APPENDICES

APPENDIX A - BIOLOGICAL ASSESSMENT

Tule River Spillway Enlargement Project
Supplemental Biological Assessment
for the
Road Relocation
and Right Abutment Spillway Cut
Tulare County, CA

July 2019

U. S. Army Corps of Engineers
Sacramento District
Environmental Planning Section
1325 J Street
Sacramento, CA 95814-2922

I. INTRODUCTION

The purpose of this Biological Assessment is to review the proposed Tule River Spillway Enlargement Project's Road Relocation and Right Abutment Cut in sufficient detail to determine to what extent these new actions may affect any of the threatened, endangered, proposed, or sensitive species and designated or proposed critical habitats listed below. This consultation is a re-initiation of the Biological Opinion of December 1999 "Formal Section 7 Consultation on the Proposed Permanent 10-foot Dam Elevation Increase at Lake Success in Tulare County, California" (USFWS 1999, 1-1-99-F-0085(Attachment 1)). In addition, the following information is provided to comply with statutory requirements to use the best scientific and commercial information available when assessing the risks posed to listed and/or proposed species and designated and/or proposed critical habitat by proposed federal actions. This Biological Assessment is prepared in accordance with legal requirements set forth under regulations implementing Section 7 of the Endangered Species Act (ESA) (50 CFR 402; 16 U.S.C. 1536 (c)).

This assessment is being pursued due to new information regarding listed species and proposed modifications to the agency action identified in the Biological Opinion reference number 1-1-99-F-0085. The changes in listed species are the removal of Valley Elderberry Longhorn Beetles' (VELB) (*Desmocerus californicus dimorphus*) protected status from Tulare County, and the de-listing of Bald Eagles (*Haliaeetus leucocephalus*). These species will not be evaluated in this document.

The modification to the proposed action that instigates this assessment for the spillway raise project is changes to the design of the road relocation and ogee weir. The road relocation and spillway widening to accommodate the ogee weir design were not covered in detail in the Final Environmental Impact Statement/Final Environmental Impact Report (FEIS/FEIR) (USACE 1999) and subsequent Biological Assessment due to insufficient information on the future location of the road and the hydraulics of the spillway.

The following Threatened, Endangered, Proposed Threatened or Proposed Endangered Species may be affected[1] by the proposed action:

San Joaquin Kit Fox (*Vulpes macrotis mutica*) **E**

San Joaquin Adobe Sunburst (*Pseudobahia peirsonii*) **T**

E = Endangered, **T** = Threatened, **CH** = Critical Habitat.

A species list was generated from IPaC Consultation Code 08ESMF00-2019-SLI-0972 on 8 February, 2019 (Attachment 2). Species determined to have "No Effect" from the proposed road relocation and spillway widening are not included in this biological assessment but are discussed in the Supplemental Environmental Assessment prepared for the changes in project design.

1 This document will discuss making the "may affect" and subsequent determinations in later sections.

II. CONSULTATION TO DATE

Received a Biological Opinion dated 17 December 1999, "Formal Section 7 Consultation on the Proposed Permanent 10-foot Dam Elevation Increase at Lake Success in Tulare County, California." (USFWS 1999, 1-1-99-F-0085)

Consultation re-initiated informally with Harry Kahler, USFWS Wildlife Biologist, in December 2018.

Field Survey of Road Relocation and increased pool surface area was conducted on 2-4 April 2019. The survey was for environmental awareness and species distribution, and was conducted by a botanist (L. Guerrero), a mammalogist and entomologist (E. Tomasovic), and an ornithologist (H. Kahler). Two locations of the San Joaquin adobe sunburst (*Pseudobahia peirsonii*) that were not documented, were discovered and are being entered into the California Natural Diversity Database [CNDDB].

III. DESCRIPTION OF THE PROPOSED ACTION

Background

Lake Success Dam is located on the main branch of the Tule River about 6 miles east of Porterville, California, in Tulare County. It is in the foothills of the Sierra Nevada, fifty miles north of Bakersfield and sixty miles southeast of Fresno.

The Tule River Spillway Raise project consists of constructing a 10 foot-high concrete ogee weir across the spillway and raising the gross pool elevation from 655.11 feet to 665.11 feet (in NAVD88 vertical elevation).

The project will be done in two construction phases:

Phase 1: Right Abutment Spillway Cut, Road Relocation, and Temporary Stockpiles
Construction Start: January 2020
Construction Completion: February 2021

Phase 2: Spillway Raise, Left Abutment Cut (if needed), Recreation,
HWY 190 & Fraizer Dike Armoring, and Utility Relocations.
Construction Start: February 2021
Construction Completion: February 2023

Proposed Action

USACE, in partnership with the Lower Tule River Irrigation District (LTRID), proposes to widen the spillway by removing a portion of the right bank abutment of the spillway at Lake Success, and incorporating a road bench within the new slope. Road relocation is required as the new spillway would obstruct the road in its current location.

The existing road (Worth Drive/Avenue 146) through the spillway allows public access to the Rock Hill Recreation site and two residences when the reservoir is not at full capacity. This road is currently located between the right abutment slope of the spillway and the spillway. USACE is proposing to relocate that road along the right abutment cut above the new gross pool, removing the road from the spillway, to avoid most future road closures due to spillway engagement during high water (Figure 1). The road would become a public use USACE road and remain open up to the 100 year event.

This document covers only Phase 1 of this project, which include the right abutment spillway cut, road relocation, and temporary stockpiles of reusable materials from blasting and excavation. A supplemental Biological Assessment (BA) for the remaining phase will be submitted as necessary in the event that development of detailed designs causes changes to the 1999 proposed action that would require reinitiation.

Construction sequencing of Phase 1 begins with staging of equipment and preliminary site preparation including office site preparation including trailers, power lines or generators, security fencing, and moving in of equipment. The second activity would be the removal of loose dirt/rock and vegetation that could interfere with blasting, and relocating it to staging areas.

The Phase 1 project sequence begins with the right abutment cut, with drilling and explosives, to shape the spillway abutment and road bench. Once blasting of the right abutment begins, there will be a noise factor to be considered. Due to the need for control of the blasts, low impact blast packages will be used, reducing the peak blast wave in comparison with normal quarry blasting. The debris will be moved to temporary staging areas using excavators and dump trucks. This material would be used on-site to shore gaps for the roadway relocation or transported off-site for disposal. The demolition is expected to occur during the winter of 2020, after most species have reproduced and the young have matured to mobility or fledged. The construction of the relocated road-bed and abutment cut is expected to be completed by February 2021, before the spring reproductive surge. The temporary effects will last one year while demolition and road bench construction are completed. The permanent effects will be the new road location and the wider spillway. See Figure 3 for the new road location and blast radii during demolition.

After each blast there must be a clearing of the debris to temporary stockpiles and potentially some sorting. The clearing will be done using excavators and dump trucks relaying material to the temporary stockpiles.

The stockpiled debris might be used as fill for the road relocation bench where there are terrain gaps. Some of the stockpiled debris will be used to armor Frazier Dike, located 3 miles north of the spillway widening. The armoring of Frazier Dike and the finishing of the road bench would be in Phase 2 of the Tule River Spillway Enlargement Project. If necessary, consultation will be reinitiated for Phase 2 when design and planning are developed enough to determine any changes from the 1999 Proposed Action.

Avoidance and Minimization

The following BMPs would be implemented to minimize effects on species that occur during project activity, especially species that are Threatened and Endangered (T&E).

- Prior to construction, an employee education program would be conducted consisting of a brief presentation of San Joaquin kit fox, Southwestern willow flycatcher, least Bell's vireo, Blunt-nosed leopard lizard, Keck's Checker-mallow, San Joaquin adobe sunburst, Springville clarkia, California Condor, Bald and Golden eagles, and migratory birds by persons knowledgeable in biology and legislative protection. The program would include the occurrence of species in the area, its description and life history, and an explanation of the species status and protection under the ESA.
- A representative shall be appointed who would be the contact for any employee/contractor who might find dead, injured, or entrapped T&E animals or new plots of T&E plants in the work area. This representative shall contact the U.S. Fish and Wildlife Service immediately.
- Project-related vehicles would observe a daytime speed limit of 15-mph and a nighttime speed limit of 10-mph throughout the site in all project areas, except on county roads and State and Federal highways. This is particularly important at night when kit foxes are most active. Night-time construction would be minimized to the extent possible. Off-road traffic, outside of designated project areas, would be prohibited.
- Stormwater runoff would be controlled using standard construction BMPs and equipment (straw wattle, silt fencing, etc.)
- All food-related trash items such as wrappers, cans, bottles, and food scraps would be disposed of in securely closed containers, and removed at least once a week from a construction or project site. Daily removal is preferred.
- No firearms would be allowed on the project site.
- No pets, such as dogs or cats, would be permitted on the project site to prevent harassment, mortality, or destruction of dens or burrows.
- To prevent inadvertent entrapment of kit foxes, or other animals, during the construction phase of a project, all excavated, steep-walled holes or trenches more than 2-feet deep would 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 would be installed. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals. If at any time a trapped or injured animal is discovered, the Service would be contacted.
- In the case of trapped animals, escape ramps or structures would be installed immediately to allow the animal(s) to escape, or the Service would be contacted for guidance.

- Kit foxes are attracted to den-like structures, such as pipes, and may enter stored pipes and become trapped or injured. 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 would be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe would not be moved until the Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved only once to remove it from the path of construction activity, until the fox has escaped.
- Use of rodenticides and herbicides in project areas would be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and California condor, and the depletion of prey populations on which they depend. All uses of such compounds would 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 Service. If rodent control must be conducted, zinc phosphide should be used because of a proven lower risk to kit fox.

Authorities

Authorization for construction is provided by the Water Resources Development Act of 1999 (PL 106-53)Section 101(b)(4) , which authorized the flood damage reduction and water supply project based on the recommendations of the final report of the Chief of Engineers.

Action Area

The action area is defined as the properties of and around Lake Success near and within the projected gross pool down the Tule River incorporating the 100 year floodplain to the Tule Lakebed where the floodwaters evaporate or are pumped to storage.

