Layers 1 and 2. Water level changes in Model Layer 1 (simulated as unconfined) are most directly influenced by the changes in deep percolation and seepage, and changes in Model Layer 2 (simulated as confined) are primarily influenced by changes in deeper groundwater pumping. However, because Model Layers 1 and 2 are hydraulically connected, any change in groundwater levels in one layer will necessarily influence the other, although to a lesser degree. For instance, while changes in groundwater pumping primarily result in groundwater level changes in Layer 2, a much smaller change will also be induced in Layer 1.

Figure 5 shows the simulated change in average groundwater levels for Model Layer 1 when comparing Existing Conditions to the Proposed Program. Results show that the water level changes are less than 9 feet on average across the District and are generally focused in areas where canal lining and changes in deep percolation are simulated to occur.

Figure 6 shows the simulated differences in average groundwater levels in Model Layer 2 when comparing Existing Conditions to the Proposed Program. Results show that simulated increases in groundwater levels are less than 9 feet on average in the majority of the District area. Groundwater levels in the El Nido region, however, are projected to increase by more than 15 feet due to a large

reduction in pumping in this area (approximately 17,000 AFY on average) under the Proposed Program. In the area surrounding El Nido, groundwater levels are projected to increase by 5 to 15 feet as a result of the reduction in pumping in the El Nido LSA.

Figure 7 shows the simulated change in average groundwater levels for Model Layer 1 when comparing the Proposed Program to the No Program Alternative. Results show that the water level changes are less than 6 feet on average across the District and are generally focused in areas where canal lining is simulated to occur. Deep percolation from irrigated lands is not predicted to change significantly between the two alternatives, as assumed land use is identical for both simulations. Therefore, water level changes in Model Layer 1 are driven by changes in estimated seepage from canals, as is evidenced by the 2- to 6-foot lower water level, on average, in the vicinity of the Main Canal due to the canal lining projects included in the Proposed Program. These minor changes in groundwater levels are not anticipated to affect productivity of shallow wells in the area. A few areas of slightly higher groundwater levels in Model Layer 1 due to implementation of the Proposed Program are observed in the Livingston, Northside, and Le Grand spheres of influence (SOIs) area. These water level changes are driven by changes in assumed pumping in Model Layer 2 and changes in water transfers to SOI regions.

Figure 8 shows the simulated differences in average groundwater levels in Model Layer 2 when comparing the No Program Alternative to the Proposed Program. Results show that simulated decreases are less than 6 feet in the main LSA region due to changes in canal seepage where canal lining is proposed. Groundwater levels in the Livingston and SOI areas are projected to increase by 2 to 5 feet as a result of changes in groundwater pumping and water transfers outside of the District. In the El Nido region, groundwater levels are projected to increase more than 15 feet due to a large reduction in groundwater pumping in this area (approximately 17,000 AFY on average) under the Proposed Program.

In conclusion, groundwater model simulations show that the Proposed Program would not significantly or negatively affect groundwater levels in the vicinity of the MID LSAs as compared to Existing Conditions, and the Proposed Program at 2040 conditions would result in minor declines in groundwater levels across the District with significant increases in water levels in some areas.

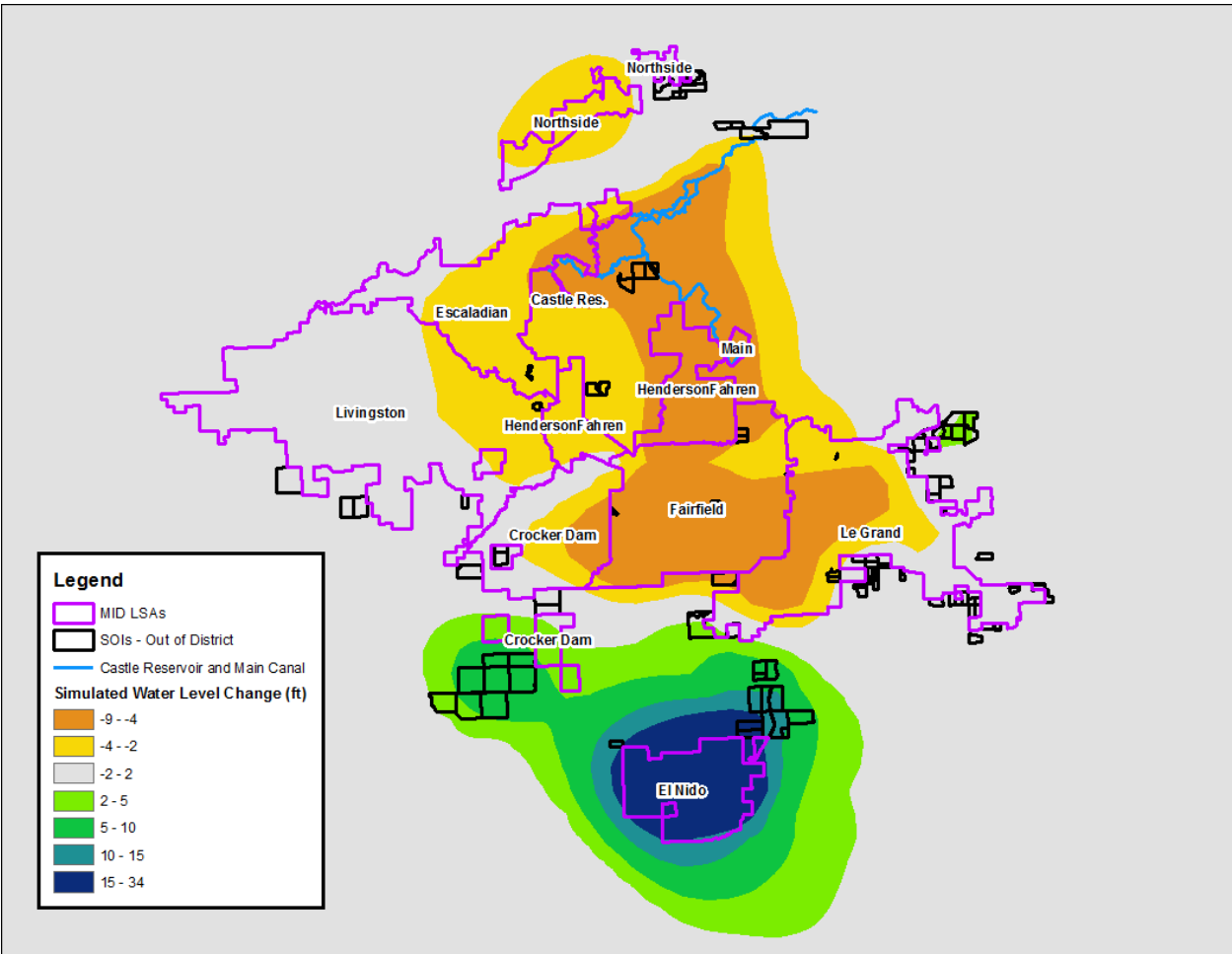


Figure 5. Simulated Change in Average Groundwater Levels for Model Layer 1 when Comparing the Proposed Program to Existing Conditions

