EAST BAY
MUNICIPAL UTILITY DISTRICT

September 29, 2026

ADDENDUM 3

TO PROSPECTIVE PROPOSERS UNDER RFP NO. (FW2-26, "Mokelumne River Floodplain Habitat Restoration Project")

Notice is hereby given that RFP NO. FW2-26 of the East Bay Municipal Utility District has been revised as follows:

A. The version of "*Exhibit G – 70% Draft Designs*" previously issued with Addendum 2 is hereby superseded and replaced in its entirety by the attached "*Exhibit G – 70% Design Report, Draft Designs, and Specifications*", issued with Addendum 3. The revised Exhibit G shall be inserted immediately following "*Exhibit F – Contract Equity Forms*".

   The attached "*Exhibit G – 70% Design Report, Draft Designs, and Specifications*" shall serve as the design basis to be used by all Proposers in preparing their proposals and pricing for this RFP. For purposes of this procurement, these documents establish a common design baseline, and Proposers should assume that the work will proceed from this level of design.

   EBMUD does not anticipate issuing further revisions to the design or specifications during the proposal and evaluation period, except as necessary to respond to Proposer questions or provide clarifications through a formal addendum issued equally to all Proposers.

ACKNOWLEDGMENT OF RECEIPT OF THIS ADDENDUM SHALL BE INDICATED BY INSERTING THE ADDENDUM NUMBER AND ITS DATE ON THE FORM LABELED "PROPOSER INFORMATION AND ACCEPTANCE" IN EXHIBIT A.

James Pearson

James Pearson
Supervisory Fish Biologist
(209) 263-6357
james.pearson@ebmud.com

RFP NO. FW2-26

EXHIBIT G
70% Design Report, Draft Designs, and Specifications

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

70% DESIGN FINAL DESIGN REPORT

DRAFT



Prepared for:

EBMUD

Prepared by:

FlowWest

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Acronyms and Abbreviations

AC: Acres
ACOE: Army Corps of Engineers
BOD: Basis of Design
CDFW: California Department of Fish and Wildlife
CFS: Cubic Feet Per Second
CVFPB: Central Valley Flood Protection Board
DBH: Diameter at Breast Height
EBMUD: East Bay Municipal Utility District
FEMA: Federal Emergency Management Agency
HECRAS: Hydraulic Engineering Center River Analysis Software
LMR: Lower Mokelumne River
NCRS: Natural Resources Conservation Service
USDA: United States Department of Agriculture
WSE: Water Surface Elevation

INTRODUCTION

The Mokelumne River Floodplain Habitat Restoration Project has been undertaken by East Bay Municipal Utility District (EBMUD) to create both floodplain and in-stream salmonid rearing habitat along the Lower Mokelumne River below Camanche Dam. The Lower Mokelumne River is used for spawning and rearing by fall-run Chinook salmon and both resident and anadromous forms of steelhead trout, whose available habitat has been heavily impacted by both the Pardee and the Camanche dams.

The project consists of three separate work areas; one is the EBMUD Day Use Area directly below Camanche Dam while the two others are on private land for which EBMUD has obtained a conservation easement (Colburn Property). Project designs aim to create at least 25 acres of floodplain rearing habitat in total. The proposed project will re-grade overbank areas to create meandering side channels and floodplain terraces, with a total earthmoving volume of 284,000 CY across all work areas. The project will also place instream gravel at each work area using screened and washed material from excavation, adding two acres of instream rearing habitat. At the most downstream site on the Colburn Property, the project will degrade the existing riverbank and construct a setback levee to convert an unused portion of the parcel into floodplain habitat while preventing new flooding of areas in agricultural or other use.

The major design considerations for the project included maximizing habitat acreage and suitability given each site's constraints; maintaining recreational use of the Day Use Area; and maintaining existing private uses of the Colburn Property which operates as a vineyard and provides private river/riparian recreational access. These considerations were balanced against other design criteria including hydrology, earthmoving volumes required to lower floodplain areas, construction access, impacts to various site resources, and cost considerations. FlowWest evaluated the design against these considerations and design criteria by performing various analyses. Those analyses are documented in this report and its appendices.

PROJECT LOCATION AND SITE HISTORY

The proposed project is located along the Lower Mokelumne River near Clements, CA in San Joaquin County between Camanche Dam and the Highway 88 Bridge overcrossing (Figure 1). The three project sites sit along a 3-mile reach of the Mokelumne River from approximately river mile (RM) 61 to 64 (River Kilometer 98 to 103) within the Reach 6 of the Lower Mokelumne River as designated by EBMUD. The three sites include the EBMUD Day Use Area and the Colburn Upstream and Downstream sites (Figure 1).

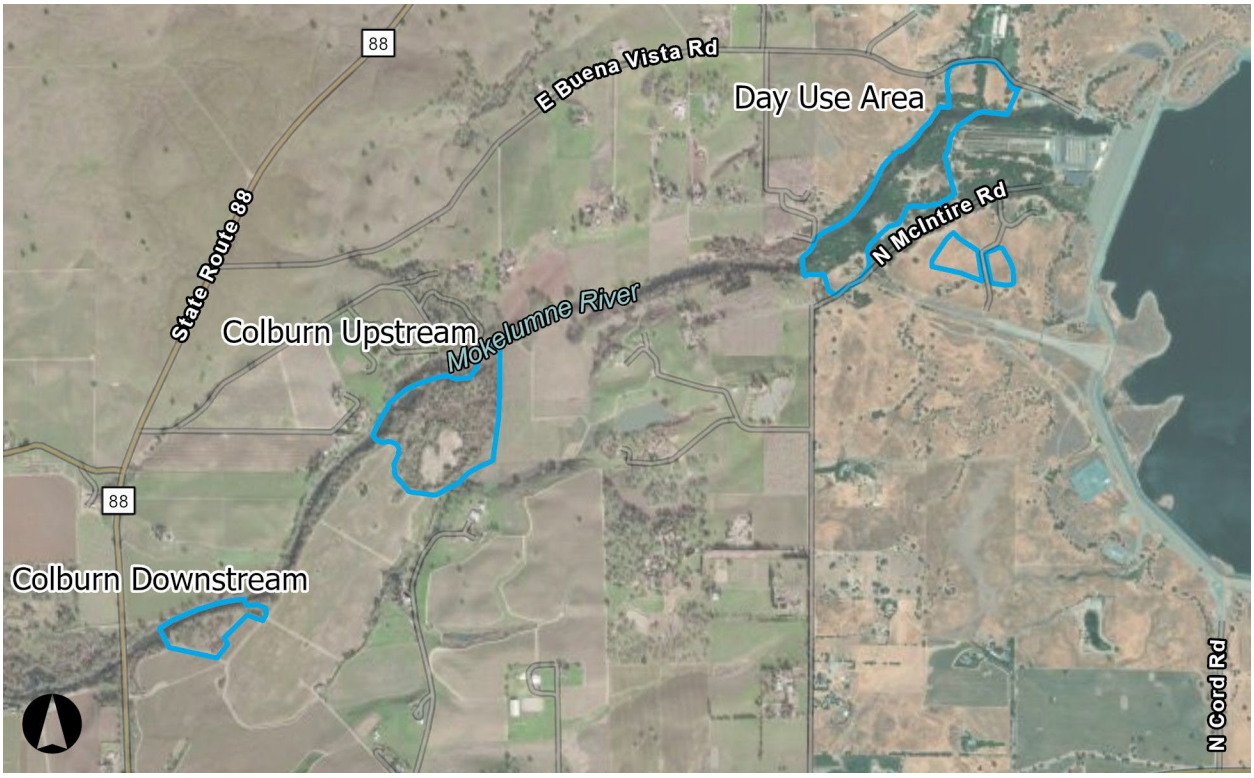


FIGURE 1: PROJECT LOCATION AND BOUNDARIES

Camanche Dam (completed in 1964) and Pardee dam further upstream significantly reduced the risk of flooding to downstream reaches by reducing peak flows. The dams also blocked the migration of fish to the upper reaches of the Mokelumne and halted the transport of sediment downstream after their completion. The current hydrology of the project reach is dictated by Camanche Dam operations, which limit flows to prevent flooding.

The project corridor was also extensively reworked by mining from the start of the Gold Rush in 1849 until approximately 1951. In-stream placer mining, hydraulic mining of terrace gravels, and finally dragline and bucket-line dredging excavated and re-sorted gravels to depths of roughly six to 50 feet, leaving a characteristically pitted floodplain of excavation ponds that is still visible at the project sites today (see Appendix D).

Day Use Site

The most upstream project site is located in a parcel owned by EBMUD (APN 02301001). The portion of this parcel on the Southern bank of the Mokelumne is operated as a recreational Day Use Area, which is a popular area for anglers, boaters, and birdwatchers, as well as for general recreation. This project site includes work areas on both banks of the Mokelumne River. An underground section of the Folsom South Canal passes through the Day Use Area adjacent to the project site and constrains potential excavations for floodplain creation (Figure 2).

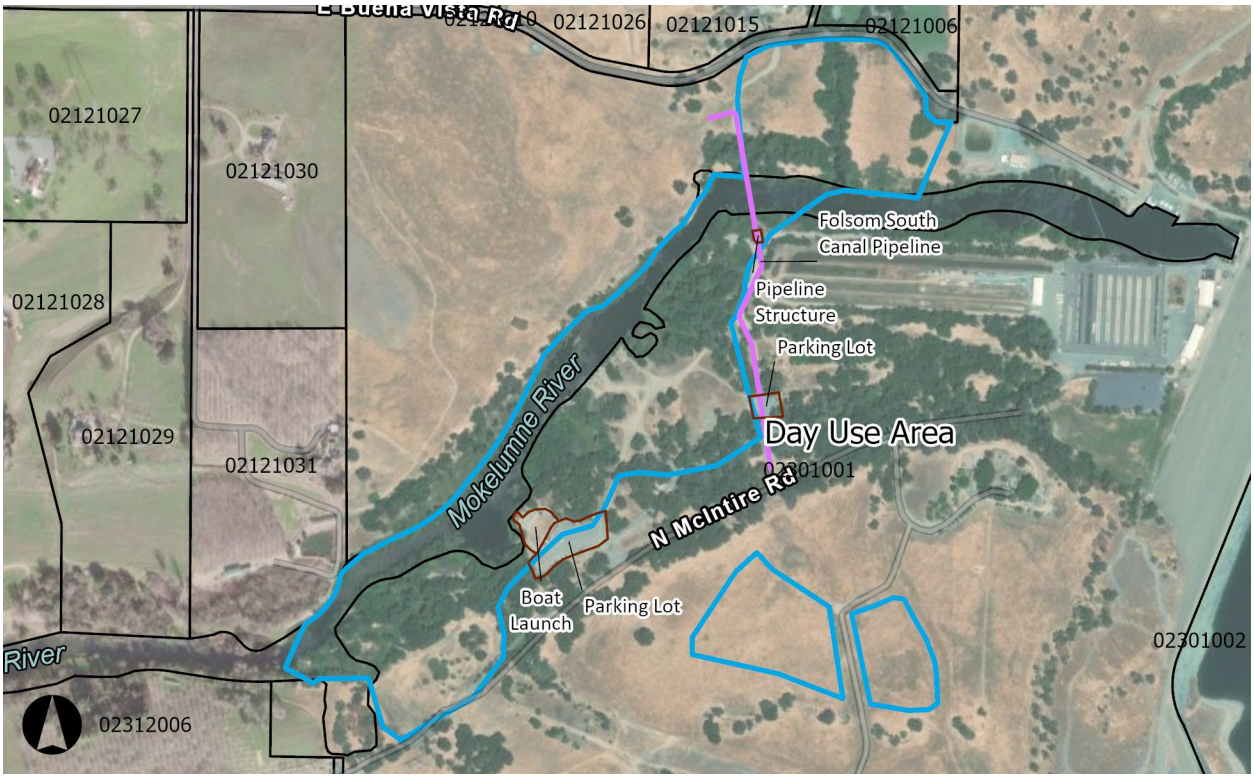


FIGURE 2: DAY USE AREA SITE AND PARCELS (PROPOSED AREAS OF WORK OUTLINED IN BLUE, FOLSOM SOUTH CANAL SHOWN IN PURPLE)