The project area/footprint for this activity is bounded by lines originating near the intersection of Avenue 146 and Bartlett Park Road and West for approximately 1/2 mile to the outflow channel of the dam. This swath continues north-northeast following the shoreline of Lake Success for 1.66 miles, forming a rectangle. See the map of the project area in Figure 2.

Success Dam and Reservoir is located along the Tule River, approximately five miles east and upstream of the town of Porterville in Tulare County, and roughly 60 miles north of Bakersfield, California. Northwest and southwest trending hills and broad valleys typify the area. The foothill belt is five to 12 miles wide and merges with increasing relief into the Sierra Nevada. The Tule River is the major stream in this area, with about 390 square miles of Tule River drainage above Success Lake. The Tule River flows from the reservoir through Porterville, and continues 25 miles through agricultural areas to Tulare Lakebed. The Tulare Lakebed is part of a closed interior drainage system with no access to discharge into the sea. The lakebed is located towards the south end of the San Joaquin Valley, where it receives water from the Kern, Tule, and Kaweah Rivers, as well as from southern distributaries of the Kings River. It was separated from the rest of the San Joaquin Valley by tectonic subsidence and alluvial fans extending out from Los Gatos Creek in the Coast Ranges and the Kings River in the Sierra Nevada. Above a threshold elevation of 207 to 210 feet, it can overflow into the San Joaquin River; however, no overflows have occurred after 1878 due to increasing diversions of tributary waters for agricultural irrigation and municipal water uses. The Tulare lakebed was dry by 1899, except for residual wetlands and occasional floods. Over time, the decreasing lake size allowed agriculture to move into the productive lakebed deposits in the valley. Due to the closed nature of this system, high water years have a potential to flood agricultural lands in the lakebed. The plan would reduce the volume and duration of flooding in the Tulare lakebed. However, the lakebed would continue to receive floodwaters from the Tule River and other major streams.

Currently, Success Dam controls downstream flows by making releases through its outlet works. When the reservoir elevation exceeds the spillway crest elevation, uncontrolled flows are released via the spillway into the downstream channel. The current spillway crest elevation (655.11 feet (NAVD88)) corresponds to a flood event with a 2.2% annual chance exceedance (ACE) (approximately, the “46 year flood”). Peak spillway discharge and routing duration information are in the USACE Lake Success Water Control Manual (revised 2019). Raising the existing spillway would offer additional storage capacity of Tule River flows along with opportunities to increase flood protection to downstream areas in Porterville and the Tulare Lakebed, irrigation water storage, hydropower production, and recreation.

Flooding downstream of Success Dam can cause extensive damage to residences, agricultural farmland, and public facilities, and it is a major risk and concern for downstream residents. Under the current operations of the dam, water releases greater than 3,200 cubic feet per second (cfs) from Success Dam can cause damage to downstream agricultural areas. The downstream channel capacity ranges from 10,000 cfs through the city of Porterville to as little as 3,200 cfs west of the city. Agricultural areas west of the city are the first areas where property damage and danger to residents have historically occurred, given a release greater than 3,200 cfs. The project would decrease flood flows in the downstream distributaries mainly during the spring snowmelt season, and thereby, decrease the flooding of adjacent agricultural lands and urban areas, and decrease the impact of high water events on the downstream levees and infrastructure.

IV. STATUS OF THE SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

For species that are described and covered in this consultation, habitat preferences and distributions are based on published data, agency documents, and review of the IPaC from USFWS (Event Code: 08ESMF00-2019-E-06380), personal conversation with Harry Kahler, and an environmental survey on 2-4 April 2019.

San Joaquin Kit Fox

Status. The San Joaquin kit fox (*Vulpes macrotis mutica*) was listed as an endangered species on 11 March 1967 (USFWS 1967; 32 FR 4001), and was listed by the State of California as a threatened species on 27 June 1971. Critical habitat has not been designated for this species.

Distribution and Life History. Historically, the San Joaquin kit fox occurred in several San Joaquin Valley native plant communities. In the southernmost portion of the range, these communities included Valley Sink Scrub, Valley Saltbush Scrub, Upper Sonoran Subshrub Scrub, and Annual Grassland. San Joaquin kit foxes also exhibit a capacity to utilize habitats that have been altered by man. Kit foxes can inhabit the margins and fallow lands near irrigated row crops, orchards, and vineyards, and may forage occasionally in these agricultural areas.

The kit fox is often associated with open grasslands, which form large contiguous blocks within the eastern portions of the range of the animal. The listed canid also utilizes oak savanna and some types of agriculture (e.g. orchards and alfalfa), although the long-term suitability of these habitats is unknown.

San Joaquin Adobe Sunburst

Status. San Joaquin adobe sunburst (*Pseudobahia peirsonii*) was federally listed as threatened on 6 February 1997 (USFWS 1997; 62 FR 5542).

Distribution and Life History. San Joaquin adobe sunburst is restricted to heavy, adobe clay soils with slight slopes on valley floors and rolling hills in scattered location in northern Kern County, Tulare, and Fresno Counties. These soils may be favored by the San Joaquin adobe sunburst for their moisture holding capacity in the summer dry season. This plant is endemic to the eastern San Joaquin Valley. The population is limited to about 31 occurrences in valleys and flats and in the foothills of the Sierra Nevada, and occurs at elevations ranging from 500 to 2,500 feet above mean sea level.

San Joaquin adobe sunburst is found primarily in annual grassland plant communities, but sometimes in annual grassland-blue oak woodland ecotone communities. San Joaquin adobe sunburst grows in grasslands dominated by non-native annual grasses, mustards, and filaree. The intrusive and aggressive nature of these herbaceous weeds appears to be detrimental to the quality of habitat for the San Joaquin adobe sunburst.

V. ENVIRONMENTAL BASELINE AND CUMULATIVE EFFECTS

This section provides information which is then used along with the species and critical habitat information from the preceding section to describe the pre-action condition of the species and critical habitat that will be exposed to the stressors and subsidies of the action(s) under consultation. The purpose of this section is also to provide a summary of the relevant local information on the impacts that other factors (human and natural) in the action area have had on the viability of the species and value of critical habitat. These other factors may have occurred in the past, may continue to affect the species and habitat today, or will affect the species and habitat in the future.

Environmental Baseline

Success Lake is located within the foothills of the southern Sierra Nevada. Northwest and southwest trending hills and broad valleys typify the area. The foothill belt is five to 12 miles wide and merges with increasing relief into the Sierra Nevada. The Tule River is the major stream in this area, with about 390 square miles of Tule River drainage above Success Lake. The valley area downstream of the dam is relatively flat due to alluvial deposits from the river.

The extant population of San Joaquin adobe sunburst at Lake Success is considered in fair condition, and a remnant population of a larger one that used to occupy an area that is now part of Lake Success. The Success Lake extant population of San Joaquin adobe sunburst has varied from 50 to over 300 individual plants in four different areas covering an estimated 10-acre area along the west side of Success Lake and Boat Island. In addition, there is a small population on the south side of the inlet where the South Fork of the Tule River enters Success Lake (USFWS 2008)

There were two historical populations on the right abutment, just north of the spillway, per CNDDB shapefiles, which would be impacted by the enlargement of the spillway. A larger historical population west of the spillway which would be indirectly effected by the spillway enlargement. These particular historical population's locations have undergone extensive grazing by horses, cattle, goats, and sheep. The surveys on 10 December and 5 February showed no sign of the species in these locations.

On 2-4 April 2019 a survey was done between the current and future maximum pool depths at Lake Success. Populations were found on the South Fork of the Tule River and between Boat Island and Frazier Dike that were not indicated by U.S. Fish and Wildlife nor by the California Natural Diversity Database. These populations would not be affected by the road relocation and right abutment cut.

Orchards occur in large contiguous blocks to the northwest of Lake Success and at scattered locations to the southwest. Orchards sometimes support prey species if the grounds are not manicured; however, denning potential is typically low and kit foxes can be more susceptible to coyote predation within the orchards. (Zeiner 1990, USFWS 2010, USEPA 2013)

Suitable, not preferred, habitat is present in the project area, but the project area is at the edge of San Joaquin kit fox's current known range. USFWS has advised that the kit fox may potentially use the area for foraging or as a movement corridor. The kit fox has been documented in the eight surrounding quads, each greater than 5 miles from the study area. However, an active fox den was located at the base of the right abutment on 5 February 2019, although the species was not determined as the tracks were only of nail scrapes. A multitude of dens are located around the area; most were last inhabited by ground squirrel, some were recently inhabited by rabbits, and a few had been inhabited by fox (unknown species). The vegetation structure is either dense invasive grassland that potentially increases coyote predation on the kit fox, grazed pasture leaving no cover for the kit fox, or active public areas where garbage would be the only attractant.

All rock within the area, with the exception of alluvium, is part of the "bedrock complex" of the Sierra Nevada.

Cumulative effects

The ESA requires USFWS to evaluate the cumulative effects of the proposed actions on listed species and designated critical habitat, and to consider cumulative effects in formulating Biological Opinions. The ESA defines cumulative effects as "those effects of future State or private actions, not involving Federal activities that are reasonably certain to occur within the action area" of the proposed action subject to consultation. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Federal ESA. Federal actions, including hatcheries, fisheries, and land management activities are not included.

A number of other commercial and private activities, including agriculture, hatchery operations, timber harvest, recreation, and urban development could potentially affect listed species in the Tulare River watershed. Levee maintenance activities by state agencies and local reclamation districts are likely to continue, although any effects on listed species would be addressed through Section 10 of the ESA. The benefit of the Success Reservoir Enlargement Project's increased storage capacity would be to provide flood damage protection to infrastructure and environments downstream to the Tulare Lakebed by increasing the ability to control the release of high flows, reducing high river flow levee damages, therefore reducing the need for repairs.

All project actions and impacts would occur on Federal land with no State actions occurring in the Action Area. As a result, cumulative effects of the proposed action May Affect, but is Not Likely to Adversely Affect the Southwestern willow flycatcher, San Joaquin kit fox, nor San Joaquin adobe sunburst.