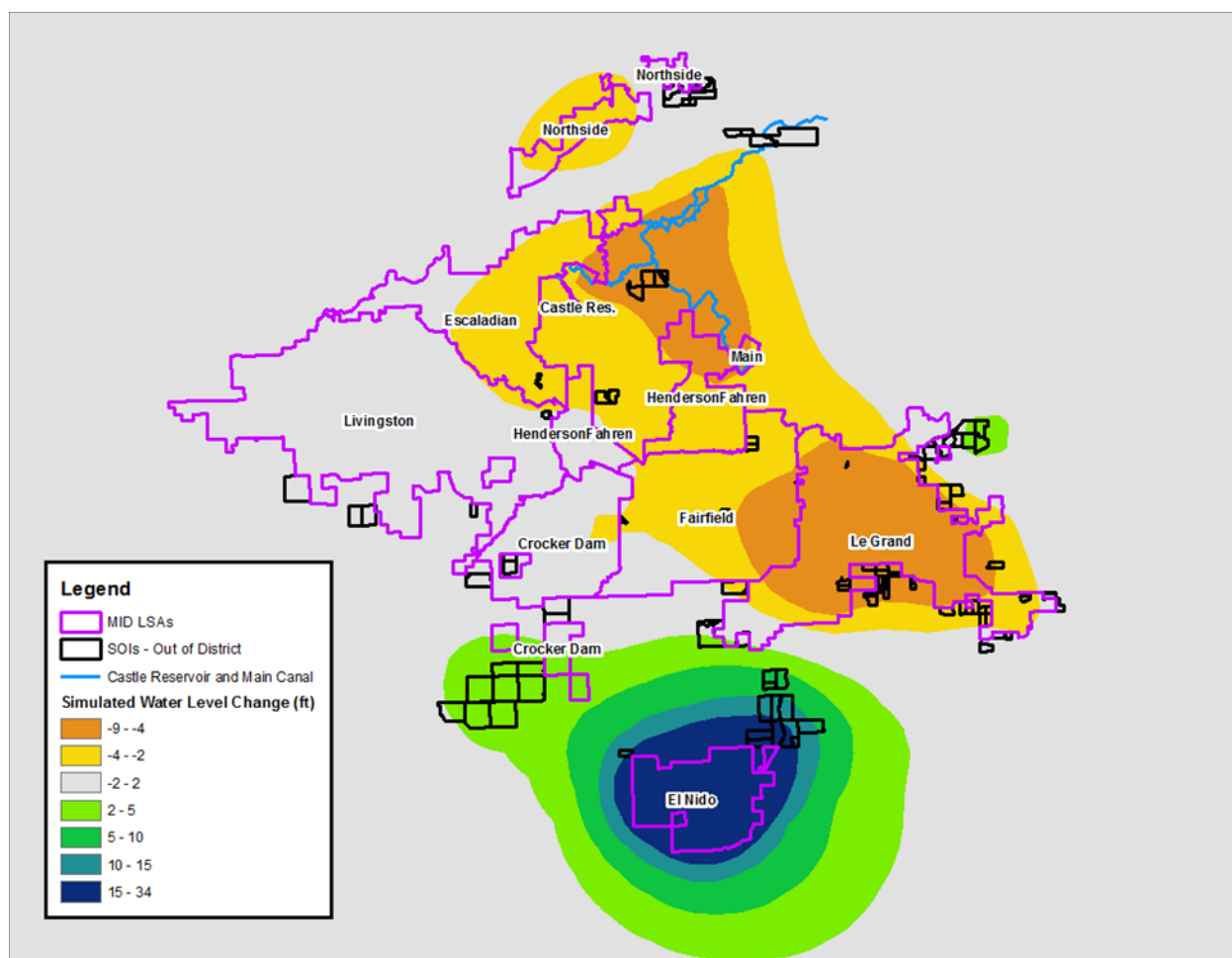


Figure 6. Simulated Change in Average Groundwater Levels for Model Layer 2 when Comparing the Proposed Program to Existing Conditions