EBMUD and CDFW have devoted significant resources in the Day Use Area to mitigate the ecological effects of Camanche Dam. The Mokelumne River Hatchery, located just downstream of the Dam, was constructed in 1964 to offset the loss of fish habitat and EBMUD performs spawning surveys and other monitoring throughout the Lower Mokelumne River to assess fish populations. EBMUD also manages the Day Use Area to promote salmonid spawning and rearing habitat - since 1990, a gravel augmentation program in this reach has offset the coarse-sediment deficit below Camanche Dam. Beginning in 2001, gravel placement design was formalized under the Spawning Habitat Integrated Rehabilitation Approach (SHIRA), producing a three-phase rehabilitation plan for the reach. The first two phases were completed by 2012, and a third phase extending through the Day Use Area was completed by 2016. The program has since shifted to annual maintenance, placing roughly 300 to 800 cubic yards of gravel per year to offset scour losses, with maintenance funding secured through 2031.

Historical USGS aerial imagery (1937 and 1957) and the 1909 topographic map were georeferenced against current (2024) imagery to evaluate how this reach has changed over time (Figure 3). Because the

Day Use Area lies immediately below Camanche Dam, its recent history is dominated by the shift to a regulated, sediment-starved flow regime: the reach likely experienced channel downcutting following dam construction as the coarse-sediment supply was cut off, and the steep exposed banks and coarse cobble substrate visible today are legacy features of that adjustment and of the earlier gold-dredging that reworked the floodplain. Despite these changes in bed elevation and sediment character, the historic centerline analysis shows the channel has held a stable planform position here since the dams were built. The riffle-dominated character of the present-day channel is largely a constructed condition, maintained by EBMUD's ongoing gravel augmentation program rather than by natural sediment delivery. Further historical analysis is present in Appendix D.

Colburn Upstream Site

The next project site is located 0.8 miles downstream of the Day Use Area spread across two parcels in private ownership (Colburn Property; APNs 02311036, 02311030). EBMUD has secured a conservation easement on the private property beginning in January 2026. The Colburn Upstream Site is undeveloped open space, with scattered remnant ponds left over from historic gravel mining. An active vineyard is located next to the project site, with vineyard roads providing access to the work areas (Figure 4).

The same georeferenced imagery and topographic sequence (1909–2024) were used to assess change at the Colburn Upstream Site (Figure 6). This site most clearly records the corridor's mining legacy: the 1909 map and mid-century aerials capture a floodplain extensively reworked by dredge and aggregate mining, and the resulting pitted surface of excavation ponds and gravel pits persists in the current imagery, several of them still functioning as backwater features. Additionally, the channel alignment has not changed since construction of the dams, indicating a geomorphically stable reach under the current flow regime.

Colburn Downstream Site

The most downstream project site is also located on the Colburn Property on which EBMUD has obtained a conservation easement (APN 02311028). This site is also adjacent to a vineyard 0.1 miles upstream of the SR88 Bridge Crossing and sits within land mostly converted to agricultural and vineyard use (Figure 5). The proposed project would reconnect an unused, leveed-off portion of the parcel that generally sits at lower elevation than the vineyards that surround it back to the river. Historical imagery for the Colburn Downstream Site shows the same long-term conversion of the surrounding floodplain to agricultural and vineyard use and a channel alignment that has not changed since dam construction (Figure 6). The most consequential change at this site is the existing berm along the river that has cut the site off from the active channel. Furthermore, the current imagery shows a leveed, geomorphically inactive floodplain.

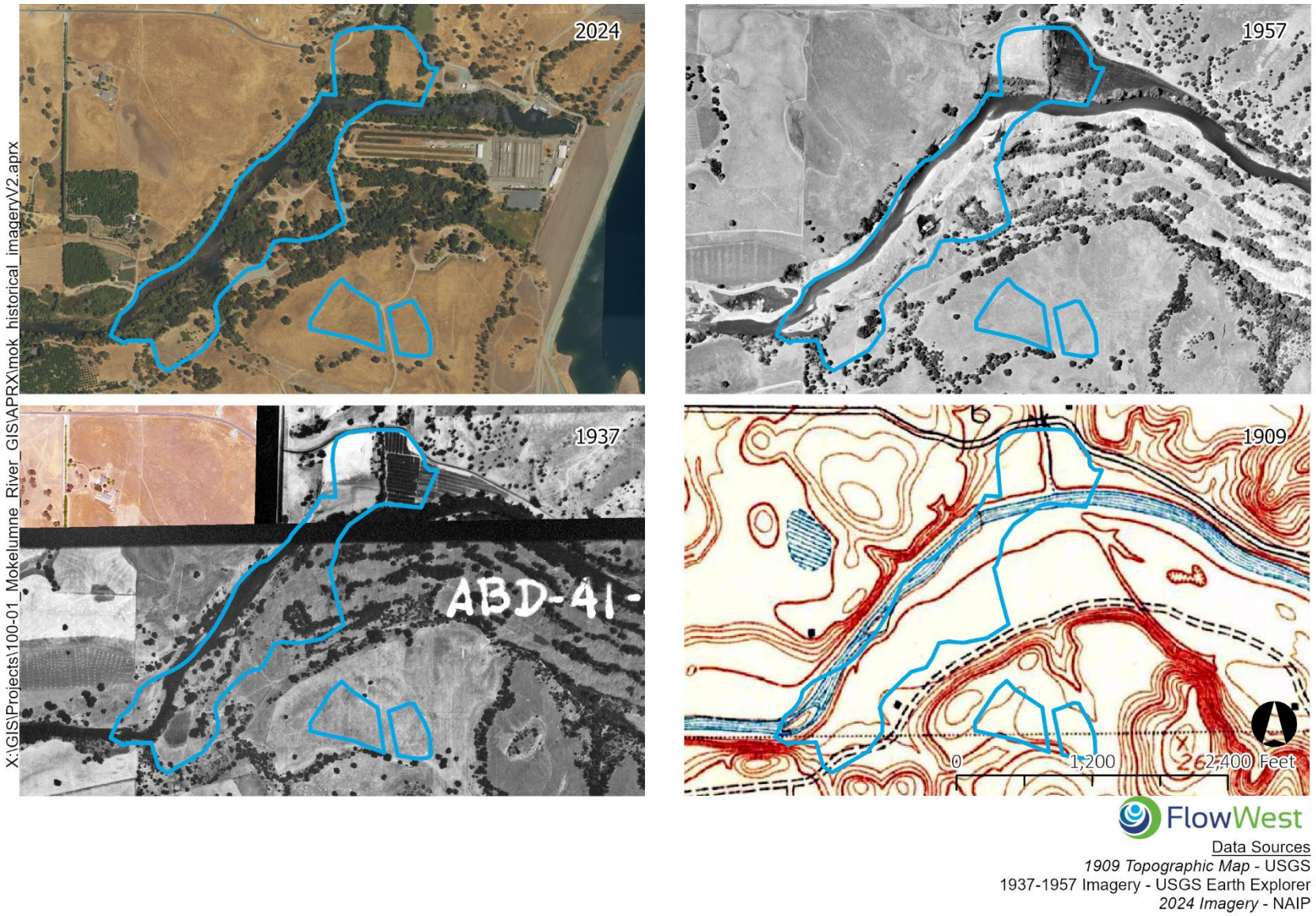


FIGURE 3: DAY USE AREA HISTORICAL IMAGERY (PROPOSED AREAS OF WORK OUTLINED IN BLUE)

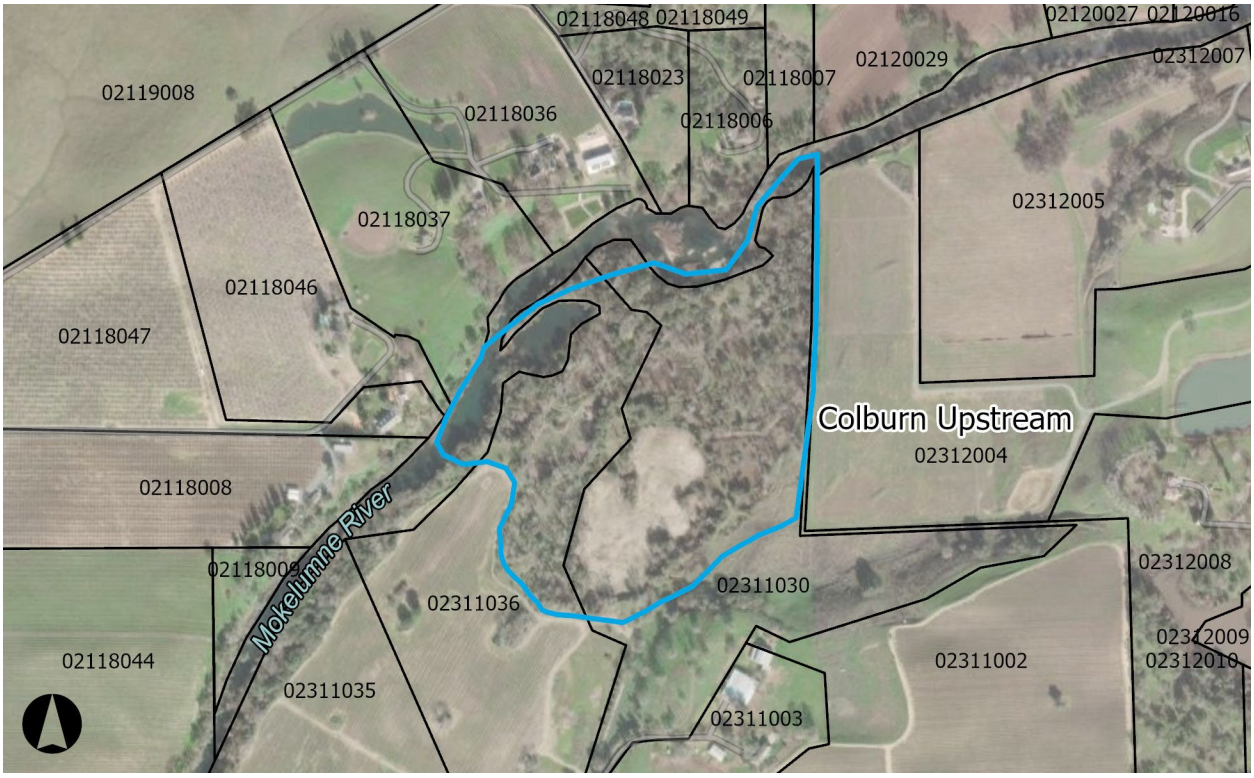


FIGURE 4: COLBURN UPSTREAM SITE PARCELS (PROPOSED AREAS OF WORK OUTLINED IN BLUE)