VI. EFFECTS OF THE ACTION

The activities to this point are relatively innocuous, although there had previously been indicated populations of San Joaquin adobe sunburst and Springville clarkia on or near the surface material to be removed. Three surveys showed extensive pasturing of cattle, horses and goats in the location indicated by the CNDDB. No evidence was seen of either of the plants near the project area when other locations of the species' were in bloom during the field surveys conducted on 2-4 April 2019.

The immediate effect of blasting is within 750 feet, and secondary effects would be within 2500 feet, as indicated on Figures 1 and 3 (Pers. Comm. AE Engineering). The effects would vary due to the hilly terrain around Lake Success both focusing, reflecting and attenuating the blast noise. Wildlife sensitive receptors in the immediate blast radius (750 feet) would be considered, although the likelihood of resident wildlife after the soil stripping would be minimal, leaving transient predators such as birds and lizards. Some wildlife in the larger 2500 foot buffer zone around demolition may be dissuaded from nesting/denning in the local area if nesting/denning coincides with the rigorous blasting. The nesting habitat available (trees) in the 2500 foot blast zone is south of the Dam around the USACE offices and an abandoned mobile home park. Also, migratory songbirds, raptors, waterbirds and shorebirds may have their migratory patterns shifted due to the disturbance. The frequency and number of detonations is not know at this time, as engineering is still compiling the geotechnical data. Most birds acclimatize quickly to disturbance if they are in a resting or nesting activities, but perching and foraging birds will more often adjust their behavior if the disturbance effects their activity. The disturbance to the animals decreases over repeated exposure if there are no negative effects noticed by the animals. There is energy budget loss due to the disturbance, but it is short term per blast decreasing with successive blasts (Pers. Obs. and Holthuijzen, et al. 1990.)

Critical Habitat

The action area addressed in this BA does not fall within designated critical habitat for any of the species listed in Section I. Therefore there is No Effect on designated Critical Habitat.

San Joaquin Kit Fox

The project actions may result in short term avoidance by kit fox due to construction and blasting. However, these actions will take place late fall and winter, reducing the likelihood of encountering a kit fox. BMPs (Section III, Avoidance and Minimization) would avoid, minimize, or reduce interactions with kit fox to less than significant.

Cumulative effects with other actions. The downstream effects of the spillway enlargement of Lake Success would decrease flooding effects for kit fox in the Tulare Lakebed watershed. State and local activities are expected to continue (e.g., levee repairs, water diversions for irrigation). The cumulative effects for San Joaquin kit fox is May Affect, but is Not Likely to Adversely Affect.

San Joaquin Adobe Sunburst

The project actions may result in the reduction of two populations of San Joaquin adobe sunburst, which have potentially been eliminated by grazing. Further populations, not in California Natural Diversity Database or IPaC were discovered on 2-4 April 2019. One population is two miles from the project area on the South Fork of the Tule River before it reaches the new projected gross pool. The other location was northwest of Boat Island near the power lines, but not underneath them. The location near the power lines must be considered during the raising and replacement of the towers in Phase 2 of the Lake Success Spillway Enlargement.

San Joaquin adobe sunburst successfully blooms during locally high rain years at Lake Success. The local population of the plant is not dependent on the flow regime or pool elevation in the locations it has been found. The populations within the construction footprint may no longer be extant due to grazing by cows and horses on private land and by goats and/or sheep on Corps lands, indicated by recent (2019) surveys.

Cumulative effects with other actions. The spillway enlargement is not likely to raise the pool to an elevation that would affect San Joaquin adobe sunburst. Heavy wind and wave action may cause the pool to shift into the population locations, but the likelihood is low due to the seasonality of severe storms in the area not coinciding with the higher pool levels. State and local activities are expected to continue upstream, while downstream has little to no habitat for this species. State and local activities are expected to continue (e.g., levee repairs, water diversions for irrigation), but these populations are on Federal land and would not be affected by non-Federal actions.

VIII. CONCLUSION

San Joaquin Kit Fox

The downstream effects of the spillway enlargement of Lake Success would decrease flooding effects for kit fox in the Tulare Lakebed watershed. State and local activities are expected to continue (e.g., levee repairs, water diversions for irrigation). The effects of the road relocation and spillway widening for San Joaquin kit fox is May Affect, Not Likely to Adversely Affect.

San Joaquin Adobe Sunburst

The spillway enlargement is not likely to raise the pool to an elevation that would affect San Joaquin adobe sunburst. Heavy wind and wave action may cause the pool to shift into the population locations, but the likelihood is low due to the seasonality of severe storms in the area not coinciding with the higher pool levels. State and local activities are expected to continue upstream (e.g., levee repairs, water diversions for irrigation), while downstream has little to no habitat for this species. These populations are on Federal land and would not be effected by non-Federal actions. As the species cannot avoid environmental changes this project May Affect, Not Likely to Adversely Affect San Joaquin adobe sunburst populations.

IX. LIST OF DOCUMENTS

Attached Documents

Figure 1. Success Lake and Vicinity with Haul Roads and Blast Radii.

Figure 2. Proposed Temporary Stock Piles and Project Area.

Figure 3. Road alignment proposed for a bench along the right abutment of the spillway.

USFWS. 1999. Formal Section 7 Consultation on the Proposed Permanent 10-foot Dam Elevation Increase at Lake Success in Tulare County, California.

USFWS. 2019. IPaC Consultation Code: 08ESMF00-2019-E-03029 "Tule River Road Relocation". 8 February 2019.

X. LITERATURE CITED

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USFWS. 2008. *Pseudobahia bahiifolia* (Hartweg's golden sunburst) *Pseudobahia peirsonii* (San Joaquin adobe sunburst) 5-Year Review: Summary and Evaluation.

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Personal Communications

Breeds, Chris. President of Blasting, Sub Terra, Inc. 1 May 2019.

Kahler, Harry. Interactive discussion during field surveys. 2-4 April 2019.

XI. LIST OF CONTACTS/CONTRIBUTORS/PREPARERS

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Environmental Manager, U.S. Army Corps of Engineers
Botanist during field survey

XII. MAPS AND IMAGES

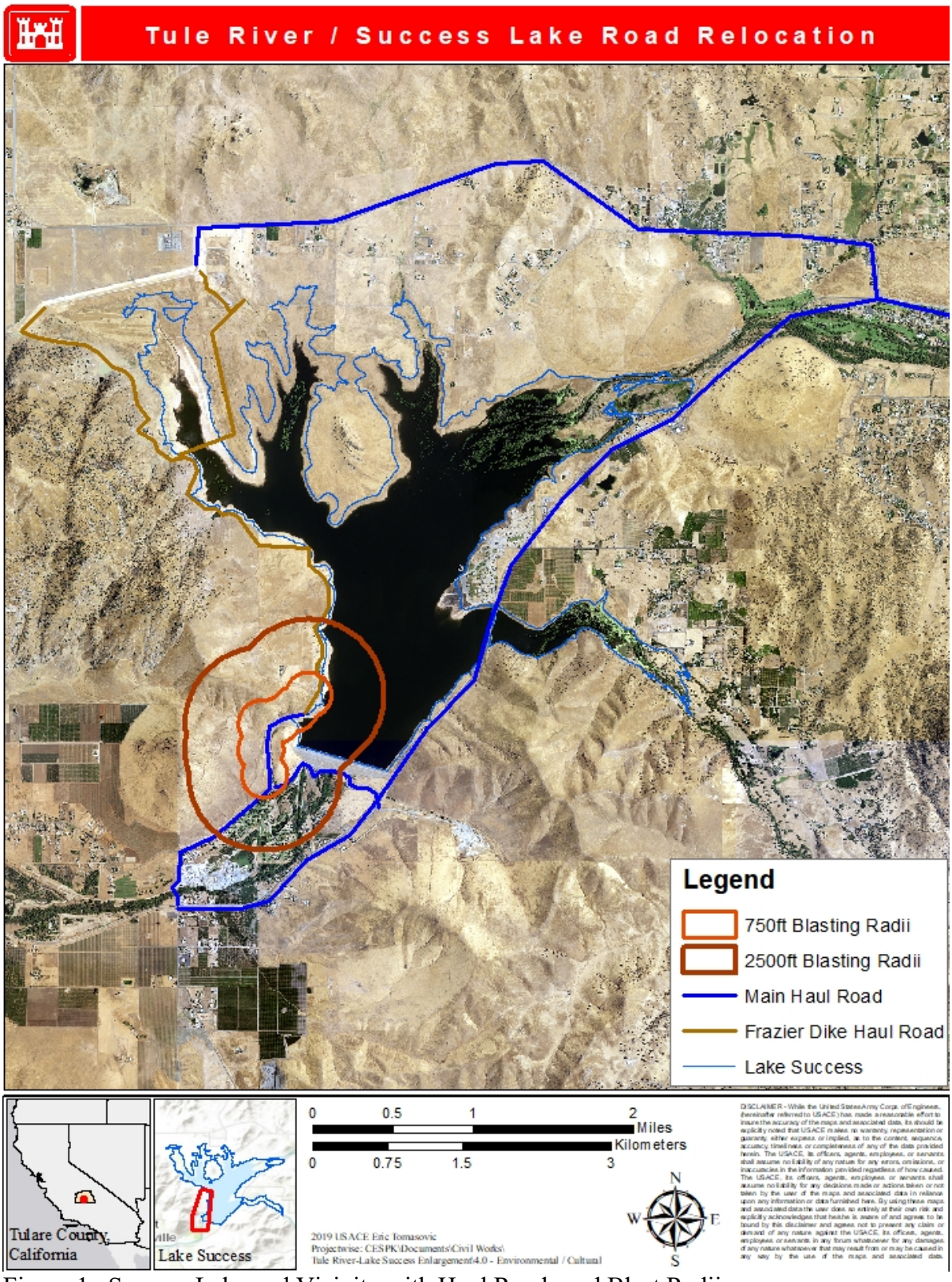

Figure 1. Success Lake and Vicinity with Haul Roads and Blast Radii.