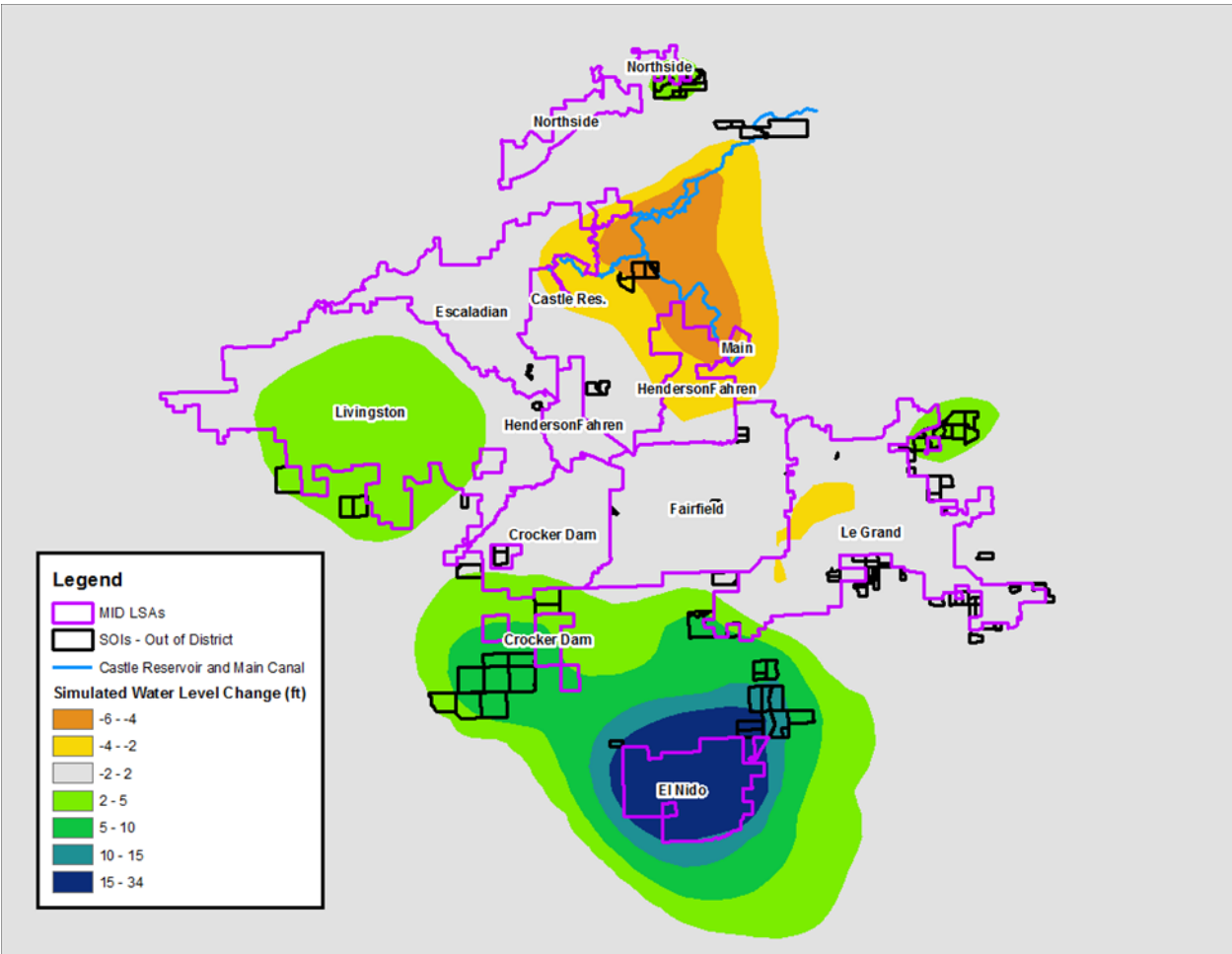


Figure 7. Simulated Change in Average Groundwater Levels for Model Layer 1 when Comparing the Proposed Program to the No Program Alternative

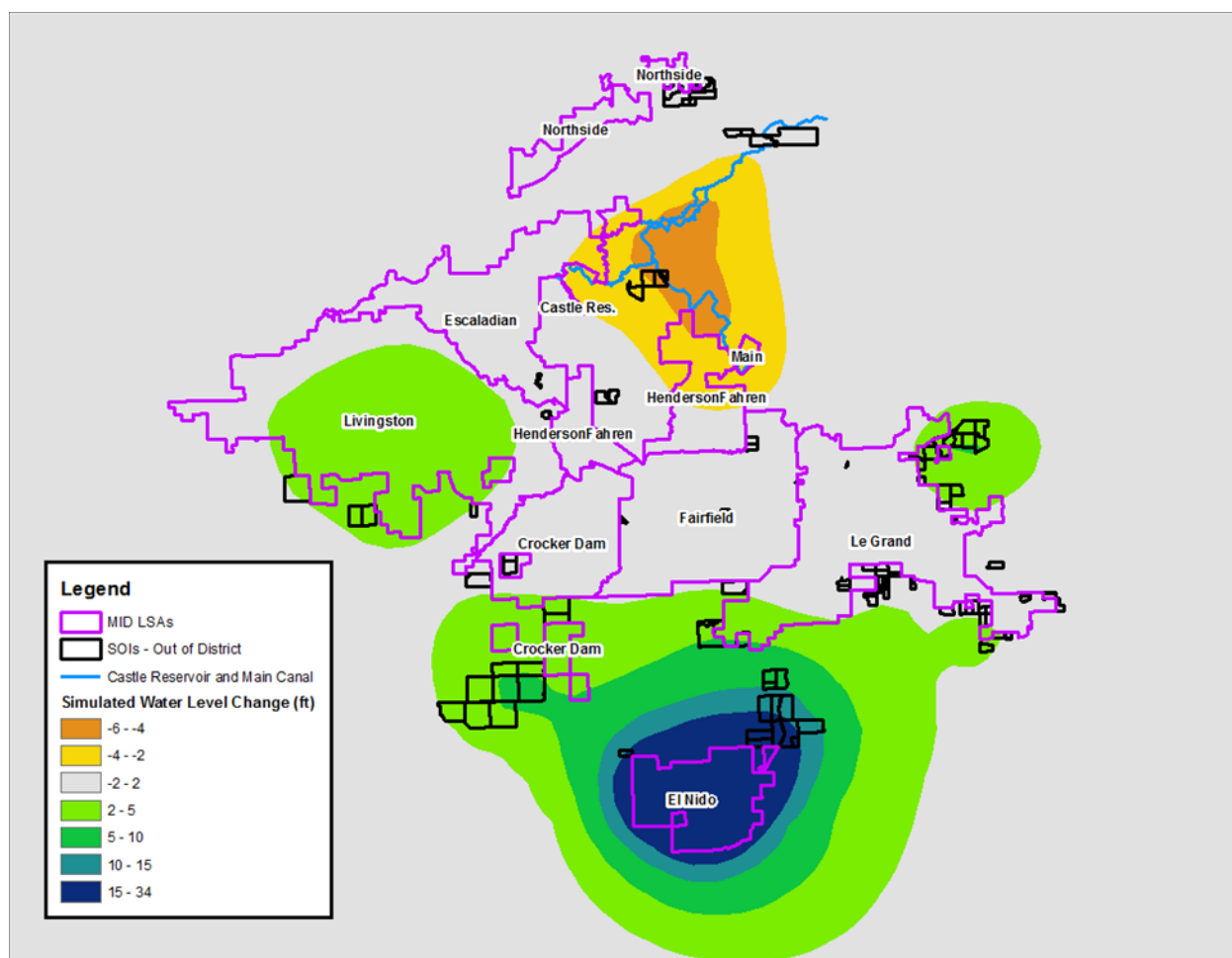


Figure 8. Simulated Change in Average Groundwater Levels for Model Layer 1 when Comparing the Proposed Program to the No Program Alternative

## Appendix G

### Water Transfer History Table

# Merced Irrigation District Water Transfer History

Over the last several decades, Merced Irrigation District (MID or District) has participated in a variety of transfer programs and flow agreements including the following:

- Davis-Grunsky Agreement as part of the initial licensing of the New Exchequer Dam
- State Drought Water Bank
- Vernalis Adaptive Management Plan (VAMP)
- In-basin transfers for irrigation within and outside MID's sphere of influence (SOI)
- Agreements with Bureau of Reclamation (Reclamation) for wildlife
- Short-term temporary water transfers to out-of-basin transferees

MID has completed temporary water transfers almost every year since 1967, with annual transfer volumes in some years exceeding 100,000 acre-feet. As shown in Table G-1, transfers have occurred almost every year and in all water year types. The District is generally able to make the greatest volume of water available for transfer in wetter years with generally adequate reservoir storage. The source of water for the majority of past transfers is the Merced River through release of previously stored water from New Exchequer Dam. Transfers have been and would be dictated primarily by such factors as water availability, timing, and the location of the transfer recipient.