FIGURE 5: COLBURN DOWNSTREAM SITE PARCELS (PROPOSED AREAS OF WORK OUTLINED IN BLUE)

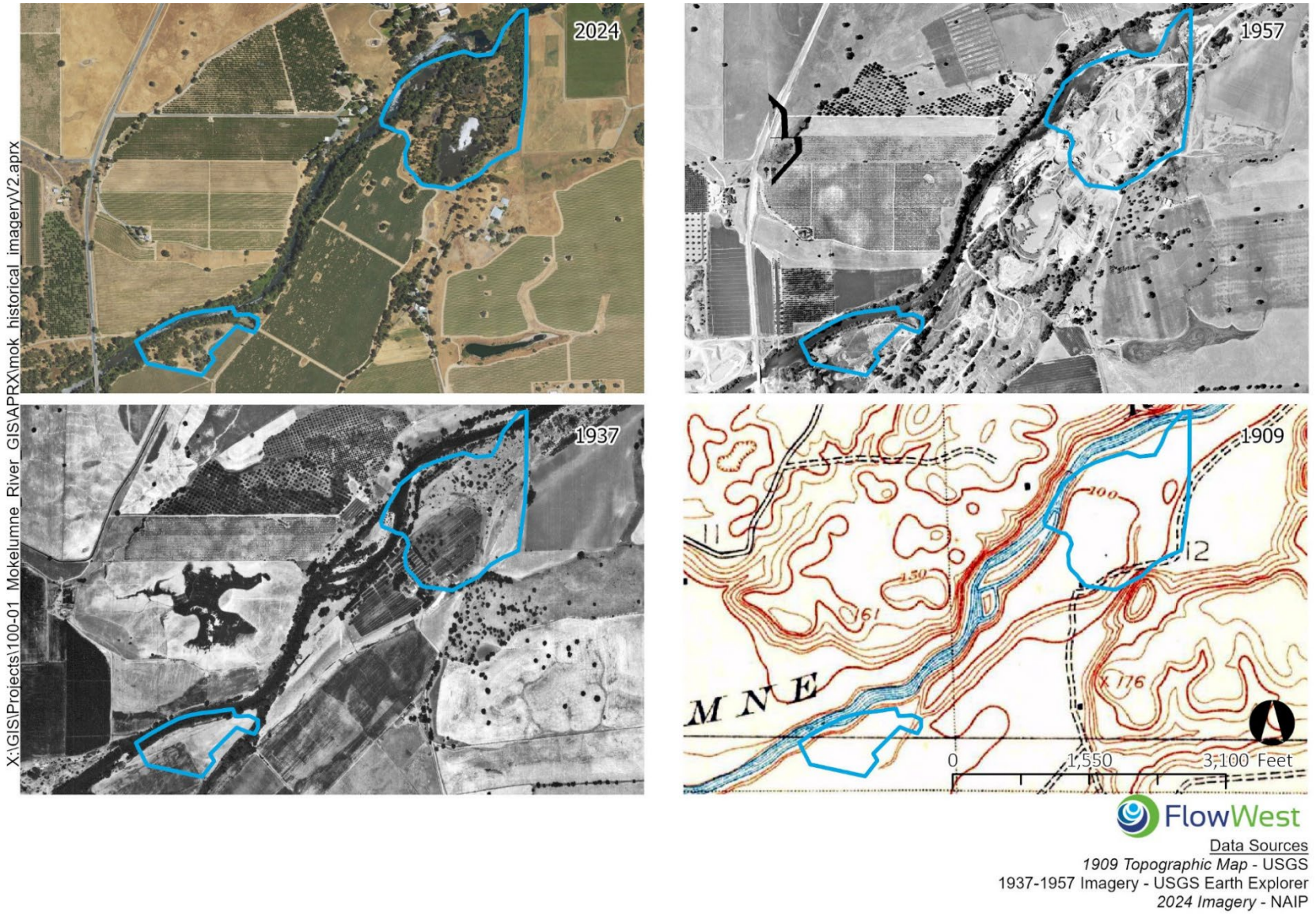


FIGURE 6: COLBURN SITES HISTORICAL IMAGERY (PROPOSED AREAS OF WORK OUTLINED IN BLUE)

SUMMARY OF CURRENT SITE CONDITIONS

HYDROLOGY

The Mokelumne Watershed extends from the Sierra Nevada to the Central Valley. Flows from the upper Mokelumne tributaries, including the North Fork, The Middle Fork, and the South Fork are impounded in reservoirs at the Pardee and Camanche Dams (see Figure 7). The area downstream of Camanche Dam is known as the Lower Mokelumne River (LMR). Flows in this reach have been heavily attenuated and are now controlled by releases from Camanche Dam.

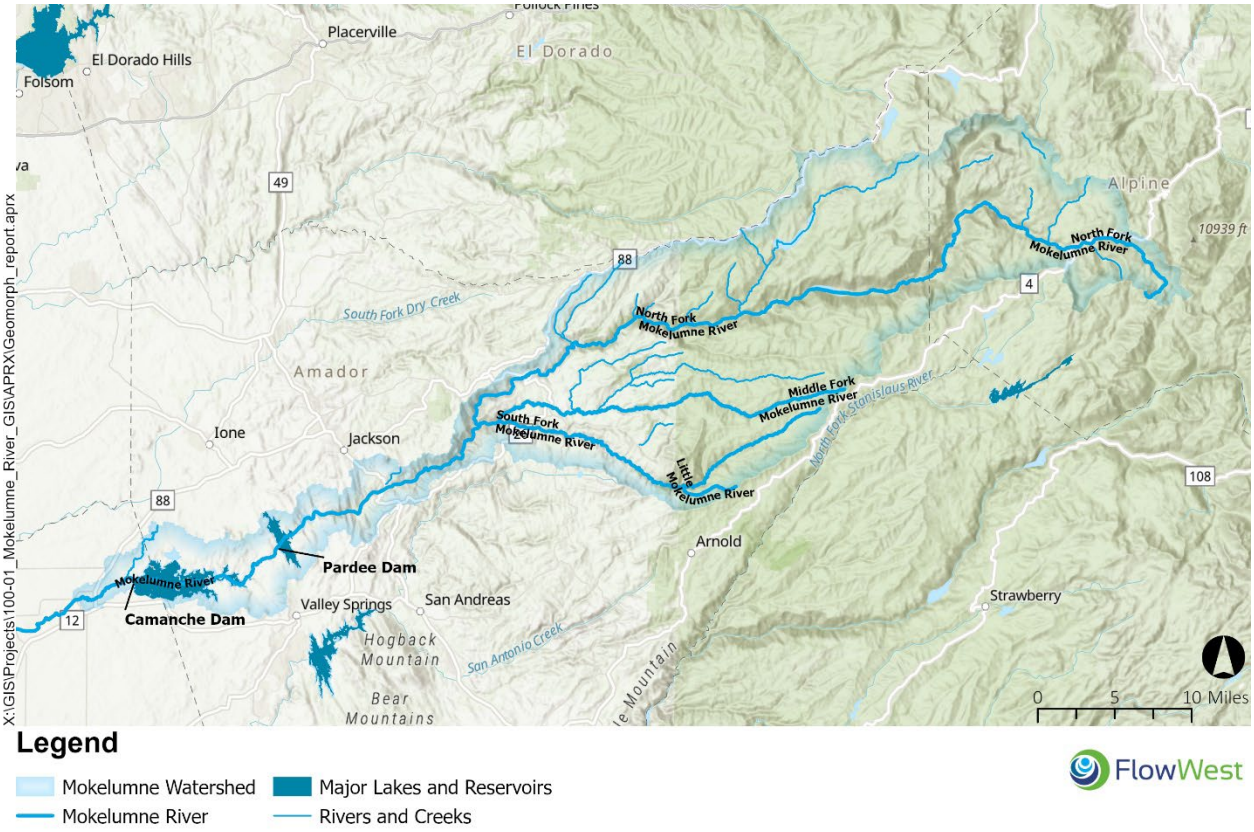


FIGURE 7: MOKELUMNE RIVER WATERSHED

Baseflows downstream of Camanche Dam range from 250-325 cfs. The maximum scheduled release is capped at 5000 cfs, which has not been exceeded in the previous 30 years (see Figure 8 below). In comparison, the gage at Mokelumne Hill (USGS Gage 11319500) upstream of the Pardee Reservoir averages 385 cfs over the same period and has regularly exceeded 10,000 cfs or more. The computed percent exceedance flows below and above the dams are compared below in Table 1.

Pulse flows released from Camanche dam are mandated by the Joint Settlement Agreement depending on Water Year Type and typically range from 1,000 to 4,000 cfs.

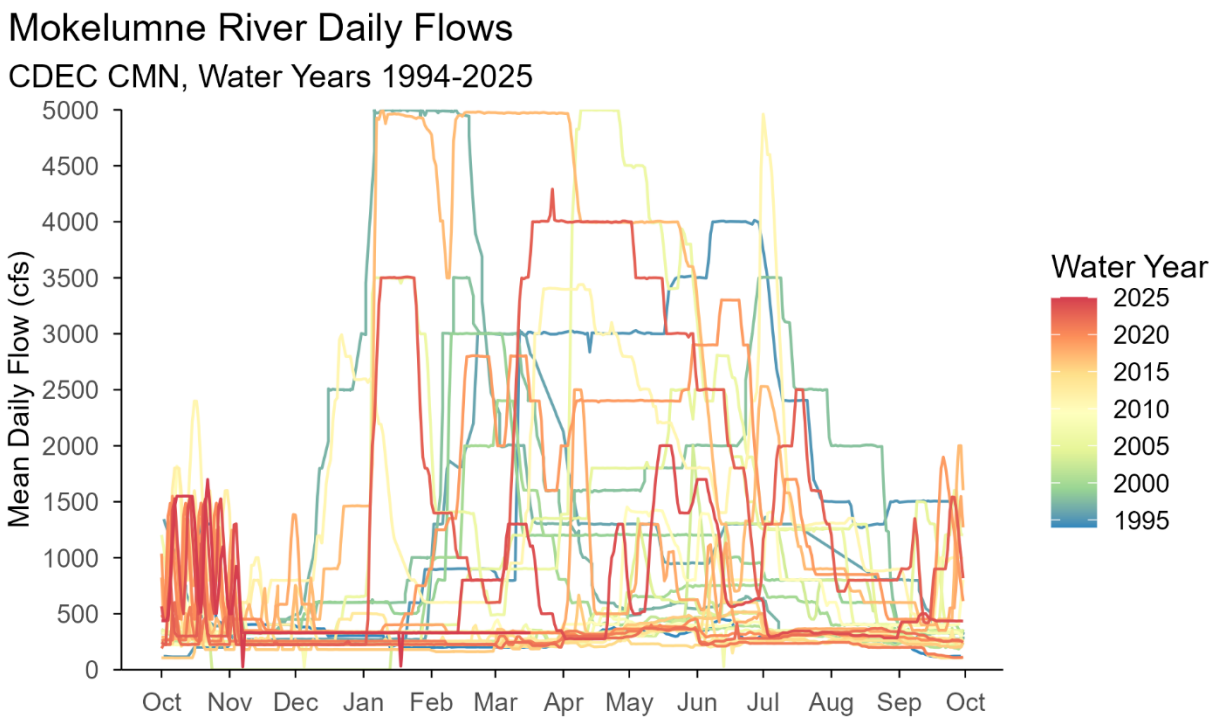


FIGURE 8: MOKELUMNE RIVER FLOWS BELOW CAMANCHE 1994-2025

TABLE 1: MOKELUMNE RIVER PERCENT EXCEEDANCE FLOWS

Percent Chance Exceedance	Recurrence Interval (years)	Below Camanche Flow (cfs)	Mokelumne Hill Flow (cfs)
1%	100	9,390	59,000
2%	50	7,690	45,000
5%	20	5,841	30,000
10%	10	4,604	21,000
20%	5	3,417	13,700
50%	2	1,795	6,000
80%	1.25	823	2,640

GEOMORPHOLOGY

FlowWest performed a geomorphic assessment for the project sites, available in Appendix D: Geomorphic Report. The report documented the impaired flows and sediment loads to the Mokelumne River below Camanche Dam. It also examined historical imagery of the river corridor and demarcated channel centerlines as well as the pool-riffle-run complex. Results of the analysis indicated that the channel bed is likely to continue to erode below the Dam, which has been mitigated by EBMUD's gravel augmentation efforts. Further downstream, at the Colburn Upstream and Downstream sites, geomorphic processes are unlikely to result in major changes to the channel alignment or channel bed under the current, regulated regime.