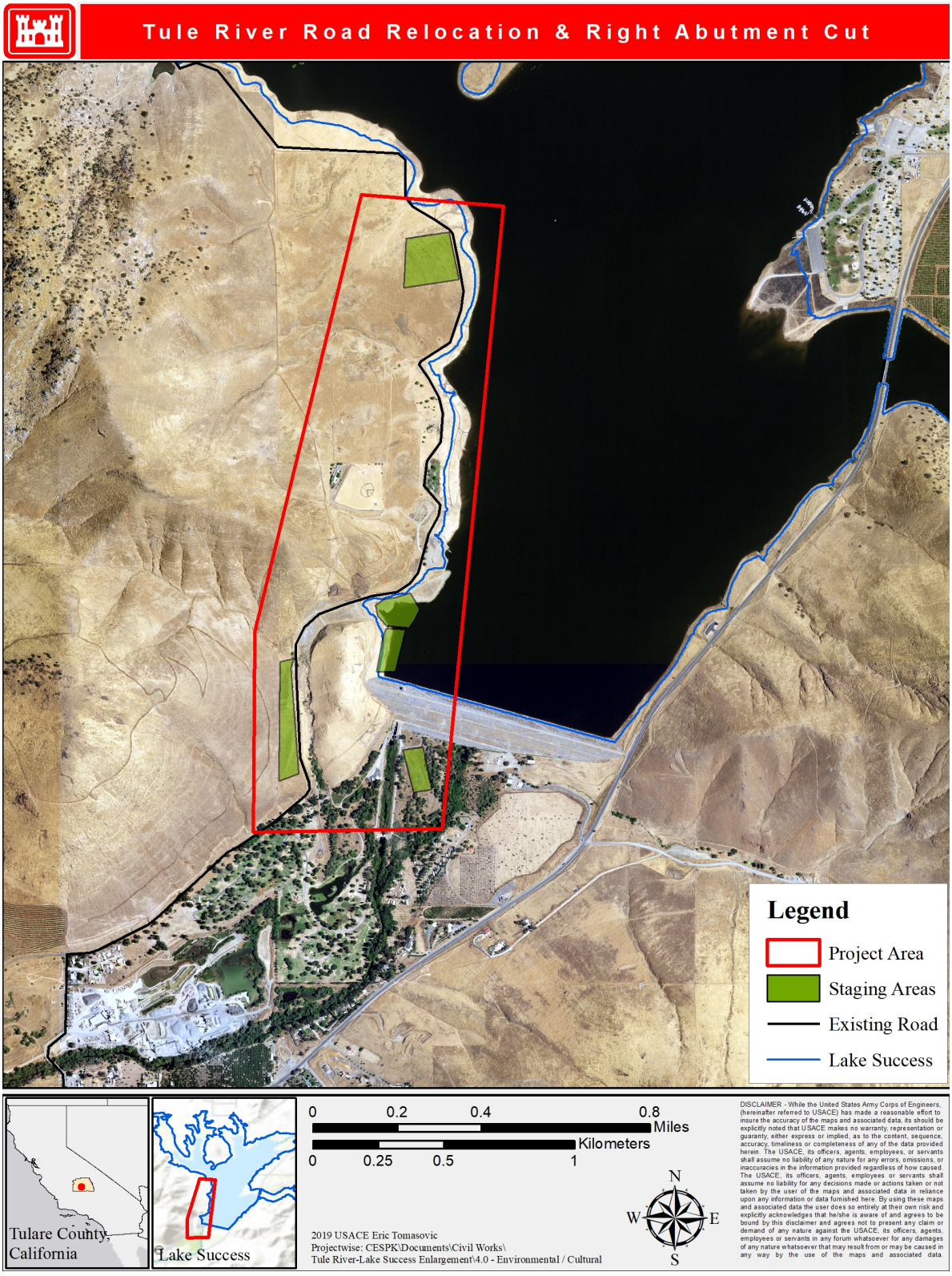

Figure 2. Proposed Temporary Stock Piles and Project Area.

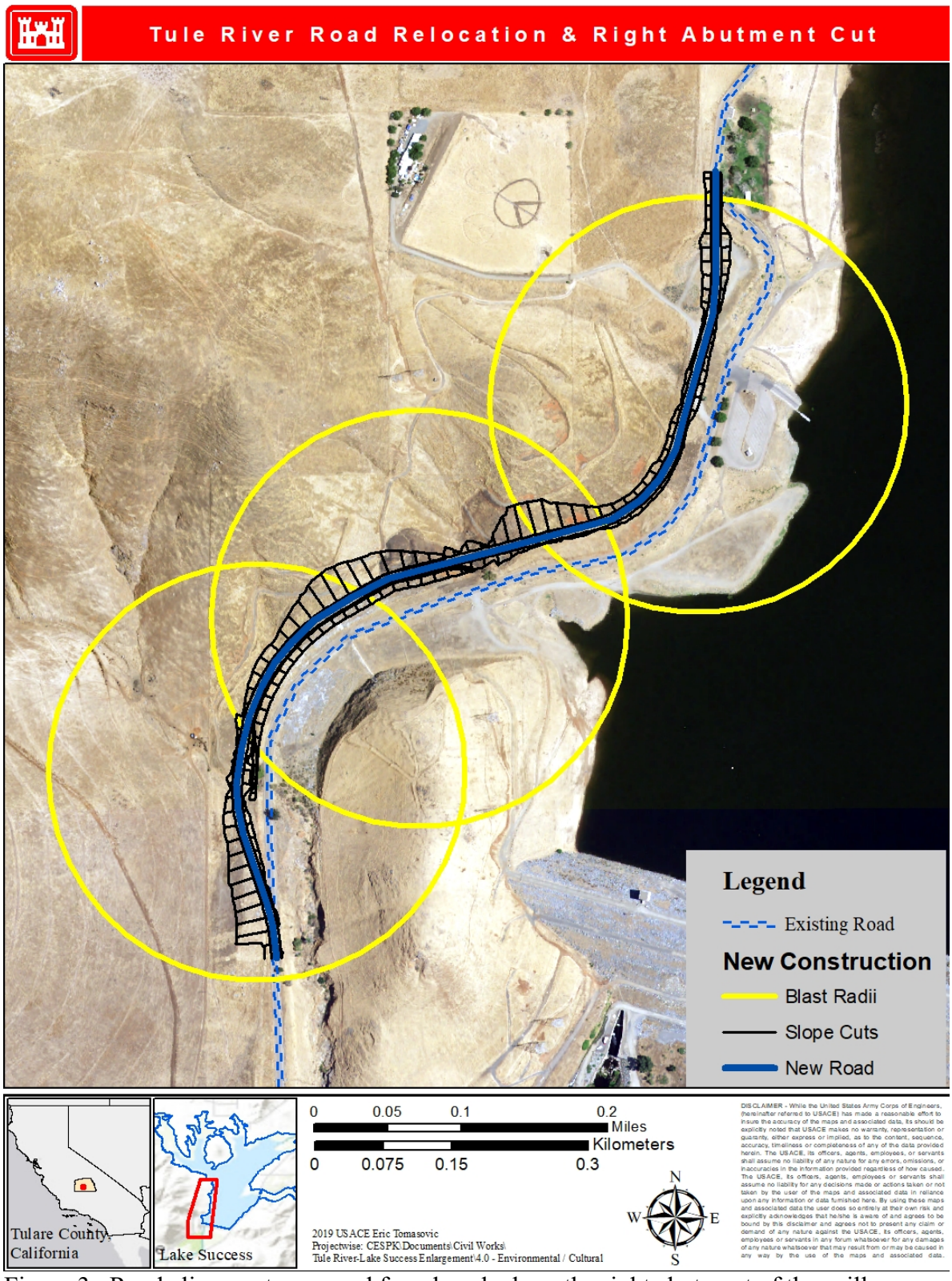

Figure 3. Road alignment proposed for a bench along the right abutment of the spillway.

APPENDIX B - CULTURAL RESOURCE COORDINATION

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING
THE TULE RIVER SPILLWAY ENLARGEMENT PROJECT

WHEREAS, the U.S. Army Corps of Engineers, Sacramento District (Corps), owns and operates Success Dam, a zoned earth-filled dam that impounds the Tule River about 5 miles east and upstream of the city of Porterville in Tulare County, California, which was authorized for construction by the Flood Control Act of 1944 (Public Law [PL] 534, 22 December 1944, Seventy-eighth Congress, Second Session); and

WHEREAS, in 1999, the Tule River Basin Investigation Final Feasibility Report and Chief's Report recommended increasing storage in Success Dam Reservoir for flood risk management and irrigation water supply by raising the spillway by 10 feet; and

WHEREAS, Congress authorized construction of a project to raise the Success Dam spillway and increase reservoir storage through the Water Resources Development Act (WRDA) of 1999 Section 101(b)(4) (PL 106-53, 17 August 1999) and provided funding for the Tule River Spillway Enlargement Project (Project) as a Civil Works Flood Control and Coastal Emergencies project through Supplemental Appropriations under PL 115-123, Division B, Subdivision 1—Further Additional Supplemental Appropriations for Disaster Relief Requirements Act, 2018; and

WHEREAS, the Project authorized and funded by Congress would increase the storage capacity of Success Dam Reservoir through a phased construction project that would widen the existing spillway from 200 to 365 feet, raise its height by 10 feet through construction of an ogee weir, and raise the maximum gross reservoir pool from 652.5 feet above mean sea level (amsl) to 662.5 feet amsl; and

WHEREAS, the Corps has determined that the Project constitutes an undertaking, as defined in 36 CFR § 800.16(y), and is therefore subject to the requirements of 54 USC § 306108, commonly known as Section 106 of the National Historic Preservation Act (NHPA), as amended; and

WHEREAS, the Corps has determined that the undertaking involves the type of activity that has the potential to cause effects on historic properties, assuming such properties are present, and that the phased nature of the Project requires phasing of the Section 106 process to identify and evaluate historic properties as described at 36 CFR § 800.4 – § 800.5, and to resolve adverse effects on historic properties if necessary in accordance with 36 CFR § 800.6, which requires execution of a Programmatic Agreement (PA) pursuant to 36 CFR § 800.14(b)(1)(ii); and