Table G-1. Summary of All Water Transfers and Other Outside Flow Agreements Executed by Merced Irrigation District Since 1967

Year	Water Year Type	Time Period	Agreement Type	Agreement Purpose	Agreement Volume (acre-feet)	Purchaser	Water Right	Source (see notes)	Destination
1967	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1968	Dry	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1969	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1970	Above	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1971	Below	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1972	Dry	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1973	Above	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1974	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1975	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1976	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1977	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1978	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1979	Above	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1980	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1981	Dry	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1982	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1983	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1984	Above	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1985	Dry	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1986	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1987	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1988	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1989	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1990	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1991	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
1992	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin

Table G-1. Summary of All Water Transfers and Other Outside Flow Agreements Executed by Merced Irrigation District Since 1967

Year	Water Year Type	Time Period	Agreement Type	Agreement Purpose	Agreement Volume (acre-feet)	Purchaser	Water Right	Source (see notes)	Destination
1992	Critical	Oct 20–Nov 15	Voluntary	Drought	11,705	State Drought Water Bank	Post-1914	Exch/MR	Out of basin
1993	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
1993	Wet	Fall	Voluntary	Irrigation	14,139	SOI	Pre-1914	Exch/MR	In basin
1994	Critical	Apr 4–May 31	Voluntary	Fish flow	28,450	Reclamation	Post-1914	NS	Out of basin
1994	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
1994	Critical	Spring	Voluntary	Irrigation	34,025	SOI	Pre-1914	NS	In basin
1995	Wet	Spring	Voluntary	Irrigation	31,084	SOI	Pre-1914	NS	In basin
1995	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
1996	Wet	Oct 9–Oct 31	Voluntary	Fish flow	16,161	Reclamation	Post-1914	Exch/MR	Out of basin
1996	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
1996	Wet	Spring	Voluntary	Irrigation	41,763	SOI	Pre-1914	NS	In basin
1997	Wet	Apr 15–May 13	Voluntary	Fish and irrigation	45,332	Reclamation	Post-1914	NS	Out of basin
1997	Wet	Oct 19–Oct 31	Voluntary	Fish flow	2,157	Reclamation	Post-1914	Exch/MR	Out of basin
1997	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
1997	Wet	Spring	Voluntary	Irrigation	39,289	SOI	Pre-1914	NS	In basin
1998	Wet	Spring	Voluntary	Irrigation	27,151	SOI	Pre-1914	NS	In basin
1998	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
1999	Above	Apr 17–May 17	Regulatory	Fish flow	82,200	VAMP	Post-1914	NS	Out of basin
1999	Above	Oct 1–Oct 31	Regulatory	Fish flow	11,998	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
1999	Above	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
1999	Above	Spring	Voluntary	Irrigation	39,615	SOI	Pre-1914	NS	In basin
2000	Above	Apr 15–May 15	Regulatory	Fish flow	46,750	VAMP	Post-1914	NS	Out of basin
2000	Above	Oct 15–Dec 31	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2000	Above	Oct 21–Nov 30	Voluntary	Refuges	24,748	Reclamation	Post-1914	Exch/MR	Out of basin

Table G-1. Summary of All Water Transfers and Other Outside Flow Agreements Executed by Merced Irrigation District Since 1967

Year	Water Year Type	Time Period	Agreement Type	Agreement Purpose	Agreement Volume (acre-feet)	Purchaser	Water Right	Source (see notes)	Destination
2000	Above	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
2000	Above	Spring	Voluntary	Irrigation	37,929	SOI	Pre-1914	NS	In basin
2001	Dry	Apr 20–May 20	Regulatory	Fish flow	42,120	VAMP	Post-1914	NS	Out of basin
2001	Dry	Oct 16–Nov 11	Voluntary	Environmental Water Account groundwater exchange	24,998	California Department of Water Resources	Post-1914	Exch/MR	Out of basin
2001	Dry	Nov 12–Dec 31	Regulatory	Fish flow	12,496	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2001	Dry	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
2001	Dry	Spring	Voluntary	Irrigation	45,973	SOI	Pre-1914	NS	In basin
2002	Dry	Apr 15–May 15	Regulatory	Fish flow	25,840	VAMP	Post-1914	NS	Out of basin
2002	Dry	Oct 15–Oct 31	Regulatory	Fish flow	12,470	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2002	Dry	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
2002	Dry	Spring	Voluntary	Irrigation	33,892	SOI	Pre-1914	NS	In basin
2003	Below	Apr 15–May 15	Regulatory	Fish flow	38,257	VAMP	Post-1914	NS	Out of basin
2003	Below	Oct 1–Oct 31	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2003	Below	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
2003	Below	Spring	Voluntary	Irrigation	25,730	SOI	Pre-1914	NS	In basin
2004	Dry	Apr 15–May 15	Regulatory	Fish flow	42,680	VAMP	Post-1914	NS	Out of basin
2004	Dry	Oct 1–Oct 31	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2004	Dry	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
2004	Dry	Spring	Voluntary	Irrigation	34,788	SOI	Pre-1914	NS	In basin
2005	Wet	May 1–May 31	Regulatory	Flood control	0	VAMP	Post-1914	NS	Out of basin
2005	Wet	Aug–Sep	Regulatory	Cowell Agreement Diverters Adjudication	6,207	Not applicable	Post-1914	NS	In basin

Table G-1. Summary of All Water Transfers and Other Outside Flow Agreements Executed by Merced Irrigation District Since 1967