BIOLOGICAL RESOURCES

Vollmar Natural Lands Consulting performed a biological resources evaluation (BRE) of the project sites. This section summarizes the key findings of the BRE. The full report, including figures and photo documentation, is presented in Appendix E: Biological Resources Evaluation.

Vegetative communities present within the project area were classified as the following types: white alder forest, Fremont's cottonwood forest, Fremont's cottonwood – white alder forest, blue oak woodland, interior live oak woodland, valley oak woodland, valley oak – interior live oak woodland, arroyo willow forest, California annual and perennial grassland, seasonal wetlands, and perennial wetlands.

The project area provides suitable habitat for a large number of common and special-status wildlife species. The majority of the common wildlife species observed during the field surveys were birds, and they were mostly concentrated around the riparian and grassland habitats. These habitats provide important foraging and nesting areas for many species of migratory and resident birds. In total, twelve bird species were incidentally documented during 2025 surveys, with no formal or focused bird surveys conducted. These included: Bewick's wren (*Thryomanes bewickii*), acorn woodpecker (*Melanerpes formicivorus*), California scrub jay (*Aphelocoma californica*), and lesser goldfinch (*Spinus psaltria*). Other wildlife species documented in the project area (by EBMUD biologists) include steelhead (*Oncorhynchus mykiss irideus*), Chinook salmon (*Oncorhynchus tshawytscha*), and three-spined stickleback (*Gasterosteus aculeatus*).

A total of 32 special-status wildlife species were determined to have potential to occur within the project area. These include two amphibians, 20 birds, two mammals, three invertebrates, four fish, and one reptile.

Table 2 provides a summary of these species including their names, listing statuses, potential to occur, and recommended avoidance and mitigation measures.

TABLE 2: SPECIAL-STATUS SPECIES WITH POTENTIAL OF OCCUR IN THE STUDY AREA

Species Name	Listing Status [1]	Potential to Occur in Study Area
California Tiger Salamander Central Valley DPS, Pop. 1, *Ambystoma californiense*	FT, ST, WL	Moderate
Western Spadefoot, *Spea hammondii*	FPT, SSC	Moderate
Tricolored Blackbird (nesting), *Agelaius tricolor*	ST, SSC, BCC	Low
Golden Eagle, *Aquila chrysaetos*	FP, WL	Low
Cooper's Hawk, *Astur cooperii*	WL	High
Western Burrowing Owl, *Athene cunicularia hypugaea*	SCE, SSC, BCC	Moderate
Ferruginous Hawk, *Buteo regalis*	WL	Low
Swainson's Hawk, *Buteo swainsoni*	ST	High
Northern Harrier, *Circus hudsonius*	SSC, BCC	High
White-tailed Kite, *Elanus leucurus*	FP	High
Willow Flycatcher, *Empidonax traillii*	SE	Low
Prairie Falcon, *Falco mexicanus*	WL	Low
Common Loon, *Gavia immer*	SSC	Low
Bald Eagle, *Haliaeetus leucocephalus*	SE, FP	Moderate
Yellow-breasted Chat, *Icteria virens*	SSC	Moderate
Loggerhead Shrike, *Lanius ludovicianus*	SSC	Moderate
Osprey, *Pandion haliaetus*	WL	High
American White Pelican, *Pelecanus erythrorhynchos*	SSC, BCC	Low
Yellow-billed Magpie, *Pica nuttalli*	BCC	Low
Purple Martin, *Progne subis*	SSC	Moderate
Bank Swallow, *Riparia riparia*	ST	Low
Northern Yellow Warbler, *Setophaga aestiva*	SSC	Moderate
Pacific Lamprey, *Entosphenus tridentatus*	SSC	Moderate
Western River Lamprey, *Lampetra ayresii*	SSC	Moderate
Steelhead Central Valley DPS, Pop. 11, *Oncorhynchus mykiss irideus*	FT, SSC	High
Chinook SalmonCentral Valley Fall Run, *Oncorhynchus shawytcha*	SSC	High
Crotch's Bumble Bee, *Bombus crotchii*	SCE	Moderate
Monarch Butterfly, Pop. 1, *Danaus plexippus plexippus*	FPT	Low
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus*	FT	High
Pallid Bat (roosting), *Antrozous pallidus*	SSC	Moderate
Western Red Bat (roosting), *Lasiurus frantzii*	SSC	Moderate
Northwestern Pond Turtle, *Actinemys marmorata*	SSC, FPT	High

[1] Listing Status: FE = Federally Endangered; FT = Federally Threatened; FPT = Federally Proposed Threatened; SE = State Endangered; ST = State Threatened; SCE = State Candidate Endangered; FP = State Fully Protected; SSC = State Species of Special Concern; WL = State Watch List; BCC = Bird of Conservation Concern; CRPR = California Native Plant Society California Rare Plant Rank: 1B = Rare, Threatened, or Endangered in California and elsewhere; 4 = Watch List, plants of limited distribution; Threat Rank: 2 = Moderately Threatened in California.

Species Name	Listing Status [1]	Potential to Occur in Study Area
Valley Brodiaea, *Brodiaea rosea* ssp. *vallicola*	CRPR 4.2	Low
Bogg's Lake Hedge Hyssop, *Gratiola heterosepala*	SE, CRPR 1B.2	Low
Sanford's Arrowhead, *Sagittaria sanfordii*	CRPR 1B.2	Low

Cultural Resources

Rincon Consultants performed a Cultural Resources Study for the project in June 2026. It is presented in Appendix F: Cultural Resources Report. The study did not identify any cultural or archaeological resources within the project's Area of Potential Effects and anticipated a low likelihood of encountering any such resources during subsurface disturbance.

Project Design Process

Design Approach and Goals

EBMUD's main goal for the project is to create at least 25 acres of new floodplain rearing habitat for juvenile Chinook salmon (*Oncorhynchus tshawytscha*) and California Central Valley (CCV) Steelhead (*Oncorhynchus mykiss*) on the Mokelumne River.

More specifically, the project seeks to:

- Lower floodplain and bank elevations to increase the frequency and duration of floodplain inundation.
- Improve hydraulic connectivity through existing depressions and side-channels to reduce fish stranding potential.
- Create and enhance in-stream juvenile rearing habitat.
- Increase cover, habitat complexity, and ecohydraulic diversity to improve rearing conditions for juvenile salmonids.

Initial Design

FlowWest created initial project designs for each of the three sites. Based on the topography and history of these locations, FlowWest developed a design approach that would transform the disconnected topography into a connected series of side channels, riffles, and off-channel floodplain. Early designs sought to take advantage of existing low-lying areas to excavate and reconnect floodplain habitat, and place spoiled excavated material in depressed areas that currently create fish stranding hazards. Designs for each site were iteratively refined as described in the following sections.

Design Charrette and Development of 35% Design

Once initial designs including various options for each site were developed, the design team held a design charrette on May 7th, 2025, with EBMUD staff and representatives from Buena Vista Rancheria of Me-Wuk Indians. The purpose of this design charrette was to present the initial design concepts to participants, solicit feedback, and select an alternative for each site to carry through to the 35% design phase. The main takeaways from the design charrette and how they were incorporated into the 35% Design are described below.

Incorporate design features and project implementation tasks to include Tribal stakeholders: Input from Buena Vista Rancheria emphasized the need to take steps during project design and implementation to respect Tribal practices and provide beneficial uses to Tribal community members. These included such request as:

- Revegetation plans should incorporate tule and willow plantings
- If elderberry are removed or trimmed, the tribe requested that they be involved in the process
- Prior to excavation, crews should be trained in procedures to minimize impacts on artefacts or culturally sensitive sites. EBMUD will utilize established procedures to repatriate remains if they are encountered.

Maximize floodplain footprint: EBMUD staff noted that the project footprints should be designed to maximize potential floodplain creation within the physical constraints. If needed, later project phases can reduce the scale of the project if needed to fit within funding limitations. The selected alternative for each site incorporated all of the areas identified as potential floodplain, except for the Day Use Area where the Folsom South Canal creates a hard constraint towards the east on floodplain expansion. At the Colburn Upstream Site, the side channel entrances and exits were expanded from 20 feet wide to 50+ feet to accommodate this recommendation. At the downstream Colburn site, an additional breach was added in the riverbank to create three connections between the river and the proposed floodplain.

Tailor Floodplain Hydraulics and Flows to Suit Site Conditions and Fisheries Goals: EBMUD staff expressed that floodplain elevations should be designed to avoid perennially wet conditions, which would likely lead to uncontrolled cattail growth. Also, floodplain features should allow for enough flow to attract rearing salmon, but also not risk high velocities that could sweep fish out of habitat areas or contribute to excessive scour. Floodplains should be designed to drain with receding flows to avoid creating new stranding risks.

With this feedback, FlowWest expanded side channel inlets and outlets and altered floodplain elevations to reduce stranding risk and more precisely target inundation thresholds at 800 and 1,500 cfs flows, while avoiding wetting at 325 cfs. These design inputs were finalized into the 35% Design Drawings which were presented to EBMUD in February 2026.

70% Design

EBMUD provided FlowWest with comments on the 35% Design Drawings and the design was refined based on this feedback. Key revisions included:

- To further reduce stranding risk, the slope of all floodplain features perpendicular to flow was increased from flat to 0.5%. This change raised the floodplain elevations at the outside edge of some floodplain habitat features outside of the target WSEs, reducing the amount of predicted suitable habitat at 800 and 1500 cfs.
- New in-stream riffle features were added to the project designs at each of the three project sites. Riffles are located adjacent to side-channel excavation at each project site, which will facilitate construction access to deposit washed and sorted gravel in the channel.
- A new side channel breach was added to the Colburn Upstream site, after EBMUD raised concerns that the single side channel exit could increase the predation risk for out-migrating juveniles.

Complete descriptions of design features and figures showing the 70% design can be found in the Design Features section. The 70% Design drawings are reproduced in Appendix A of this report.