WHEREAS, the Corps is complying with Section 106 of the NHPA for this Project through the execution and implementation of this PA, pursuant to 36 CFR § 800.14(b)(1)(iii), because the Corps cannot fully determine the effects of the undertaking on historic properties for all phases of the Project prior to the approval of the expenditure of Federal funds on the undertaking; and

WHEREAS, the Corps has consulted with the California State Historic Preservation Officer (SHPO) on the development of this PA for phasing the Section 106 process for the undertaking; and

WHEREAS, the Corps has invited the Lower Tule River Irrigation District, the non-Federal sponsor for the Project, to be a Concurring Party to this PA; and

WHEREAS, the California Native American Heritage Commission (NAHC) has identified the Tule River Indian Tribe, Santa Rosa Rancheria Tachi Yokut Tribe, Kern Valley Indian Community, Tubatulabals of Kern Valley, and the Wuksache Indian Tribe/Eshom Valley Band as having cultural resources interests in the Project area and the Corps has invited these Indian tribes and Native American interested parties to participate as Section 106 consulting parties regarding the undertaking and as Concurring Parties to this PA; and

WHEREAS, in accordance with 36 CFR § 36 CFR § 800.6(a)(1), through correspondence dated June 18, 2019, the Corps notified the Advisory Council on Historic Preservation (ACHP) of the development of this PA and through correspondence dated July 31, 2019, the ACHP declined to participate in its development; and

WHEREAS, in accordance with 36 CFR § 800.6(a)(4) and 36 CFR § 800.14(b)(2)(ii), the Corps has notified the public of the Project of the development of this PA and provided an opportunity for members of the public to comment on the Project and the Section 106 process for the undertaking; and

WHEREAS, the definitions set forth in 36 CFR § 800.16, the definitions for Signatory Parties set forth in 36 CFR § 800.6(c)(1), and the definitions for Concurring Parties set forth in 36 CFR § 800.6(c)(3), are incorporated herein by reference and apply throughout this PA; and

NOW, THEREFORE, the Signatories agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on historic properties.

I. TIME FRAMES AND REVIEW PROCEDURES

A. For any document or deliverable produced in accordance with the stipulations of this PA, the Corps shall provide a draft version to the SHPO, Concurring Parties, and/or Indian tribes or other Native American interested parties for review. To the extent feasible, the

Corps will provide draft documents and deliverables to reviewers by hard copy and electronically, by email or other means, if so requested by a reviewer. Any written comments provided to the Corps by hard copy or electronically or within thirty (30) calendar days after the date of receipt by the reviewing party shall be considered in the revision of the document or deliverable.

B. The Corps shall keep a record of the written comments received for all draft documents or deliverables and how those comments were addressed. The Corps shall provide electronic and hard copies of revised final documents or deliverables to the SHPO for concurrence. The SHPO shall have thirty (30) calendar days from the date of receipt to accept or concur with the document or deliverable.

C. Failure of the SHPO, Concurring Parties, and Indian tribes or other Native American interested parties to respond within thirty (30) calendar days of any submittal shall not preclude the Corps from moving forward with the undertaking or next steps in this PA.

D. Should the SHPO object to a final document or deliverable submitted for concurrence, the Corps and SHPO shall consult regarding the objection as outlined in Stipulation XIV (Dispute Resolution).

II. AREA OF POTENTIAL EFFECTS

A. Current planning, design, engineering and funding requirements necessitate multiple Project phases. The first phase of the Project will consist of the right abutment spillway cut; the realignment of a segment of Worth Drive/Avenue 146, a road currently aligned down the invert of the existing spillway; and stockpiling of materials removed through these activities. Subsequent Project phases include the left abutment spillway cut and spillway raise (i.e., ogee weir construction within the enlarged spillway); land acquisitions; utility relocations; armoring of the Highway 190 bridge and Frazier Dike, to prevent impacts from a higher gross reservoir pool; and changes in the water control diagram associated with managing increased reservoir capacity. The reservoir pool raise itself would occur intermittently after the completion of Project construction.

B. The overall Project APE, as documented in Appendix A to this PA, consists of the following:

1. The extent of all Project construction activities required to enlarge and raise the spillway and increase the gross reservoir pool; and

2. All construction staging areas, access routes, borrow areas, spoil areas, and stockpiling areas; and

3. Any additional rights-of-way or easements obtained by the Corps or local partner as required for Project construction; and

4. Other areas that may be impacted by Project-related activities, including downstream areas that may be affected by changes in reservoir operations; areas associated with habitat restoration or environmental mitigation measures; and/or other areas potentially affected by Project construction.

C. As a Project phase approaches final design, the Corps will prepare and consult with the SHPO, Concurring Parties, and Indian tribes or other Native American interested parties on a refined APE specific to that Project phase. Consultation time frames and review procedures for consultation on a refined APE will follow those described in Stipulation I (Time Frames and Review Procedures).

D. If changes in Project design necessitate modifying an APE previously subject to review under this PA, the Corps will submit a modified APE to the SHPO, Concurring Parties, and Indian tribes or other Native American interested parties. Time frames and review procedures for consultation on a modified APE will follow those described in Stipulation I (Time Frames and Review Procedures). Any objections or disputes related to documentation of the Project APE or modified APE will be handled as described in Stipulation XIV (Dispute Resolution).

E. The APE for specific Project phases, or for the Project as a whole, may be refined as described herein without requiring amendment to this PA.

F. As necessary to meet Project schedules, the Corps may address multiple steps in 36 CFR §§ 800.4 through 800.6 as provided for at 36 CFR § 800.3(g).

III. IDENTIFICATION AND EVALUATION OF HISTORIC PROPERTIES

A. To the extent feasible under Project schedule constraints, the Corps shall identify and evaluate historic properties in the APE through the process described at 36 CFR § 800.4. In the event that evaluation is not feasible, the Corps may elect to treat identified cultural resources as eligible for inclusion in the NRHP for the purposes of this undertaking. Based on Project schedule and access, the Corps may phase these identification and evaluation efforts pursuant to 36 CFR § 800.4(b)(2).

B. The Corps shall consult on the results of identification and evaluation efforts for each Project phase in accordance with the timeframes and procedures described in Stipulation I (Time Frames and Review Procedures).

C. As necessary to meet Project schedules, the Corps may address multiple steps in 36 CFR §§ 800.4 through 800.6 in a single consultation, as provided for at 36 CFR § 800.3(g).

IV. ASSESSMENT AND RESOLUTION OF ADVERSE EFFECTS

A. The Corps will apply the criteria of adverse effect to historic properties identified within the APE, refined APE, or modified APE pursuant to 36 CFR § 800.5(a)(1). Based on Project schedule and access, the Corps may use a phased process in applying the criteria of adverse effect consistent with phased identification and evaluation efforts pursuant to 36 CFR § 800.5(a)(3).

1. Avoidance of adverse effects to historic properties is the preferred treatment approach. If feasible, the Corps will consider redesign of Project elements in order to avoid historic properties and adverse effects; however, given Project constraints, avoidance through redesign may not be possible.

2. If an adverse effect to a historic property cannot be avoided, the Corps will develop and implement a Historic Property Treatment Plan (HPTP) to resolve the adverse effect as described in Stipulation VI (Historic Property Treatment Plans).

V. HISTORIC PROPERTY TREATMENT PLAN

A. The Corps, in consultation with the SHPO, Concurring Parties, and Indian tribes or other Native American interested parties and/or any additional consulting parties, shall develop and implement a HPTP for the Project that describes the actions the Corps will take to avoid, minimize, and/or resolve any adverse effect(s) resulting from the undertaking (or phase of the undertaking).

1. Resolution of adverse effects to archaeological properties through means other than data recovery may be considered when developing the HPTP (e.g., detailed architectural recordation, oral history documentation, development of interpretive materials or publications, or other mitigation means, as agreed upon by the Corps and the SHPO). If data recovery is determined to be the most appropriate method of treatment, the Corps shall ensure that the recovery methods and documentation adhere to the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation.*

2. The Corps shall be responsible for consulting on the appropriate means of mitigation with the SHPO, Concurring Parties, and Indian tribes or other Native American interested parties and/or any additional consulting parties concerned with the effect of the Project on historic properties.

3. The Corps will submit all documentation related to HPTP implementation for review as described in Stipulation I (Timeframes and Review Procedures). Any objections or disputes related to HPTP implementation will be handled as described in Stipulation XIV (Dispute Resolution).

VI. POST-REVIEW DISCOVERIES

A. If historic properties are discovered, or unanticipated effects on historic properties are found, during any phase of Project construction, the Corps will follow the procedures at 36 CFR § 800.13.

1. The Project HPTP, prepared in consultation with the SHPO, Concurring Parties, Indian tribes, other Native American interested parties, and/or other consulting parties, shall include a plan for responding to such discoveries pursuant to 36 CFR § 800.13(a)(2).

VII. TREATMENT OF NATIVE AMERICAN HUMAN REMAINS

A. It is possible that human remains may be discovered during Project construction or during archaeological excavations associated with identification, evaluation, or data recovery efforts associated with the undertaking.

B. If Native American human remains, associated funerary objects, unassociated funerary objects, sacred objects, and/or objects of cultural patrimony are inadvertently discovered or intentionally excavated on Federal lands, the Corps will follow the procedures outlined in the Native American Graves Protection and Repatriation Act (NAGPRA), as specified in the implementing regulations at 43 CFR § 10.2(d)(1-2). The Corps will ensure that all such NAGPRA cultural items encountered on Federal lands during any activity associated with the undertaking are treated in accordance with Section 3(c-d) of NAGPRA and the implementing regulations at 43 CFR Part 10.

C. For Native American burials, skeletal remains, and associated grave goods discovered or intentionally excavated on non-Federal land during any activity associated with the undertaking, the treatment and disposition of the remains will follow the requirements of Section 7050.5 of the California State Health and Human Safety Code and Section 5097.98 of the California Public Resources Code.

D. Any HPTP developed under this PA also may include an Inadvertent Discovery and Burial Treatment Plan specific to the actions specified in the HPTP, as needed.