Year	Water Year Type	Time Period	Agreement Type	Agreement Purpose	Agreement Volume (acre-feet)	Purchaser	Water Right	Source (see notes)	Destination
2005	Wet	Oct 1–Oct 26	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2005	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
2005	Wet	Spring	Voluntary	Irrigation	16,648	SOI	Pre-1914	NS	In basin
2006	Wet	May 1–May 31	Regulatory	Flood control	0	VAMP	Post-1914	NS	Out of basin
2006	Wet	Oct 8–Oct 28	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2006	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
2006	Wet	Spring	Voluntary	Irrigation	14,689	SOI	Pre-1914	NS	In basin
2007	Critical	Apr 22–May 22	Regulatory	Fish flow	28,960	VAMP	Post-1914	NS	Out of basin
2007	Critical	Jun 21–Jul 30	Voluntary	Irrigation	3,970	SOI transfer	Post-1914	NS	In basin
2007	Critical	Spring	Voluntary	Irrigation	10,325	SOI	Pre-1914	NS	In basin
2007	Critical	Jun 10–Jun 18	Voluntary-Emergency	Delta smelt	15,000	Reclamation	Post-1914	NS	Out of basin
2007	Critical	Jun–Aug	Regulatory	Cowell Agreement Diversers Adjudication	19,648	No applicable	Post-1914	NS	In basin
2007	Critical	Oct 24–Nov 8	Voluntary	Environmental Water Account groundwater exchange	25,000	Reclamation	Post-1914	Exch/MR	Out of basin
2007	Critical	May 5–May 12	Voluntary	Irrigation	7,300	San Luis and Delta- Mendota Water Authority	Post-1914	NS	Out of basin
2007	Critical	Nov 6–Dec 31	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2007	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
2008	Critical	Apr 22–May 22	Regulatory	Fish flow	47,300	VAMP	Post-1914	NS	Out of basin
2008	Critical	Oct 1–Oct 24	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2008	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin

Table G-1. Summary of All Water Transfers and Other Outside Flow Agreements Executed by Merced Irrigation District Since 1967

Year	Water Year Type	Time Period	Agreement Type	Agreement Purpose	Agreement Volume (acre-feet)	Purchaser	Water Right	Source (see notes)	Destination
2009	Below	Spring	Regulatory	No flow	0	VAMP	Post-1914	NS	Out of basin
2009	Below	May 5–May 12	Voluntary	Irrigation	6,600	San Luis and Delta-Mendota Water Authority	Post-1914	NS	Out of basin
2009	Below	Oct 8–Oct 28	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2009	Below	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	NS	Out of basin
2009	Below	Fall	Voluntary	Irrigation	1,800	SOI transfer	Post-1914	Exch/MR	In basin
2009	Below	Spring	Voluntary	Irrigation	8,661	SOI	Pre-1914	NS	In basin
2010	Above	Apr 25–May 25	Regulatory	Fish flow	21,800	VAMP	Post-1914	Exch/MR	Out of basin
2010	Above	Nov 25–Dec 9	Voluntary	Irrigation	14,269	Kern County-Dudley Ridge	Post-1914	Exch/MR	Out of basin
2010	Above	Oct 15–Nov 8	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2010	Above	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
2010	Above	Spring	Voluntary	Irrigation	16,469	SOI	Pre-1914	Exch/MR	In basin
2010	Above	Dec 10–Jan 1	Voluntary	Wildlife habitat	500	Reclamation East Bear Creek Unit	Pre-1914	LY/CD	In basin
2011	Wet	Apr–May	Regulatory	Flood control	0	VAMP	Post-1914	Exch/MR	Out of basin
2011	Wet	Oct 1–Oct 31	Regulatory	Fish flow	12,500	San Joaquin River Agreement	Post-1914	Exch/MR	Out of basin
2011	Wet	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
2011	Wet	Aug–Sep	Voluntary	Irrigation	2,131	SOI transfer	Post-1914	Exch/MR	In basin
2011	Wet	Nov 1–Nov 30	Voluntary	Wildlife habitat	893	Reclamation East Bear Creek Unit	Post-1914	LY/CD	In basin
2011	Wet	Spring	Voluntary	Irrigation	24,450	SOI	Pre-1914	Exch/MR	In basin
2012	Critical	Apr 29–May 11	Voluntary	Fish flow	25,000	Reclamation	Post-1914	Exch/MR	Out of basin
2012	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
2012	Critical	May 11–May 12	Voluntary	Fish flow	714	Reclamation	Post-1914	Exch/MR	Out of basin
2012	Critical	May–Jul	Voluntary	Irrigation	3,869	SOI transfer	Post-1914	Exch/MR	In basin

Table G-1. Summary of All Water Transfers and Other Outside Flow Agreements Executed by Merced Irrigation District Since 1967

Year	Water Year Type	Time Period	Agreement Type	Agreement Purpose	Agreement Volume (acre-feet)	Purchaser	Water Right	Source (see notes)	Destination
2012	Critical	Jan 3–Jan 31	Voluntary	Wildlife habitat	734	Reclamation East Bear Creek Unit	Pre-1914	LY/CD	In basin
2012	Critical	Nov 1–Dec 31	Voluntary	Wildlife habitat	2,793	Reclamation East Bear Creek Unit	Pre-1914	LY/CD	In basin
2012	Critical	Nov 1–Mar 1	Voluntary	Irrigation	10,000	Westlands Water District	Post-1914	Exch/MR	Out of basin
2013	Critical	Jan 1–Feb 28	Voluntary	Wildlife habitat	970	Reclamation East Bear Creek Unit	Pre-1914	LY/CD	In basin
2013	Critical	Apr 15–Apr 25	Voluntary	Fish flow	4,800	Reclamation	Post-1914	Exch/MR	Out of basin
2013	Critical	Sep 14–Sep 30	Voluntary	Wildlife habitat	1,645	Reclamation East Bear Creek Unit	Post-1914	LY/CD	In basin
2013	Critical	Sep 17–Sep 26	Voluntary	Irrigation	15,000	San Luis Water District/Westlands Water District	Post-1914	Exch/MR	Out of basin
2013	Critical	Nov 1–Dec 31	Voluntary	Wildlife habitat	2,438	Reclamation East Bear Creek Unit	Pre-1914	LY/CD	In basin
2013	Critical	Nov 1–Mar 31	Voluntary	Fish enhance	59,902	Davis-Grunsky	Post-1914	Exch/MR	Out of basin
2014	Critical	Apr 1–Apr 30	Voluntary	Fish flow	5,444	San Luis Water District/Westlands Water District	Post-1914	Exch/MR	Out of basin
2015	Critical	Dec 23–Feb 7	Voluntary	Irrigation	1,677	San Luis Water District/Westlands Water District	Pre-1914	LY/CD	Out of basin
2016	Below	Dec 23–Jan 24	Voluntary	Irrigation	734	San Luis Water District	Pre-1914	LY/CD	Out of basin