Basis of Design

Throughout the design process, the Mokelumne River Floodplain Habitat Restoration project designs have been informed by a 2D hydrodynamic model, which was used to ensure the designs meet well-established salmonid habitat criteria. Other analyses, including a drainage analysis, vegetation survey, and flood assessment were performed to maximize the ecological value of the project and analyze and mitigate potential negative impacts to vegetation or flood conveyance.

Hydrodynamic Modeling

Project designs were evaluated using a 2D HECRAS model. The model development process is documented in the Mokelumne River Floodplain Restoration Project Hydrologic Analysis and Hydrodynamic Modeling Technical Memorandum (FlowWest, 2026), found in Appendix C.

Modeled Flows and Inundation Targets

The project was designed with several inundation criteria provided by EBMUD. Since the hydrology of the river is controlled by dam operations, EBMUD has specified the project flows, rather than those being determined by standard statistical analysis (such as Bulletin 17C flow frequency calculations)

TABLE 3: PROJECT FLOWS

Project Flow	CFS	Approximate Return Interval
Baseflow	325	Baseflow
Low Floodplain Inundation	800	1-year
High Floodplain Inundation	1500	2-year
Maximum Release	5000	10-year
FEMA Flood Flow	9700	100-year

At baseflow, all project floodplain and side channel areas are designed to remain dry. Maintaining dry conditions at baseflow is intended to reduce the prevalence of nuisance vegetation, namely Cattail (genus *Typha*).

Low and High Floodplains are designed to meet the Floodplain Rearing Habitat criteria described below at their respective flows. In-channel features are designed to meet the In-Channel Rearing Habitat criteria described above.

Results from the Habitat Suitability Evaluation are presented in the 70% Design Evaluation section.

Salmonid Rearing Habitat

Habitat quality for salmonids is defined by a combination of hydraulic conditions (water depth and velocity), physical features (substrate type, channel morphology), structural cover, water quality parameters, and floodplain connectivity. The criteria described below draw on design standards established in the California State Water Resources Control Board's Water Quality Control Plan (CSWRCB 2025), the Healthy Rivers and Landscapes (HRL) Strategic Plan (CNRA 2024), and the Mokelumne River Tributary-Specific Science Plan (LMR Science Plan 2025) developed for the LMR.

Rearing Habitat Criteria

Juvenile salmonids use two broad categories of rearing habitat on the LMR: in-channel rearing habitat within the active channel, and floodplain rearing habitat on inundated overbank areas during elevated flow events. Both habitat types are important for supporting juvenile growth and survival, but they differ in their hydraulic characteristics, temporal availability, and ecological functions.

In-Channel Rearing Habitat

In-stream rearing habitat refers to areas within the main channel or side channels where juveniles can feed, find cover, and avoid predators during periods when flows are confined to the channel. On the Lower Mokelumne River, in-channel habitat is designed and constructed for flows ranging from 200 to 600 cfs, with portions providing suitable conditions at flows as low as 150 cfs and as high as 1,000 cfs to accommodate dry and wet year hydrology (LMR Science Plan 2025).

The formal design criteria for in-stream rearing habitat, as established in the Water Quality Control Plan (CSWRCB 2025, Table 15), are presented in Table 4 below.

TABLE 4: DESIGN CRITERIA FOR IN-STREAM REARING HABITAT (TABLE 15, CSWRCB 2025, AS CITED IN LMR SCIENCE PLAN 2025)

Parameter	Criterion
Water Depth	• 0.5-4.0 feet
Water Velocity	• 0.0-3.0 feet per second
Cover (minimum areal coverage)	• Minimum 20% areal coverage of cover • 75% of required cover (15% of total habitat area) must be quantified as the actual physical extent of the feature with no buffer • The remaining 25% of required cover (5% of total habitat area) may include cobble 3-12 inches in diameter or a 2-foot buffer applied to woody debris, boulders, undercut banks, root wads, logjams/submerged brush piles, and large wood.

In-channel restoration actions are designed to improve water depths and velocities, increase habitat complexity, and reduce non-native predator habitat. These collective improvements are intended to support juvenile salmonid survival and growth outcomes.

Floodplain Rearing Habitat

When overbank areas are inundated, juveniles gain access to warm, shallow, slow-moving waters that are rich in invertebrate prey and offer structural cover from predators. Juveniles rearing in floodplain environments grow faster and survive at higher rates than those confined to the main channel (Sommer et al. 2001).

The formal design criteria for floodplain rearing habitat established in the Water Quality Control Plan (CSWRCB 2025, Table 15) are the same as the in-channel rearing habitat criteria presented in Table 4.

Other Important Rearing Considerations

In addition to hydraulic criteria, water quality, type of cover, and floodplain inundation timing are parameters supporting juvenile growth and survival. Water quality considerations include water temperature, dissolved oxygen level, turbidity, conductivity, salinity, alkalinity, and pH, and should be monitored to assure the appropriate ranges are maintained. Important cover features include woody material, boulders, grasses, willow, and riparian vegetation. These types of cover can create important habitat for rearing juveniles to rest and take shelter from predators. Lastly, floodplain inundation must be activated at the correct timing and last for a sufficient duration to be ecologically beneficial. On the Lower Mokelumne River, design guidance states that flows ranging from 700 to 1500 cfs should be designed for to activate the floodplain, and events lasting 7 days or greater are considered suitable (LMR Science Plan 2025).

Design Features

This section describes the design features of each project site.

Day Use Area

At the upstream end of the Day Use Area project extent, a small floodplain terrace is excavated on the North riverbank, adjacent to Murphy Creek. This terrace will begin wetting at 800 cfs and achieve full inundation at 1500 cfs.

On the south bank, Day Use Area design begins (at the upstream end) by following the contours of existing inlets and backwater ponds, deepening existing topographical depressions to increase the frequency and depth of inundation. The design then widens into a large floodplain area, with a meandering secondary channel/low floodplain that inundates at 800 cfs. A new side channel continues parallel to the main river, creating an intermittent floodplain island feature adjacent to the main channel at flows above 325 cfs.

Side channels are designed with a 25-foot width throughout. The channel bed is V-shaped with a 2% grade toward the channel centerline. Floodplains are graded toward the nearest side channel at 0.5% slope.

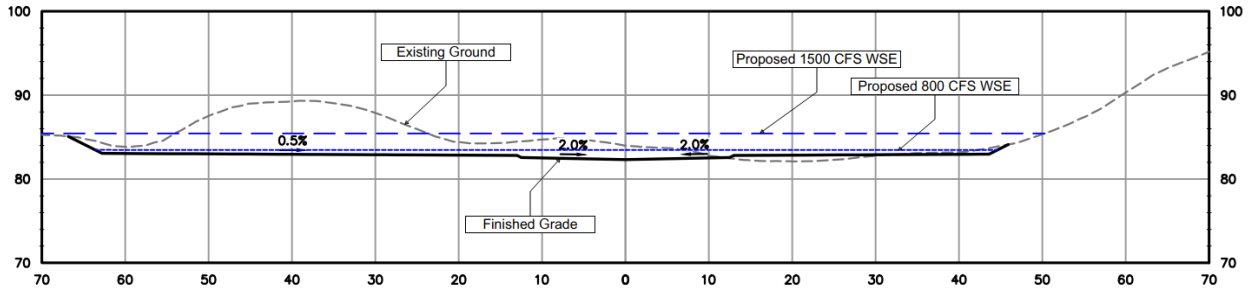


FIGURE 9: TYPICAL SIDE CHANNEL AND FLOODPLAIN CROSS SECTION

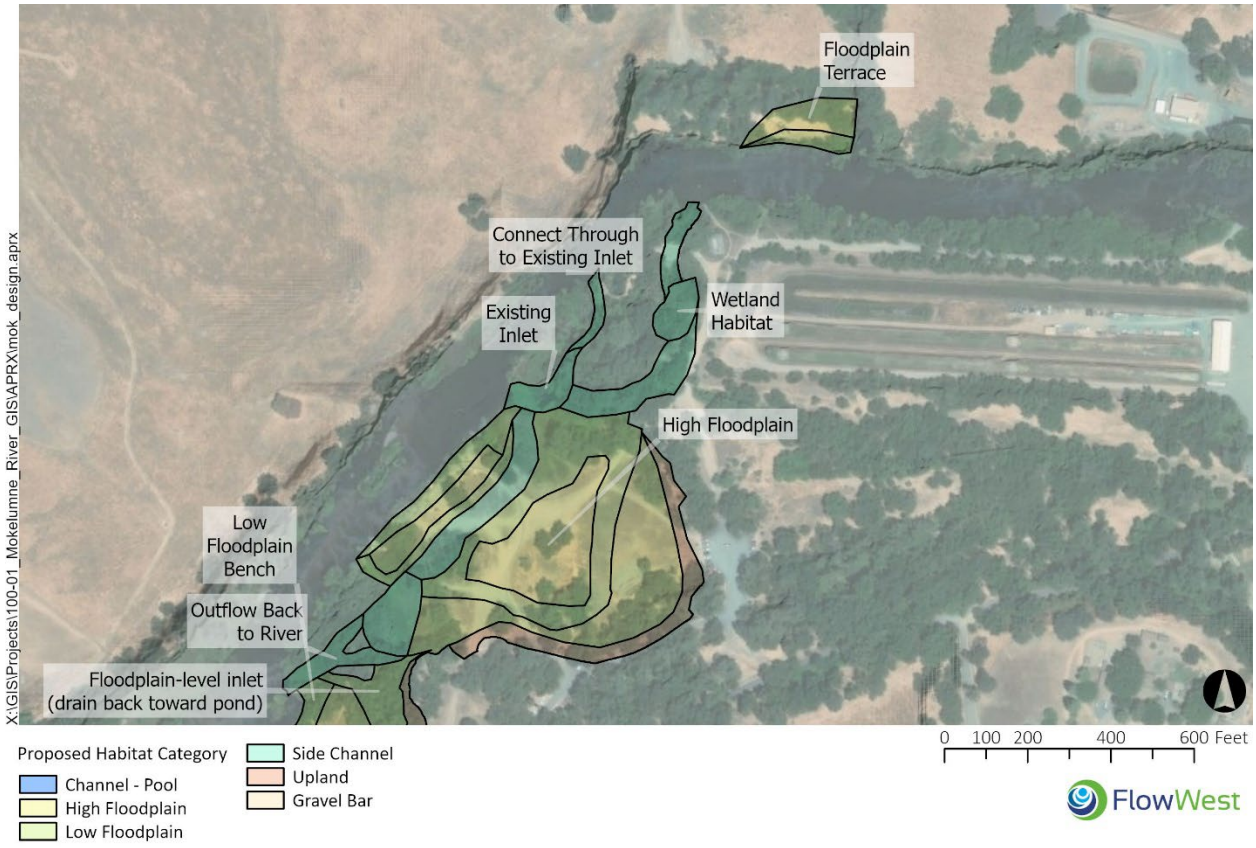


FIGURE 10: DAY USE AREA UPSTREAM DESIGN

At the downstream portion of the Day Use Area, excavation cuts into the existing hand-launch The access point for kayaks, rafts, and float tubes, replacing it with floodplain. EBMUD plans to replace the existing hand-launch access point (current footprint) immediately following completion of the floodplain restoration project, thereby maintaining continued public access to the site. Existing channels downstream of the parking lot will be deepened and widened. At the downstream end, a riffle has been placed in the main channel.