VIII. CURATION OF ARCHAEOLOGICAL COLLECTIONS

A. The Corps will ensure that any non-NAGPRA related cultural materials and associated records that result from the identification, evaluation, and/or treatment of historic properties on Corps land pursuant to this PA shall be curated and properly maintained in accordance with the requirements of 36 CFR Part 79 (see Stipulation XIII for treatment of NAGPRA-related items).

B. The Corps will ensure that any archaeological materials excavated or otherwise recovered from non-Federal land during implementation of the undertaking shall be handled and maintained in accordance with 36 CFR § 79 until all necessary analyses of such materials have been completed as outlined in an HPTP, as applicable.

C. For any collections made on private lands, the Corps will encourage the landowner(s) to consent to the curation of archaeological materials recovered from their lands in a museum or repository that meets the requirements of 36 CFR § 79 upon the completion of all necessary analyses. If a private landowner does not consent to the curation of recovered archaeological materials, the Corps will return the materials to the landowner(s) and encourage them to rebury the returned items close to their original location, if possible, based on Project requirements. The Corps will document the return and submit copies of this documentation to the parties named in the specific HPTP within thirty (30) days of such return.

D. The HPTP developed under this PA will detail the types of materials, if any, proposed for curation as a part of this project. If items are to be curated in a museum or other repository, the Corps will ensure that documentation of the curation of these materials is prepared and provided to the parties named in the HPTP, specific to the resolution of effects for that historic property, within thirty (30) days of curation of the materials.

IX. NATIVE AMERICAN CONSULTATION AND PARTICIPATION

A. The Corps shall make a reasonable and good-faith effort to ensure that Indian tribes and other Native American interested parties identified by the California Native American Heritage Commission as having cultural ties or interests in the APE, have the opportunity to participate in the development and implementation of the terms of this PA, including, but not limited to, the identification of historic properties within the Project APE, National Register of Historic Places eligibility determinations, findings of effect, and the resolution of adverse effects to historic properties.

B. The Corps shall ensure that Native American consultation regarding the Project continues throughout the Section 106 process. Section 106 Consultation may be carried out via letters of notification, public meetings, site visits, and/or other appropriate methods.

C. Failure of any contacted group to comment within thirty (30) calendar days shall not preclude the Corps from proceeding with the Project as proposed.

X. PUBLIC AND CONSULTING PARTY PARTICIPATION

A. Individuals, organizations, and local agencies with a demonstrated interest in the Project may be invited to participate as Concurring Parties to this PA and consulting parties for the undertaking, to provide input on the identification, evaluation, and proposed treatment of historic properties consistent with 36 CFR §§ 800.2(c)(5) and 800.2(d). Public input

will be sought and received through Section 106 letters of notification, public meetings, or by other means and venues.

B. Information regarding the undertaking that is released to the public will comply with Stipulation XIII (Confidentiality); 36 CFR § 800.2(d)(1-2) and 800.11(c)(1) and (3); Section 304 of the NHPA, as amended (54 U.S.C. § 307103); Section 9 of the Archaeological Resources Protection Act (10 U.S.C. § 470aa – 470mm); Executive Order on Sacred Sites 13007, dated May 24, 1996; the Freedom of Information Act (FOIA) (5 USC § 552); and Section 6254.10 of the California Government Code, as applicable.

XI. NOTICES TO PROCEED WITH CONSTRUCTION

A. Notices to Proceed (NTPs) may be issued by the Corps for a Project phase under any of the following conditions:

1. The Corps, in consultation with the SHPO, Concurring Parties, Indian tribes, other Native American interested parties, and/or other consulting parties, has determined that there are no historic properties present within the APE for the Project phase.

2. The Corps, in consultation with the SHPO, Concurring Parties, Indian tribes, other Native American interested parties, and/or other consulting parties, has determined that there will be no adverse effect to historic properties within the APE for the Project phase.

3. Mitigation measures to resolve adverse effects to historic properties have been documented in an HPTP that has been reviewed according to Stipulation I (Timeframes and Review Procedures) and Stipulation IX (Native American Consultation And Participation), or otherwise have been agreed to in consultation with the SHPO, Concurring Parties, Indian tribes, other Native American interested parties, and/or other consulting; the fieldwork portion of treatment has been completed; and the Corps has accepted a fieldwork summary and a schedule for final reporting of that work.

XII. PROFESSIONAL QUALIFICATIONS AND STANDARDS

A. The Corps will ensure that all actions prescribed in this PA that involve the identification, evaluation, analysis, recording, treatment, monitoring, or disposition of historic properties, or that involve reporting or documentation of such actions in the form of reports, forms, or other records, shall be carried out by or under the direct supervision of a person or persons who meet the Secretary of Interior's Professional Qualifications Standards (48 FR 44738-44739; Appendix A to 36 CFR 61) in the appropriate discipline.

B. Historic preservation activities carried out pursuant to this PA shall meet the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740), as well as standards and guidelines for historic preservation activities established by the SHPO.

XIII. CONFIDENTIALITY

A. Information regarding the nature and location of Native American archaeological sites and any other Native American cultural resources identified or discussed pursuant to this PA shall be limited to appropriate Corps personnel, Corps contractors, Indian tribes and Native American consulting parties, the SHPO, and other parties involved in developing, reviewing, and implementing this PA, to the extent permitted by law.

XIV. DISPUTE RESOLUTION

A. Should any Signatory to this PA object in writing to any action proposed or carried out pursuant to this PA, the Corps consult with the objecting party for a period of time, not to exceed thirty (30) calendar days, to resolve the objection. If the objection is resolved through consultation, the Corps may authorize the disputed action to proceed in accordance with the terms of such resolution.

B. Should the SHPO object to any final document or deliverable submitted for review and concurrence pursuant to this PA, the Corps and the SHPO shall consult for a period not to exceed fifteen (15) calendar days following receipt by the Corps of the SHPO's written objection in an effort to come to an agreement regarding the issue(s) on which the SHPO has objected.

C. If the Corps determines that any objection cannot be resolved during the consultation periods stipulated above, the Corps shall forward all documentation relevant to the dispute to the ACHP. Within forty five (45) calendar days after receipt of all pertinent information, the ACHP shall:

1. Advise the Corps that the ACHP concurs with the Corps' proposed response to the objection, whereupon the Corps will implement the proposed response; or

2. Provide the Corps with recommendations, which the Corps shall consider in reaching a final decision regarding the objection; or

3. Notify the Corps that the ACHP will comment in accordance with the requirements of Section 106, and proceed to comment.

4. The Corps will take into account any ACHP recommendation or comment, and any comments from the other parties to this PA, in reaching a final decision regarding the objection. Reclamation's responsibility and ability to carry out all actions under this PA that are not the subject of the objection shall remain unchanged.

5. Should the ACHP not exercise on the of above options within forty five (45) calendar days after receipt of all submitted pertinent documentation, the Corps may implement the proposed response to the objection.

D. At any time during implementation of the terms of this PA should an objection pertaining to this PA be raised by a Concurring Party, consulting party, or member of the public, the Corps shall notify the Signatory Parties and take the objection under consideration. The Corps shall consult with the objecting party for up to fifteen (15) calendar days. Within fifteen (15) calendar days following the consultation period, the Corps will render a decision regarding the objection and respond in writing to the objecting party. The Corps' decision regarding resolution of the objection will be final. Following issuance of its final decision, the Corps may authorize the action that was the subject of the dispute to proceed in accordance with the terms of that decision. The Corps responsibility to carry out all other actions under this Agreement shall remain unchanged.

E. The timeframes for consultation to resolve any disagreement or objection to the terms of this PA or PA deliverable may be extended by mutual consent of the Corps and SHPO.

XV. AMENDMENT

A. Any Signatory Party to this PA may propose that the PA be amended, whereupon the Corps shall consult with the SHPO to consider such an amendment. The PA may be amended only upon written concurrence by all Signatory Parties.

B. Any attachments to the PA, the APE, and HPTPs developed pursuant to the PA may be modified or revised, or updated through consultation consistent with Stipulation I (Timeframes and Review Procedures) without requiring amendment of this PA.

XVI. TERMINATION

A. Only the Signatory Parties may terminate this PA. Any Signatory proposing termination shall notify the other Signatories in writing, explain the reasons for proposing termination, and consult with the other Signatories to seek alternatives to termination, within thirty (30) calendar days of the notification. Should such consultation result in an agreement on an alternative to termination, the Signatory Parties shall proceed in accordance with that agreement.

B. Should such consultation fail, the Signatory Party proposing termination may terminate this PA by notifying the other Signatory Parties and Concurring Parties in writing. Beginning with the date of termination, the Corps shall ensure that until and unless a new PA is executed for the actions covered by this PA, such actions shall be reviewed individually in accordance with 36 CFR Part 800.

XVII. DURATION

A. The PA will be assessed by the Signatories to reconsider its terms every five (5) years. Reconsideration may include continuation of the PA as originally executed, amendment, or termination. The Signatories shall consult on reconsideration of the Agreement on a date not less than six months prior to the fifth anniversary of PA execution. If the Signatories determine that the PA is not effective and cannot be amended to address concerns, the Signatory Parties shall terminate the PA pursuant to Stipulation XVI. The Corps will memorialize the termination of the PA in a letter to the Signatory Parties.

XVIII. EFFECTIVE DATE

A. The PA shall take effect on the date that it has been fully executed by the Corps and the SHPO.

EXECUTION of this PA by the Corps and the SHPO, its transmittal to the ACHP, and subsequent implementation of its terms evidence that the Corps has afforded the ACHP an opportunity to comment on the undertaking and its effects on historic properties, that the Corps has taken into account the effects of the undertaking on historic properties, and that the Corps has satisfied its responsibilities under Section 106 of the NHPA and applicable implementing regulation for all aspects of the undertaking.