Notes:

Exch/MR = Exchequer/Merced River

LY/CD = Lake Yosemite/Crocker Dam

NS = not specified

## Appendix H

### Traffic Data Tables

# Average Daily Trips and Level of Service for Roadways in the Program Area under Existing Conditions and the Proposed Program

Table H-1. Program Area ADT and LOS during High Construction Activity Year

*Programmatic Environmental Impact Report for the Merced Irrigation District Water Resources Management Plan*

Roadway	Segment	Area	Lanes	Roadway Classification	Existing ADT <sup>a</sup>	Existing LOS <sup>b</sup>	2021 ADT without Program <sup>a</sup>	2021 LOS without Program <sup>b</sup>	2021 ADT with Program <sup>a,c</sup>	2021 LOS with Program <sup>b</sup>
SR 99	Madera County Line to Childs Avenue	Rural	4	Freeway	42,500	C	45,286	C	45,694	C
	Childs Avenue to SR 140 East Junction	Urban	4	Freeway	42,500	C	45,286	C	45,694	C
	SR 140 East Junction to G Street	Urban	4	Freeway	52,000	C	55,409	D*	55,817	D*
	G Street to SR 59 South Junction	Urban	4	Freeway	46,000	C	49,015	C	49,423	C
	SR 59 South Junction to R Street	Urban	4	Freeway	51,000	C	54,343	D*	54,751	D*
	R Street to SR 140 West/SR 59 North Junction	Urban	4	Freeway	57,700	D*	61,482	D*	61,890	D*
	SR 140 West/SR 59 North Junction to Atwater Boulevard	Urban	4	Freeway	56,000	D	59,671	D	60,079	D
	Atwater Boulevard to 16th Street	Urban	4	Freeway	59,000	C	62,868	D	63,276	D
	16th Street to Buhach Road	Urban	4	Freeway	49,000	C	52,212	D	52,620	D
	Buhach Road to East Atwater Boulevard	Urban	4	Freeway	52,000	C	55,409	D	55,817	D
	East Atwater Boulevard to Applegate Road	Urban	4	Freeway	53,000	D	56,474	D	56,882	D
	Applegate Road to West Atwater Boulevard	Urban	4	Freeway	54,000	D	57,540	D	57,948	D
	West Atwater Boulevard to Hammatt Avenue	Urban	4	Freeway	61,000	D	64,999	D	65,407	D
	Hammatt Avenue to Winton Parkway	Urban	4	Freeway	60,000	D	63,933	D	64,341	D
	Winton Parkway to Collier Road	Urban	4	Freeway	73,000	E*	77,785	F*	78,193	F*
	Collier Road to Shanks Road	Urban	4	Freeway	74,500	E*	79,384	F*	79,792	F*
	Shanks Road to Golden State Boulevard	Rural	4	Freeway	62,000	E*	66,064	F*	66,472	F*
	Golden State Boulevard to Stanislaus County Line	Rural	4	Freeway	65,000	F*	69,261	F*	69,669	F*

**Table H-1. Program Area ADT and LOS during High Construction Activity Year***Programmatic Environmental Impact Report for the Merced Irrigation District Water Resources Management Plan*

Roadway	Segment	Area	Lanes	Roadway Classification	Existing ADT <sup>a</sup>	Existing LOS <sup>b</sup>	2021 ADT without Program <sup>a</sup>	2021 LOS without Program <sup>b</sup>	2021 ADT with Program <sup>a,c</sup>	2021 LOS with Program <sup>b</sup>
SR 59	Madera County Line/SR 152 Junction to El Nido Road	Rural	2	Arterial	6,750	C	7,192	C	7,600	C
	El Nido Road to Sandy Mush Road	Rural	2	Arterial	6,850	C	7,299	C	7,707	C
	Sandy Mush Road to Dickenson and Mission Roads	Rural	2	Arterial	9,200	D*	9,803	D*	10,211	D*
	Dickenson and Mission Roads to Childs Avenue	Urban	2	Arterial	11,500	D*	12,254	D*	12,662	D*
	Childs Avenue to SR 99/SR 140 Junctions	Urban	4	Arterial	23,000	D*	24,508	D*	24,916	D*
	SR 99/SR 140 Junctions to 16th and V Streets	Urban	4	Freeway	27,400	B	29,196	B	29,604	B
	16th and V Streets to 16th Street	Urban	4	Arterial	18,200	D*	19,393	D*	19,801	D*
	16th Street to West Olive Avenue/Santa Fe Drive	Rural	2	Arterial	12,000	D*	12,787	D*	13,195	D*
	West Olive Avenue/Santa Fe Drive to Bellevue Road	Rural	2	Arterial	3,700	B	3,943	B	4,351	B
	Bellevue Road to Oakdale Road	Rural	2	Arterial	1,950	B	2,078	A	2,486	A
	Oakdale Road to Youd Road	Rural	2	Arterial	2,100	B	2,238	A	2,646	B
	Youd Road to Turlock Road	Rural	2	Arterial	1,500	A	1,598	A	2,006	A
	Turlock Road to Snelling Road	Rural	2	Arterial	3,900	B	4,156	B	4,564	B
	Snelling Road to Montgomery Street	Rural	2	Arterial	2,600	B	2,770	B	3,178	B
SR 140	SR 165 Junction to Lincoln Boulevard	Rural	2	Arterial	3,550	B	3,783	B	4,191	B
	Lincoln Boulevard to Applegate Road	Rural	2	Arterial	4,400	B	4,688	B	5,096	B
	Applegate Road to Buhach Road	Rural	2	Arterial	6,800	C	7,246	C	7,654	C
	Buhach Road to Franklin Road	Rural	2	Arterial	7,050	C	7,512	C	7,920	C
	Franklin Road to Massacio Street	Rural	2	Arterial	6,000	C	6,393	C	6,801	C
	Massacio Street to X Street	Urban	2	Arterial	12,700	D*	13,533	D*	13,941	E*
	X Street to SR 99/SR 59 Junctions	Urban	2	Arterial	14,700	C	15,664	E*	16,072	E*
	SR 99/SR 59 Junctions to Glen Avenue/Motel Drive	Urban	4	Freeway	12,200	A	13,000	A	13,408	A
	Glen Avenue/Motel Drive to Parsons Avenue	Urban	2	Arterial	11,400	D*	12,147	D*	12,555	D*
	Parsons Avenue to Santa Fe Avenue	Rural	2	Arterial	8,700	D*	9,270	D*	9,678	D*
	Santa Fe Avenue to Planada Road	Rural	2	Arterial	8,000	C	8,524	C	8,932	D*
	Planada Road to Mariposa County Line	Rural	2	Arterial	3,900	B	4,156	B	4,564	B