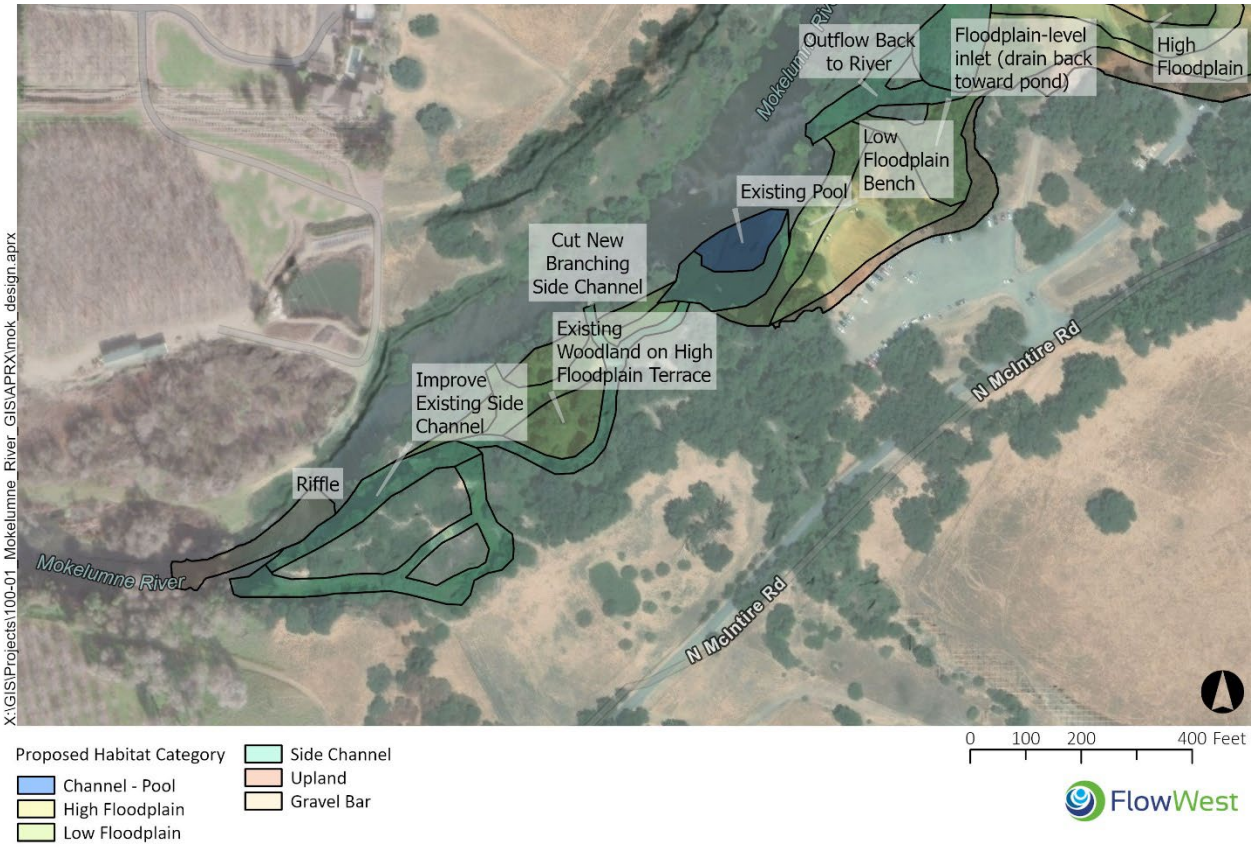


FIGURE 11: DAY USE AREA DOWNSTREAM DESIGN

COLBURN UPSTREAM SITE

The Colburn Upstream design widens and deepens an existing side channel that follows the edge of the Colburn parcel. Excavation cuts through existing low elevation areas to connect scattered topographical depression and ponds with the branching side channels. The area adjacent to the side channels is graded to inundate at flows between 800 and 1500 cfs. Spoils material will be placed to fill the southern portion of the existing pond. Approximately 9600 CY of spoils material will be sorted and washed for placement in the main channel as a riffle, and in the existing backwater pond.

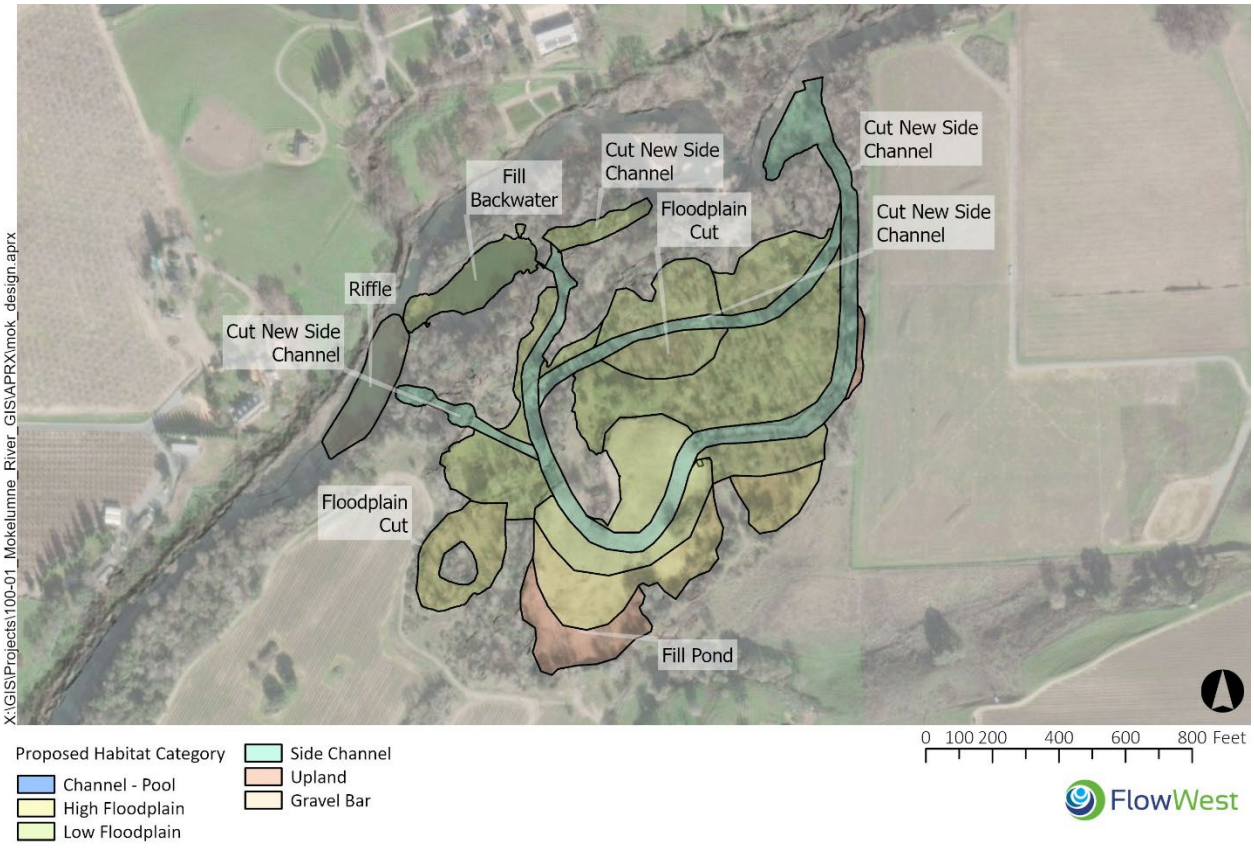


FIGURE 12: COLBURN UPSTREAM DESIGN

Colburn Downstream Site

The Colburn Downstream design creates three breaches in the existing riverbank. Material excavated from the bank and the floodplain is placed in a new trapezoidal setback berm at the original height of the bank. Excess spoils are placed in an existing disconnected pond at the East side of the site, and washed and sorted material utilized to construct another in-stream riffle.

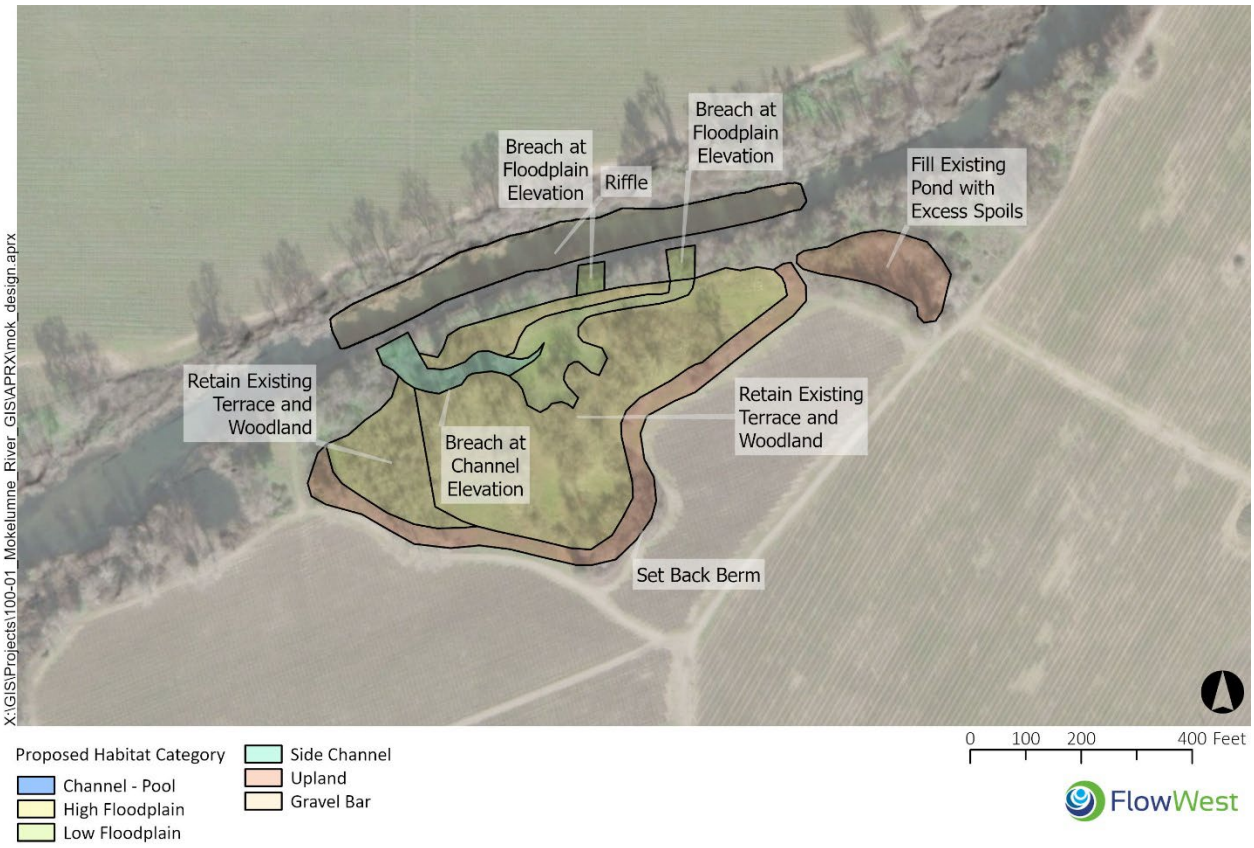


FIGURE 13: COLBURN DOWNSTREAM DESIGN

TREE REMOVALS

The proposed floodplain excavation in all three project sites overlaps with areas of mature riparian vegetation. As a result, the project will require the removal of a considerable number of medium and large trees.