SIGNATORY:

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

BY: _____ DATE: _____

SIGNATORY:

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

BY: _____ DATE: _____

CONCURRING PARTY:

LOWER TULE RIVER IRRIGATION DISTRICT

BY: _____ DATE: _____

CONCURRING PARTY:

KERN VALLEY INDIAN COMMUNITY

BY: _____ DATE: _____

CONCURRING PARTY:

TUBATAULABALS OF KERN COUNTY

BY: _____ DATE: _____

CONCURRING PARTY:

TULE RIVER INDIAN TRIBE

BY: _____ DATE: _____

CONCURRING PARTY:

WUKSACHE INDIAN TRIBE/ESHOM VALLEY BAND

BY: _____ DATE: _____

APPENDIX C - AIR QUALITY MODELING

Welcome to the Road Construction Emissions Model, Version 9.0.0

User Instructions

This spreadsheet system contains the following individual worksheets:

1 This worksheet of User Instructions
2 Updates
3 Emission Estimates
4 Data Entry
5 Non-default Off-road Equipment
6 EMFAC2017
7 On-road Mitigation EF
8 OFFROAD Convert
9 Off-road Tier 4 EF
10 OFFROAD HP & LF
11 OFFROAD EF
12 x-ref

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

The Emission Estimates worksheet calculates a project's emissions in pounds per day (and tons) by project phase and tons over the entire construction period.
The worksheet can be used to estimate emissions for both vehicle exhaust and fugitive dust. The methodology used to estimate fugitive dust emissions is a simplified methodology involving estimates of the maximum area (acreage) of land disturbed daily. Detailed fugitive dust emission estimates associated with individual materials handling operations and/or activity/vehicle types cannot be conducted with this version of the model.
The Emission Estimates worksheet cannot be modified directly, it is a protected worksheet. It can only be modified indirectly by entering information for the project in selected areas of the Data Entry worksheet.
by the user.
They are protected worksheets.
Even though all or portions of several worksheets are protected, the individual formulas used in the calculations can be seen by the user.
The Data Entry worksheet includes several areas that can be modified by the user.
User instructions in the Data Entry worksheet are highlighted in red.
On the Data Entry worksheet, the user has two options for entering project data: required data and optional data. Required data is entered in the data input section (yellow cells). That required data is then used by the worksheet to calculate default values for the project.
The user can override the default values (blue cells) calculated for a project and is encouraged to do so if project specific information is available. Due to the difficulty in developing reliable default values for road construction projects, the user is encouraged to enter as much site specific information as is available for the project being analyzed.
The Data Entry Worksheet also includes a button that allows the user to clear previously entered data. This button is found just at the top of and to the right of the data entry portion of the worksheet.
When projects are discontinuous, the user must make adjustments to the spreadsheet manually, since the program cannot be setup to anticipate unexpected project delays.

#VALUE! <- This error message may occur during use of the spreadsheets. This occurs whenever the user enters a non numeric value, including a space character, into a cell that is used to calculate a numeric value. Consequently, to erase values entered into the spreadsheets, use the delete key instead of the space bar!

Note: Information in this worksheet is based on conversations with knowledgeable individuals at the Sacramento Metropolitan Air Quality Management District, the California Department of Transportation, the California Air Resources Board, the U.S. EPA, and private industry involved in road construction. Also, the 26th edition of Walker's Building Estimator's Reference Book (1999) was used in the development of this spreadsheet. This spreadsheet was prepared by Jones & Stokes, TIAX LLC and Ramboll Environ with the financial support and direction of the Sacramento Metropolitan Air Quality Management District.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT
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Road Construction Emissions Model, Version 9.0.0

Daily Emission Estimates for -> Tule River Road Realignment without Mitigation Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	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
Grading/Excavation	12.52	93.71	143.23	131.20	6.20	125.00	31.58	5.58	26.00	0.20	19,936.82	5.51	0.47	20,213.24
Drainage/Utilities/Sub-Grade	10.86	87.56	112.84	130.16	5.16	125.00	30.79	4.79	26.00	0.18	17,032.08	3.61	0.28	17,206.64
Paving	3.96	39.37	39.97	2.21	2.21	0.00	1.95	1.95	0.00	0.07	7,073.42	1.68	0.25	7,191.09
Maximum (pounds/day)	12.52	93.71	143.23	131.20	6.20	125.00	31.58	5.58	26.00	0.20	19,936.82	5.51	0.47	20,213.24
Total (tons/construction project)	1.40	10.94	15.46	14.44	0.69	13.75	3.49	0.63	2.86	0.02	2,236.83	0.57	0.05	2,265.91

Notes:

Project Start Year ->	2020
Project Length (months) ->	12
Total Project Area (acres) ->	50
Maximum Area Disturbed/Day (acres) ->	13
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	0	0	0	0	0	0
Grading/Excavation	992	0	300	0	1,560	120
Drainage/Utilities/Sub-Grade	331	0	102	0	1,480	80
Paving	0	663	0	204	920	80

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> Tule River Road Realignment without Mitigation Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	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
Grading/Excavation	0.90	6.70	10.24	9.38	0.44	8.94	2.26	0.40	1.86	0.01	1,425.48	0.39	0.03	1,311.12
Drainage/Utilities/Sub-Grade	0.42	3.37	4.34	5.01	0.20	4.81	1.19	0.18	1.00	0.01	655.73	0.14	0.01	600.98
Paving	0.09	0.87	0.88	0.05	0.05	0.00	0.04	0.04	0.00	0.00	155.62	0.04	0.01	143.52
Maximum (tons/phase)	0.90	6.70	10.24	9.38	0.44	8.94	2.26	0.40	1.86	0.01	1425.48	0.39	0.03	1,311.12
Total (tons/construction project)	1.40	10.94	15.46	14.44	0.69	13.75	3.49	0.63	2.86	0.02	2236.83	0.57	0.05	2,055.62

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Road Construction Emissions Model, Version 9.0.0

Daily Emission Estimates for -> Tule River Road Realignment with Tier 4 Mitigation

Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	1.28	25.86	3.78	0.20	0.20	0.00	0.18	0.18	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation	6.19	112.96	19.97	125.99	0.99	125.00	26.79	0.79	26.00	0.20	19,936.82	5.51	0.47	20,213.24
Drainage/Utilities/Sub-Grade	5.07	99.39	14.92	125.83	0.83	125.00	26.66	0.66	26.00	0.18	17,032.08	3.61	0.28	17,206.64
Paving	2.17	44.43	9.87	0.48	0.48	0.00	0.36	0.36	0.00	0.07	7,073.42	1.68	0.25	7,191.09
Maximum (pounds/day)	6.19	112.96	19.97	125.99	0.99	125.00	26.79	0.79	26.00	0.20	19,936.82	5.51	0.47	20,213.24
Total (tons/construction project)	0.69	12.88	2.22	13.86	0.11	13.75	2.95	0.09	2.86	0.02	2,236.83	0.57	0.05	2,265.91

Notes:

Project Start Year ->	2020
Project Length (months) ->	12
Total Project Area (acres) ->	50
Maximum Area Disturbed/Day (acres) ->	13
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	0	0	0	0	0	0
Grading/Excavation	992	0	300	0	1,560	120
Drainage/Utilities/Sub-Grade	331	0	102	0	1,480	80
Paving	0	663	0	204	920	80

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> Tule River Road Realignment with Tier 4 Mitigation

Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	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
Grading/Excavation	0.44	8.08	1.43	9.01	0.07	8.94	1.92	0.06	1.86	0.01	1,425.48	0.39	0.03	1,311.12
Drainage/Utilities/Sub-Grade	0.20	3.83	0.57	4.84	0.03	4.81	1.03	0.03	1.00	0.01	655.73	0.14	0.01	600.98
Paving	0.05	0.98	0.22	0.01	0.01	0.00	0.01	0.01	0.00	0.00	155.62	0.04	0.01	143.52
Maximum (tons/phase)	0.44	8.08	1.43	9.01	0.07	8.94	1.92	0.06	1.86	0.01	1425.48	0.39	0.03	1,311.12
Total (tons/construction project)	0.69	12.88	2.22	13.86	0.11	13.75	2.95	0.09	2.86	0.02	2236.83	0.57	0.05	2,055.62

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

APPENDIX D - ENVIRONMENTAL NOISE ANALYSIS

This appendix summarizes environmental noise considerations for evaluating the effects of construction noise on the area surrounding the proposed action at Success Dam and Lake, Tulare County, California.

Characteristics of Environmental Noise

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that disrupts or interferes with normal human activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day and the type of activity during which the noise occurs, and the sensitivity of the individual.

Sound is a physical phenomenon consisting of minute pressure variations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by a number of variables, including frequency and intensity. Frequency describes the sound's pitch and is measured in hertz (Hz), while intensity describes the sound's loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example: 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB.

Hertz is an indicator of the rate at which pressure fluctuations occur. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. A particular tone that makes the drum skin vibrate 100 times per second generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived as a tonal pitch of 100 Hz. Sound frequencies between 20 Hz and 20,000 Hz are within the range of sensitivity of the best human ear.

Sound from a tuning fork contains a single frequency referred to as a tone. In contrast, most sounds heard in the environment do not consist of a single frequency but a broad band of frequencies differing in sound level. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound according to a weighting system that reflects how human hearing is less sensitive at lower frequencies and higher frequencies than at the mid-range frequencies, about 200 Hz to 5,000 Hz. The most commonly used filter introduces an A weighting, and the decibel level measured is called the A-weighted sound level (dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources that creates a relatively steady background noise in which no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used. The Leq is the energy-mean A-weighted sound level during

a measured interval. It is the "equivalent" constant sound level that would have to be produced by a given source to equal the fluctuating level measured.

Two other descriptors describe noise exposure over a 24-hour period. The first is known as the day-night average noise Level (Ldn). It is calculated by adding a 10-decibel penalty to sound levels at night (10:00 PM to 7:00 AM) to compensate for the increased sensitivity to noise during the quieter nighttime hours. The Ldn is used by jurisdictions (such as the State of California and Tulare County) to define acceptable land use compatibility with respect to noise. Figure includes sound levels of typical noise sources and environments to provide a frame of reference.