**Table H-1. Program Area ADT and LOS during High Construction Activity Year***Programmatic Environmental Impact Report for the Merced Irrigation District Water Resources Management Plan*

Roadway	Segment	Area	Lanes	Roadway Classification	Existing ADT <sup>a</sup>	Existing LOS <sup>b</sup>	2021 ADT without Program <sup>a</sup>	2021 LOS without Program <sup>b</sup>	2021 ADT with Program <sup>a,c</sup>	2021 LOS with Program <sup>b</sup>
Santa Fe Avenue	Childs Avenue to Le Grand Avenue	Rural	2	Major Collector	1,612	A	1,717	B	2,125	B
	Le Grand Avenue to Madera County Line	Rural	2	Major Collector	1,414	A	1,507	B	1,915	C
Santa Fe Drive	Stanislaus County Line to Bradbury Road	Rural	2	Arterial	5,732	C	6,108	C	6,516	C
	Bradbury Road to El Capitan Way	Rural	2	Arterial	4,984	B	5,311	C	5,719	C
	El Capitan Way to Cressey Way	Rural	2	Arterial	7,119	C	7,586	C	7,994	C
	Cressey Way to Walnut Avenue	Urban	2	Arterial	5,862	C	6,246	C	6,654	C
	Chestnut Lane to Shaffer Road	Urban	2	Arterial	12,345	D	13,154	D	13,562	E*
	Shaffer Road to Wallace Road	Urban	2	Arterial	14,506	D	15,457	E*	15,865	E*
	Bellevue Road to Franklin Road	Urban	4	Arterial	27,714	D	29,531	E*	29,939	E*
	Franklin Road to SR 59	Urban	4	Arterial	26,910	D	28,674	E*	29,082	E*
Westside Boulevard	SR 165 to Washington Boulevard	Rural	2	Major Collector	2,464	B	2,626	C	3,034	C
	Washington Boulevard to Lincoln Boulevard	Rural	2	Major Collector	2,750	B	2,930	C	3,338	C
	Lincoln Boulevard to Sultana Drive	Rural	2	Major Collector	1,655	A	1,764	B	2,172	C
	Sultana Drive to SR 99	Rural	2	Major Collector	1,228	A	1,308	B	1,716	B
Walnut Avenue	Sultana Drive to Cressey Way	Rural	2	Major Collector	4,989	B	5,316	C	5,724	C
	Cressey Way to Vine Avenue	Rural	2	Major Collector	5,388	C	5,741	C	6,149	C
	Chestnut Lane to Shaffer Road	Rural	2	Major Collector	438	A	466	B	874	B

<sup>a</sup>Based on 1.6 percent average annual growth rate applied to estimated 2016 ADT presented in Table H-1<sup>b</sup>Based on Merced County LOS thresholds presented in Table 3.12-1<sup>c</sup>Includes all Proposed Program ADT, as presented in Table 3.12-2, to represent maximum possible ADT

\*Unacceptable LOS

Notes:

ADT = average daily trips

LOS = level of service

SR = State Route

**Table H-2. Program Area ADT and LOS during Medium Construction Activity Year***Programmatic Environmental Impact Report for the Merced Irrigation District Water Resources Management Plan*

Roadway	Segment	Area	Lanes	Roadway Classification	Existing ADT <sup>a</sup>	Existing LOS <sup>b</sup>	2023 ADT without Program <sup>a</sup>	2023 LOS without Program <sup>b</sup>	2023 ADT with Program <sup>a,c</sup>	2023 LOS with Program <sup>b</sup>
SR 99	Madera County Line to Childs Avenue	Rural	4	Freeway	42,500	C	47,495	D*	47,773	D*
	Childs Avenue to SR 140 East Junction	Urban	4	Freeway	42,500	C	47,495	C	47,773	C
	SR 140 East Junction to G Street	Urban	4	Freeway	52,000	C	58,111	D*	58,389	D*
	G Street to SR 59 South Junction	Urban	4	Freeway	46,000	C	51,406	D*	51,684	D*
	SR 59 South Junction to R Street	Urban	4	Freeway	51,000	C	56,994	D*	57,272	D*
	R Street to SR 140 West/SR 59 North Junction	Urban	4	Freeway	57,700	D*	64,481	D*	64,759	D*
	SR 140 West/SR 59 North Junction to Atwater Boulevard	Urban	4	Freeway	56,000	D	62,581	D	62,859	D
	Atwater Boulevard to 16th Street	Urban	4	Freeway	59,000	C	65,934	E*	66,212	E*
	16th Street to Buhach Road	Urban	4	Freeway	49,000	C	54,759	D	55,037	D
	Buhach Road to East Atwater Boulevard	Urban	4	Freeway	52,000	C	58,111	D	58,389	D
	East Atwater Boulevard to Applegate Road	Urban	4	Freeway	53,000	D	59,229	D	59,507	D
	Applegate Road to West Atwater Boulevard	Urban	4	Freeway	54,000	D	60,346	D	60,624	D
	West Atwater Boulevard to Hammatt Avenue	Urban	4	Freeway	61,000	D	68,169	E*	68,447	E*
	Hammatt Avenue to Winton Parkway	Urban	4	Freeway	60,000	D	67,051	E*	67,329	E*
	Winton Parkway to Collier Road	Urban	4	Freeway	73,000	E*	81,579	F*	81,857	F*
	Collier Road to Shanks Road	Urban	4	Freeway	74,500	E*	83,255	F*	83,533	F*
SR 59	Shanks Road to Golden State Boulevard	Rural	4	Freeway	62,000	E*	69,286	F*	69,564	F*
	Golden State Boulevard to Stanislaus County Line	Rural	4	Freeway	65,000	F*	72,639	F*	72,917	F*
	Madera County Line/SR 152 Junction to El Nido Road	Rural	2	Arterial	6,750	C	7,543	C	7,821	C
	El Nido Road to Sandy Mush Road	Rural	2	Arterial	6,850	C	7,655	C	7,933	C
	Sandy Mush Road to Dickenson and Mission Roads	Rural	2	Arterial	9,200	D*	10,281	D*	10,559	D*
	Dickenson and Mission Roads to Childs Avenue	Urban	2	Arterial	11,500	D*	12,851	D*	13,129	D*
	Childs Avenue to SR 99/SR 140 Junctions	Urban	4	Arterial	23,000	D*	25,703	D*	25,981	D*
	SR 99/SR 140 Junctions to 16th and V Streets	Urban	4	Freeway	27,400	B	30,620	B	30,898	B
	16th and V Streets to 16th Street	Urban	4	Arterial	18,200	D*	20,339	D*	20,617	D*