The project is proposing the removal of 316 trees with DBH greater than 6 inches in the Day Use Area, 464 trees in the Colburn Upstream site, and 109 trees in the Colburn Downstream site.

The details of the tree removals including species, DBH, and locations can be found in Appendix B: Tree Removals.

REVEGETATION

General Revegetation Strategy

The planting design for the Mokelumne River Floodplain Restoration Project supports three principal ecological and management goals:

1) Provide seasonal rearing habitat for native fish and additional habitat benefits for other wildlife species, including the Valley Elderberry Longhorn Beetle (VELB);

2) Retain and enhance existing native plant communities, including Valley oak woodland, valley foothill riparian, and native grassland habitats;
3) Maintain visibility and openness across the site through a grassland-dominated structure with strategically spaced woody vegetation.

Native grasses and herbaceous species will form a continuous vegetative matrix across all zones, supporting soil stability, biodiversity, and long-term resilience. Given the site's proximity to residential areas, plantings are designed to preserve sight lines for safety, access, and ongoing monitoring. Large trees and shrubs will be limited to widely spaced individuals in upland and high floodplain areas. Denser vegetation clusters will be confined to the side channel areas. Existing woody vegetation will be retained where feasible and mitigated where removal is required (see Biological Resources Assessment, Appendix E).

Planting zones were delineated based on modeled inundation patterns, site topography, and proximity to the channel. All proposed species are native to California and suited to the site's hydrology and soils, with the intent to promote long-term habitat function and self-sustainability. The full list of proposed plantings and planting density is listed in Table 5 after the following descriptions.

Vegetation Zones

Side Channel

Target vegetation for this zone includes species that can tolerate prolonged inundation with a summer dry period.

The channel will be kept clear of larger woody vegetation to help reduce the risk of debris getting caught in the side channel. Instead, the side channel will consist of slender sedge (*Carex praegracilis*), creeping wild rye (*Leymus triticoides*), and slender sedge (*Carex praegracilis)*, which provide erosion control, soil stabilization, and cover (USDA, NRCS 2019).

Low Floodplain

Proposed vegetation of the floodplain planting zones is intended to provide habitat benefits while maintaining resilience to fluctuating hydrologic conditions.

The woody vegetation layer will include a diverse willow mix, sandbar willow (*Salix exigua*), arroyo willow (*S. lasiolepis*), red willow (*S. laevigata*), and shining willow (*S. lucida*), all of which are fast-growing, flood-tolerant, and adapted to saturated soils (USDA, NRCS 2019). Additionally, Buttonbush (*Cephalanthus occidentalis*) and red osier dogwood (*Cornus sericea*) are both flood-tolerant shrubs that thrive in moist soils and contribute high habitat value for birds and pollinators. These species are particularly well-suited to lower floodplain areas that retain moisture longer into the dry season (USDA, NRCS 2019).

The herbaceous layer will be dominated by white root sedge (*Carex barbarae*), slender sedge (*Carex praegracilis*), and creeping wild rye (*Leymus triticoides*). These species are well-adapted to variable moisture conditions, stabilize soils during flood events, and persist through summer dry periods (USDA, NRCS 2019; California Native Plant Society 2019). Collectively, this mix of woody and herbaceous species will enhance habitat quality, stabilize the floodplain surface, and support long-term ecological resilience.

High Floodplain

Target vegetation for this zone must tolerate occasional prolonged saturation and extended periods of drought. The herbaceous layer will include creeping wildrye (*Leymus triticoides*), mugwort (*Artemisia douglasiana*), and great valley gumweed (*Grindelia camporum*), species well-suited to drier conditions but tolerant of occasional soil saturation.

Woody plantings will be limited to widely spaced individuals, California boxelder (*Acer negundo var. californicum*), and Fremont cottonwood (*Populus fremontii*). These species are well adapted to deep alluvial soils and provide long-term canopy development, while their wide spacing preserves visibility and openness across the floodplain (USDA, NRCS 2019). Elderberry (*Sambucus mexicana*) will be introduced in clusters, spaced no farther than 100 feet apart, to provide habitat for the federally listed elderberry longhorn beetle (USDA, NRCS 2019). Elderberry clusters will be limited to areas where soils are well-drained, where clustering will not impede sightlines, and where clustering can maintain canopy connectivity.

Upland

The upland margin zone includes areas rarely inundated, generally only in high-flow conditions associated with ≥5-year flood events. Vegetation in this zone is intended to replicate native grassland and oak systems while preserving open sightlines across the site.

The upland area will be seeded with a native grass and perennial seed mix to promote growth and reestablishment of a native grassland and provide important pollinator habitat. The perennial seed mix will include species to support pollinators including Lupinus, Asclepias, and Phacelia. Additional plantings include Valley oak as a widely spaced overstory species. Occasional shrubs such as Coyote bush (*Baccharis pilularis*) and Elderberry (*Sambucus mexicana*) will be dispersed, especially on the southeast-facing slope adjacent to the side channel.

TABLE 5: PLANTING TABLE

Planting Table					
Zone	**Planting Type**	**Common Name**	**Scientific Name**	**Form**	**Count Per Acre**
Side Channel	Wetland Grass	Hardstem bullrush	*Schoenoplectus acutus*	Grass	750
		Creeping wild rye	*Leymus triticoides*	Grass	750
		Slender sedge	*Carex praegracilis*	Grass	750
		Common rush	*Juncus effusus*	Grass	750
Low Floodplain	Wetland Grass & Willows Mix	Sandbar willow	*Salix exigua*	Shrub / Small Tree	20
		Arroyo willow	*Salix lasiolepis*	Shrub / Small Tree	40
		Red willow	*Salix laevigata*	Shrub / Small Tree	20
		Red osier dogwood	*Cornus sericea*	Shrub	40
		Button bush	*Cephalanthus occidentalis*	Shrub / Small Tree	40
		White Root Sedge	*Carex barbarae*	Grass	680
		Slender sedge	*Carex praegracilis*	Grass	680
		Iris leaf rush	*Juncus xiphioides*	Grass	680
		creeping wild rye	*Leymus triticoides*	Grass	680
High Floodplain Lower Slopes	Mixed Grasses with Some Trees & Shrubs	High Floodplain Seed Mix	*Mixed spp.*	Seed	See spec (tbd)
		Cottonwood	*Populus fremontii*	Tree	10
		California boxelder	*Acer negundo var. californicum*	Tree	10
		Elderberry	*Sambucus mexicana*	Large Shrub	40
Upland	Mixed Grasses with Some Trees & Shrubs	Crotchs Bumblebee Mix	*Mixed spp.*	Seed	See spec (tbd)
		Elderberry	*Sambucus mexicana*	Large Shrub	40
		Cottonwood	*Populus fremontii*	Tree	10
		Valley oak	*Quercus lobata*	Tree	10
		Coyote bush	*Baccharis pilularis*	Shrub	40

Non-Native Species Management

Non-native species present on the site will be managed based on their level of invasiveness and are excluded from the proposed species.

Himalayan blackberry (*Rubus armeniacus*), water hyacinth (*Eichhornia crassipes*), and other non-native species observed during site surveys are not appropriate for the restoration context and will be actively managed or excluded from planting.

70% Design Evaluation

Habitat Suitability

The proposed design was evaluated using the 2D Hydrodynamic HECRAS model for the flows and criteria described in the Rearing Habitat Criteria section. Suitable acreages were calculated based on the project area that met the criteria at flows between 325 cfs and 2000 cfs. Calculated quantities are shown in Table 6 below.

TABLE 6: SUITABLE REARING HABITAT ACREAGE

	Suitable Rearing Habitat (acres)					
	Day Use Area		Colburn Upstream		Colburn Downstream	
Flow (cfs)	Existing	Proposed	Existing	Proposed	Existing	Proposed
325	1.1	0.9	0.3	1.9	0.7	1.5
800	1.5	2.6	1.3	9.2	0.6	2.3
900	1.6	3.2	1.3	14.6	0.6	2.7
1,100	1.7	4.6	1.4	21	0.6	3.7
1,300	1.9	6	2.2	21.9	0.6	4.2
1,500	2.2	6.9	2.4	22	0.6	4.6
1,800	2.8	9.3	2.6	22	0.5	4.6
2,000	3	11.1	2.7	21.6	0.4	4.6

Across all sites, the net gain of suitable in-stream rearing habitat at 325 cfs is 2.2 acres. The net gain of floodplain rearing habitat at 1500 cfs is 28.3 acres, which exceeds the goal of 25 new acres of floodplain habitat at the high-floodplain flow.

Figures showing the suitable habitat areas of the proposed design compared to existing conditions are shown below.