Figure. Typical Noise Levels (CalTrans 2019a)

Common Outdoor Activities	**Noise Level (dBA)**	**Common Indoor Activities**
Jet flyover at 1,000 feet	--110--	Rock band
Gas lawnmower at 3 feet	--100--	
Diesel truck at 50 feet at 50 mph	--90--	Food blender at 3 feet
Noisy urban area, daytime	--80--	Garbage disposal at 3 feet
Gas lawnmower, 100 feet	--70--	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	--60--	Large business office
Quiet urban daytime	--50--	Dishwasher in next room
Quiet urban nighttime	--40--	Theater, large conference room (background)
Quiet suburban nighttime	--30--	Library
Quiet rural nighttime	--20--	Bedroom at night, concert hall (background)
	--10--	Broadcast/recording studio
Lowest threshold of human hearing	--0--	

The second sound level descriptor commonly used to describe noise exposure over a 24-hour period is known as the CNEL. This is similar to the Ldn described above but with an additional 5 dBA "penalty" added to noise events that occur during the noise-sensitive hours between 7:00 PM and 10:00 PM, which are typically reserved for relaxation, conversation, reading, and television. If using the same 24-hour noise data, the reported CNEL is typically approximately 0.5 dBA higher than the L_{dn}.

With respect to how humans perceive and react to changes in noise levels, a 1-dBA increase is imperceptible, a 3-dBA increase is barely perceptible, a 6-dBA increase is clearly noticeable, and a 10-dBA increase is subjectively perceived as approximately twice as loud (Egan 1988), as presented in Figure. This table was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broadband noise and to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dBA, as this is the usual range of voice and interior noise levels.

Figure. Subjective Reaction to Changes in Noise Levels of Similar Sources

Change in Level (dBA)	Subjective Reaction	Factor Change in Acoustical Energy
1	Imperceptible (except for tones)	1.3
3	Just barely perceptible	2.0
6	Clearly noticeable	4.0
10	About twice (or half) as loud	10.0

Source: Architectural Acoustics, M. David Egan, 1988

Sound Propagation and Attenuation

As sound propagates from the source to the receptor, its attenuation, or manner of noise reduction in relation to distance, depends on surface characteristics, atmospheric conditions, and the presence of physical barriers. The inverse-square law describes the attenuation caused by the pattern in which sound travels from the source to receptor. Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dBA per doubling of distance (dBA/DD). However, from a line source (e.g., a road), sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dBA/DD. The surface characteristics between the source and the receptor may result in additional sound absorption or reflection. Atmospheric conditions, such as wind speed, temperature, and humidity, may affect noise levels. Furthermore, the presence of a barrier between the source and the receptor may also attenuate noise levels. The actual amount of attenuation depends on the size of the barrier and the frequency of the noise. A noise barrier may be any natural or human-made feature, such as a hill, tree, building, wall, or berm (CalTrans 2019b).

All buildings provide some exterior-to-interior noise reduction. A building constructed with a wood frame and stucco or wood sheathing exterior and dual pane windows typically provides a minimum exterior-to-interior noise reduction of 25 dBA with its windows closed. A typical mobile home or light frame structure would be expected to provide an exterior-to-interior noise level reduction of 15 to 20 dBA with windows closed (FHWA 2010).

Noise Descriptors

Environmental noise generally derives, in part, from a conglomeration of distant noise sources. Such sources may include distant traffic, wind in trees, and distant industrial or farming activities, and all part of our daily lives. These distant sources create a low-level background noise in which no particular individual source is identifiable. Background noise is often relatively constant from moment to moment but varies slowly from hour to hour as natural forces change or as human activity follows its daily cycle. Superimposed on this low-level, slow varying background noise is a succession of identifiable noise events of relatively brief duration. These events may include single-vehicle passbys, aircraft flyovers, screeching brakes, and other short-term events, all causing noise level to fluctuate significantly from moment to moment (FHWA 2006).

It is possible to describe these fluctuating noises in the environment using single-number descriptors. To do this allows manageable measurement, computations, and impact assessment.

The following are some of the descriptors commonly used in environmental noise assessment, including this report:

- **L_{max} (Maximum Noise Level) –** The maximum instantaneous noise level during a specific period. The L_{max} may also be referred to as the "peak (noise) level";
- **L_{min} (Minimum Noise Level) –** The minimum instantaneous noise level during a specific period;
- **L_X (Statistical Descriptor) –** The noise level exceeded X percent of a specific period;
- **L_{eq} (Equivalent Noise Level) –** The energy mean (average) noise level. The instantaneous noise levels during a specific period in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the L_{eq}. In noise environments determined by major noise events, such as aircraft overflights, the L_{eq} value is heavily influenced by the magnitude and number of single events that produce the high noise levels;
- **L_{dn} (Day-Night Noise Level) –** The 24-hour L_{eq} with a 10 dBA penalty for noise events that occur during the noise-sensitive hours between 10:00 PM and 7:00 AM. In other words, 10 dBA is added to noise events that occur in the nighttime, and this generates a higher reported noise level when determining compliance with noise standards. The L_{dn} attempts to account for increased sensitivity to noise at night, when most people are asleep.
- **CNEL (Community Noise Equivalent Level) –** The CNEL is similar to the L_{dn} described above but with an additional 5 dBA penalty added to noise events that occur during the noise-sensitive hours between 7:00 PM and 10:00 PM, which are typically reserved for relaxation, conversation, reading, and television. If using the same 24-hour noise data, the reported CNEL is typically approximately 0.5 dBA higher than the L_{dn}.
- **SEL (Sound Exposure Level) –** The SEL represents the total sound energy of one noise event, typically a vehicle passby or other discrete operation. SELs typically represent the noise events used to calculate the L_{eq}, L_{dn}, and CNEL.

Characteristics of Construction Vibration

Vibration is the periodic oscillation of a medium or object. The rumbling caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such as explosions. As is the case with airborne sound, ground-borne vibrations may be described by amplitude and frequency.

Vibration amplitudes are usually expressed in PPV or RMS, as in RMS vibration velocity. The PPV and RMS velocity are normally described in inches per second. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is often used in monitoring blasting vibration because it is related to the stresses that are experienced by buildings (FHWA 2006; CalTrans 2013).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity often expressed in decibel notation as VdB, which serves to compress the range of numbers required to describe vibration (FHWA 2006). This is based on a reference value of 1 μin/sec.

The background vibration-velocity level in residential areas is usually approximately 50 VdB. Ground-borne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FHWA 2006).

Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground-borne vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Construction can generate ground-borne vibrations, which can pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FHWA 2006).

Construction vibrations can be transient, random, or continuous. Transient construction vibrations generated by blasting, impact pile driving, and wrecking balls. Continuous vibrations result from vibratory pile drivers, large pumps, horizontal directional drilling, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment. Figure describes the general human response to different levels of ground-borne vibration-velocity levels.

Figure. Human Response to Ground-Borne Vibration Levels

Vibration Velocity VdB	Human Response
65	Approximate threshold of perception for many humans.
75	Approximate dividing line between barely perceptible and distinctly perceptible.
85	Vibration acceptable only if there are an infrequent number of events per day.

Source: FHWA 2006

Construction-related activities would generate noise levels from heavy-duty truck travel on proposed haul routes for material transport and heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites. Construction equipment would likely include scrapers, excavators, bulldozers, compactors, loaders, trucks, crushers, pumps, generators, and other miscellaneous pieces of equipment. Typical noise levels of construction equipment and a typical usage factor for each equipment type used in the analysis of potential impacts are shown in Figure. The usage factor is an estimate of the fraction of time each piece of equipment operates at full power.

Figure. Typical Construction Equipment Noise

Equipment	L_{max} Noise Limit at 50 feet, dB, Slow	Usage Factor	Impact Device?
All other equipment more than 5 horsepower	85	50	No
Auger drill rig	85	20	No
Backhoe	80	40	No
Bar bender	80	20	No
Blasting	94	N/A	Yes
Boring jack power unit	80	50	No
Chain saw	85	20	No
Clam shovel	93	20	Yes
Compactor (ground)	80	20	No
Compressor (air)	80	40	No
Concrete batch plant	83	15	No
Concrete mixer truck	85	40	No
Concrete pump truck	82	20	No
Concrete saw	90	20	No
Crane (mobile or stationary)	85	16	No
Dozer	85	40	No
Dump truck	84	40	No
Excavator	85	40	No
Flatbed truck	84	40	No
Front end loader	80	40	No
Generator (25 kilovolt-amperes [kVA] or less)	70	50	No
Generator (more than 25 kVA)	82	50	No
Gradall	85	40	No
Grader	85	40	No
Horizontal boring hydraulic jack	80	25	No
Hydra break ram	90	10	Yes
Impact pile driver (diesel or drop)	95	20	Yes
Jackhammer	85	20	Yes
Mounted impact hammer (hoe ram)	90	20	Yes
Paver	85	50	No
Pickup truck	55	40	No
Pneumatic tools	85	50	No
Pumps	77	50	No
Rock drill	85	20	No
Scraper	85	40	No
Slurry plant	78	100	No
Slurry trenching machine	82	50	No
Soil mix drill rig	80	50	No
Tractor	84	40	No
Vacuum street sweeper	80	10	No
Vibratory concrete mixer	80	20	No
Vibratory pile driver	95	20	No
Welder/Torch	73	40	No

Source: Federal Highway Administration 2006.

Blasting Noise

The Corps has determined that some short-duration controlled blasting would need to take place to break up the bedrock within the proposed Emergency Spillway channel. A *Controlled Blasting Management Plan* would be developed by the Corps or designated contractor prior to the start of construction, which would include any short-term road

closures and other public safety management measures that may be required in the vicinity of the blasting.

Blasting generally includes a series of small charges or shots, which are placed in holes drilled into the rock formation. The charges or shots are detonated and are timed so that they occur in sequence (generally milliseconds apart). This is referred to as the "shot timing". The noise levels associated with blasting are generally a function of shot sizes, number of shots, depth of the blasting charges and the shot timing. Noise levels associated with blasting is generally very low frequency in nature. Assuming a Controlled Blasting Management Plan would be developed and followed the short duration blasting noise impacts associated with this alternative are anticipated to be low to moderate and less-than–significant.

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