**Table H-2. Program Area ADT and LOS during Medium Construction Activity Year***Programmatic Environmental Impact Report for the Merced Irrigation District Water Resources Management Plan*

Roadway	Segment	Area	Lanes	Roadway Classification	Existing ADT <sup>a</sup>	Existing LOS <sup>b</sup>	2023 ADT without Program <sup>a</sup>	2023 LOS without Program <sup>b</sup>	2023 ADT with Program <sup>a,c</sup>	2023 LOS with Program <sup>b</sup>
SR 140	16th Street to West Olive Avenue/Santa Fe Drive	Rural	2	Arterial	12,000	D*	13,410	E*	13,688	E*
	West Olive Avenue/Santa Fe Drive to Bellevue Road	Rural	2	Arterial	3,700	B	4,135	B	4,413	B
	Bellevue Road to Oakdale Road	Rural	2	Arterial	1,950	B	2,179	A	2,457	A
	Oakdale Road to Youd Road	Rural	2	Arterial	2,100	B	2,347	A	2,625	B
	Youd Road to Turlock Road	Rural	2	Arterial	1,500	A	1,676	A	1,954	A
	Turlock Road to Snelling Road	Rural	2	Arterial	3,900	B	4,358	B	4,636	B
	Snelling Road to Montgomery Street	Rural	2	Arterial	2,600	B	2,906	B	3,184	B
	SR 165 Junction to Lincoln Boulevard	Rural	2	Arterial	3,550	B	3,967	B	4,245	B
	Lincoln Boulevard to Applegate Road	Rural	2	Arterial	4,400	B	4,917	B	5,195	B
	Applegate Road to Buhach Road	Rural	2	Arterial	6,800	C	7,599	C	7,877	C
	Buhach Road to Franklin Road	Rural	2	Arterial	7,050	C	7,879	C	8,157	C
	Franklin Road to Massacio Street	Rural	2	Arterial	6,000	C	6,705	C	6,983	C
	Massacio Street to X Street	Urban	2	Arterial	12,700	D*	14,193	F*	14,471	F*
	X Street to SR 99/SR 59 Junctions	Urban	2	Arterial	14,700	C	16,428	F*	16,706	F*
Santa Fe Avenue	SR 99/SR 59 Junctions to Glen Avenue/Motel Drive	Urban	4	Freeway	12,200	A	13,634	A	13,912	A
	Glen Avenue/Motel Drive to Parsons Avenue	Urban	2	Arterial	11,400	D*	12,740	D*	13,018	D*
Santa Fe Drive	Parsons Avenue to Santa Fe Avenue	Rural	2	Arterial	8,700	D*	9,722	D*	10,000	D*
	Santa Fe Avenue to Planada Road	Rural	2	Arterial	8,000	C	8,940	D*	9,218	D*
Santa Fe Avenue	Planada Road to Mariposa County Line	Rural	2	Arterial	3,900	B	4,358	B	4,636	B
	Childs Avenue to Le Grand Avenue	Rural	2	Major Collector	1,612	A	1,801	B	2,079	C
Santa Fe Drive	Le Grand Avenue to Madera County Line	Rural	2	Major Collector	1,414	A	1,580	B	1,858	B
	Stanislaus County Line to Bradbury Road	Rural	2	Arterial	5,732	C	6,406	C	6,684	C
Santa Fe Drive	Bradbury Road to El Capitan Way	Rural	2	Arterial	4,984	B	5,570	C	5,848	C
	El Capitan Way to Cressey Way	Rural	2	Arterial	7,119	C	7,956	C	8,234	C
	Cressey Way to Walnut Avenue	Urban	2	Arterial	5,862	C	6,551	C	6,829	C

**Table H-2. Program Area ADT and LOS during Medium Construction Activity Year***Programmatic Environmental Impact Report for the Merced Irrigation District Water Resources Management Plan*

Roadway	Segment	Area	Lanes	Roadway Classification	Existing ADT <sup>a</sup>	Existing LOS <sup>b</sup>	2023 ADT without Program <sup>a</sup>	2023 LOS without Program <sup>b</sup>	2023 ADT with Program <sup>a,c</sup>	2023 LOS with Program <sup>b</sup>
	Chestnut Lane to Shaffer Road	Urban	2	Arterial	12,345	D	13,796	E*	14,074	E*
	Shaffer Road to Wallace Road	Urban	2	Arterial	14,506	D	16,211	F*	16,489	F*
	Bellevue Road to Frankline Road	Urban	4	Arterial	27,714	D	30,971	F*	31,249	F*
	Franklin Road to SR 59	Urban	4	Arterial	26,910	D	30,073	F*	30,351	F*
Westside Boulevard	SR 165 to Washington Boulevard	Rural	2	Major Collector	2,464	B	2,754	C	3,032	C
	Washington Boulevard to Lincoln Boulevard	Rural	2	Major Collector	2,750	B	3,073	C	3,351	C
	Lincoln Boulevard to Sultana Drive	Rural	2	Major Collector	1,655	A	1,850	C	2,128	C
	Sultana Drive to SR 99	Rural	2	Major Collector	1,228	A	1,372	B	1,650	B
Walnut Avenue	Sultana Drive to Cressey Way	Rural	2	Major Collector	4,989	B	5,575	C	5,853	C
	Cressey Way to Vine Avenue	Rural	2	Major Collector	5,388	C	6,021	C	6,299	C
	Chestnut Lane to Shaffer Road	Rural	2	Major Collector	438	A	489	B	767	B

<sup>a</sup>Based on 1.6 percent average annual growth rate applied to estimated 2016 ADT presented in Table H-1<sup>b</sup>Based on Merced County LOS thresholds presented in Table 3.12-1<sup>c</sup>Includes all Proposed Program ADT, as presented in Table 3.12-2, to represent maximum possible ADT

\*Unacceptable LOS

Notes:

ADT = average daily trips

LOS = level of service

SR = State Route