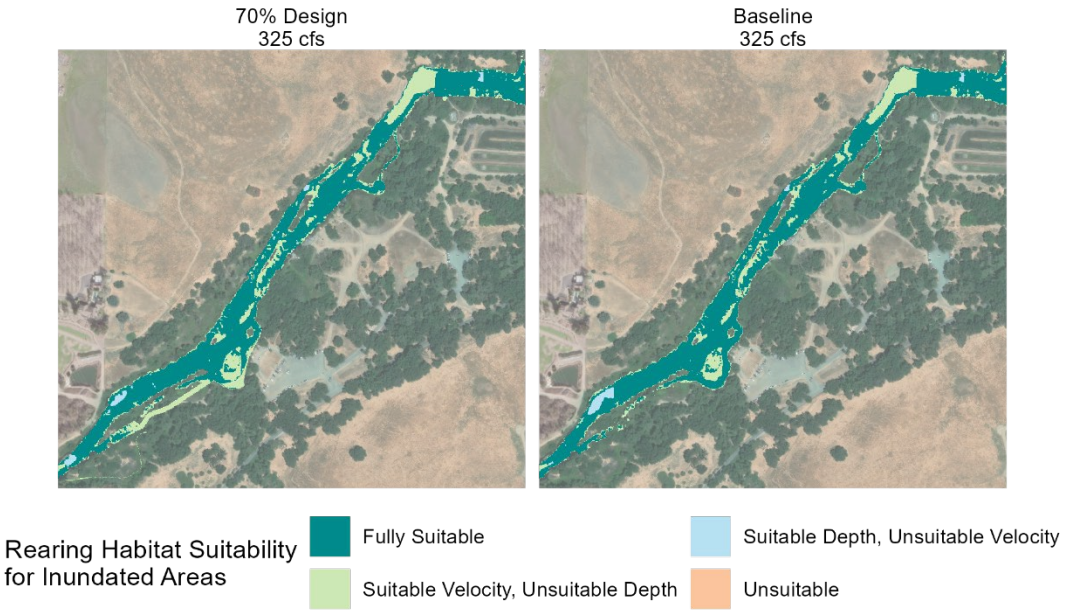


FIGURE 14: DAY USE AREA SUITABLE HABITAT AT 325 CFS

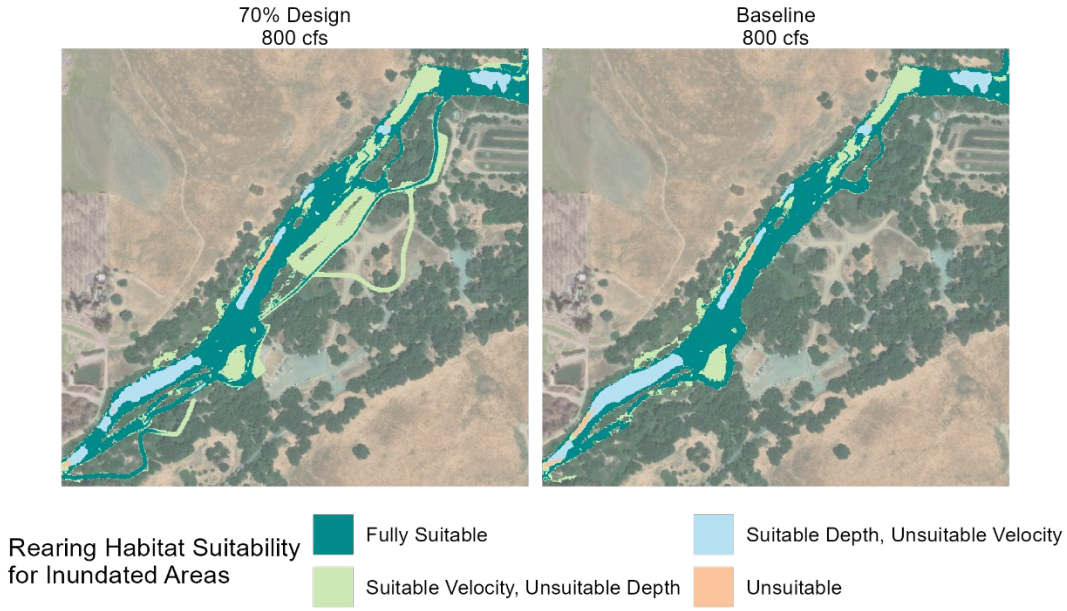


FIGURE 15: DAY USE AREA SUITABLE HABITAT AT 800 CFS

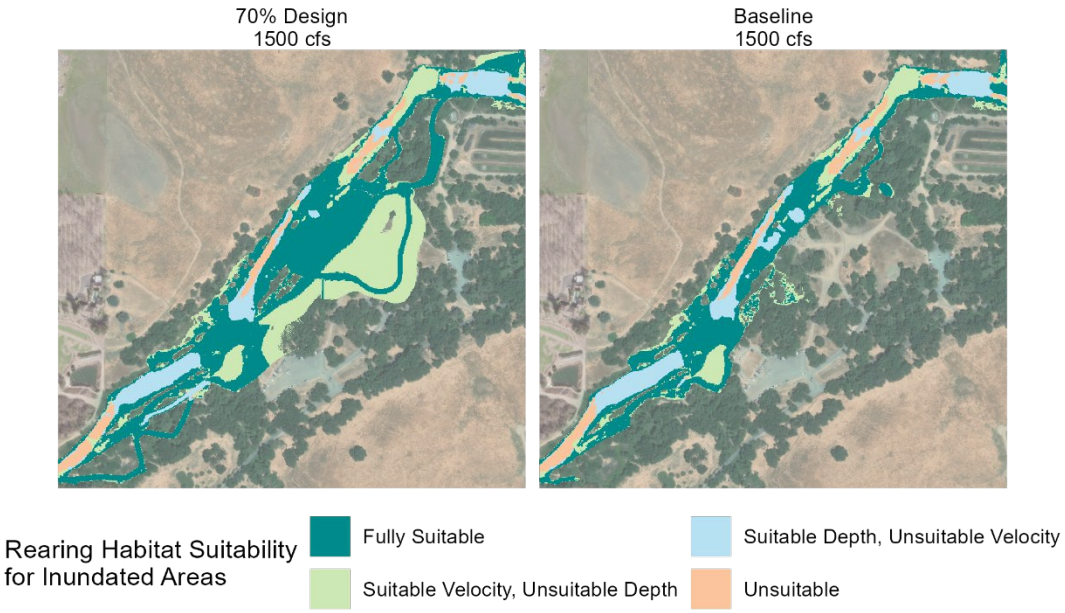


FIGURE 16: DAY USE AREA SUITABLE HABITAT AT 1500 CFS

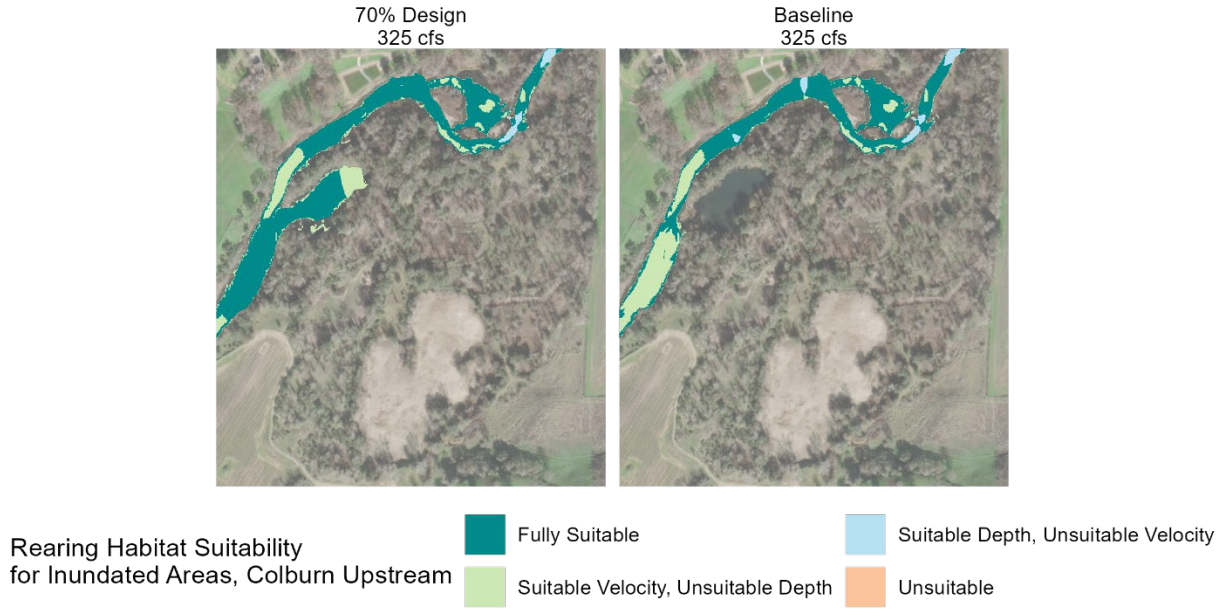


FIGURE 17: COLBURN UPSTREAM SUITABLE HABITAT AT 325 CFS

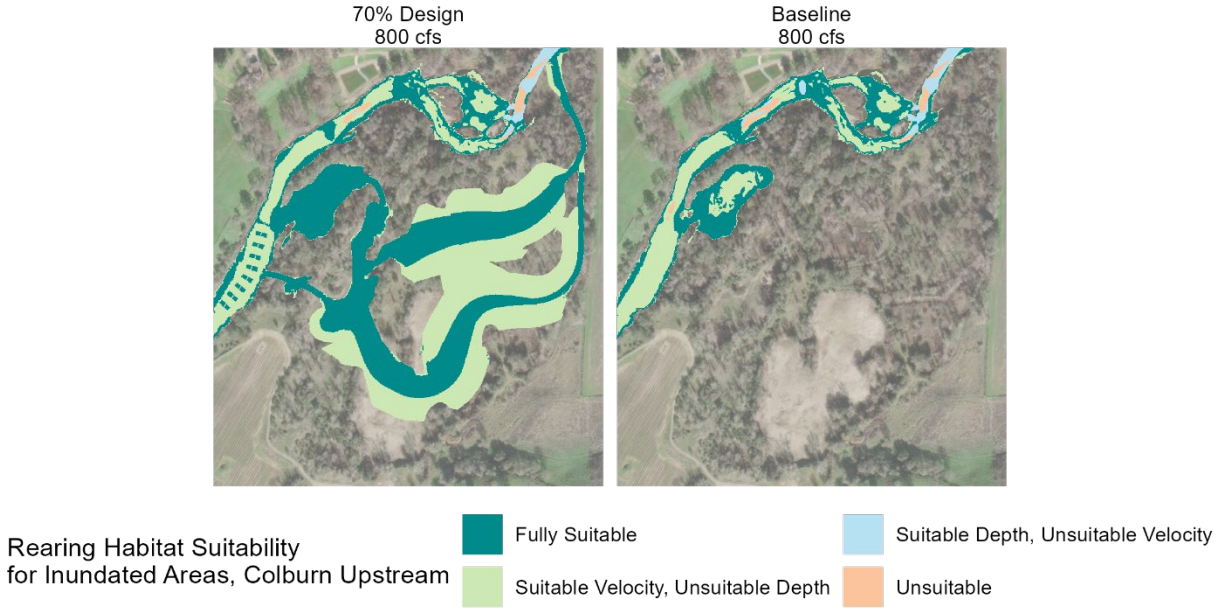


FIGURE 18: COLBURN UPSTREAM SUITABLE HABITAT AT 800 CFS

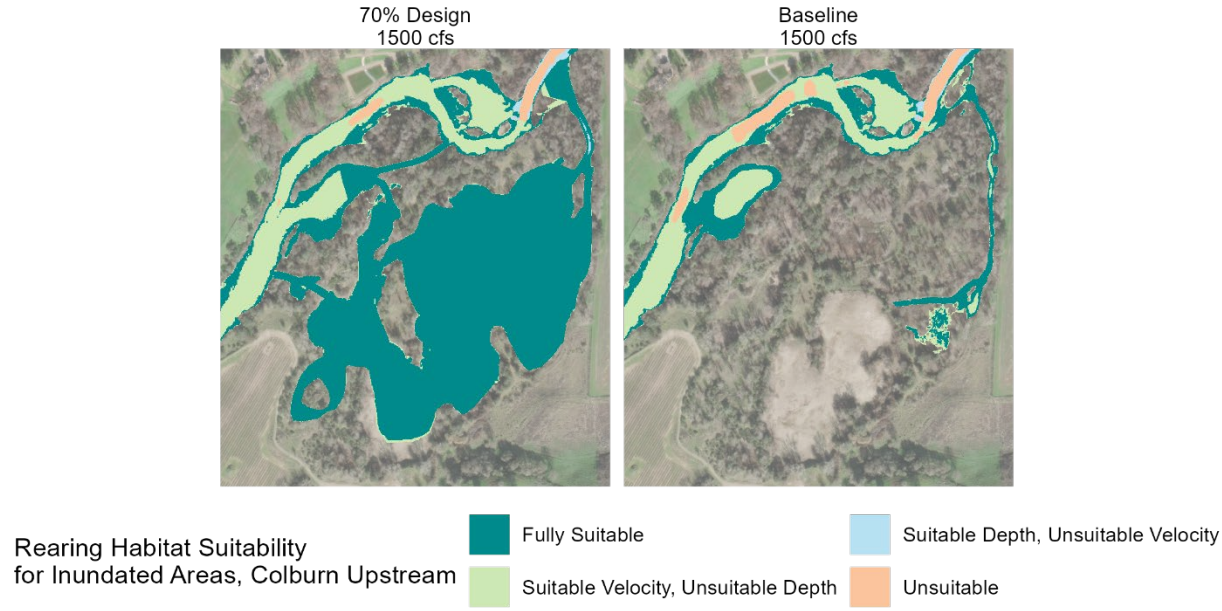


FIGURE 19: COLBURN UPSTREAM SUITABLE HABITAT AT 1500 CFS

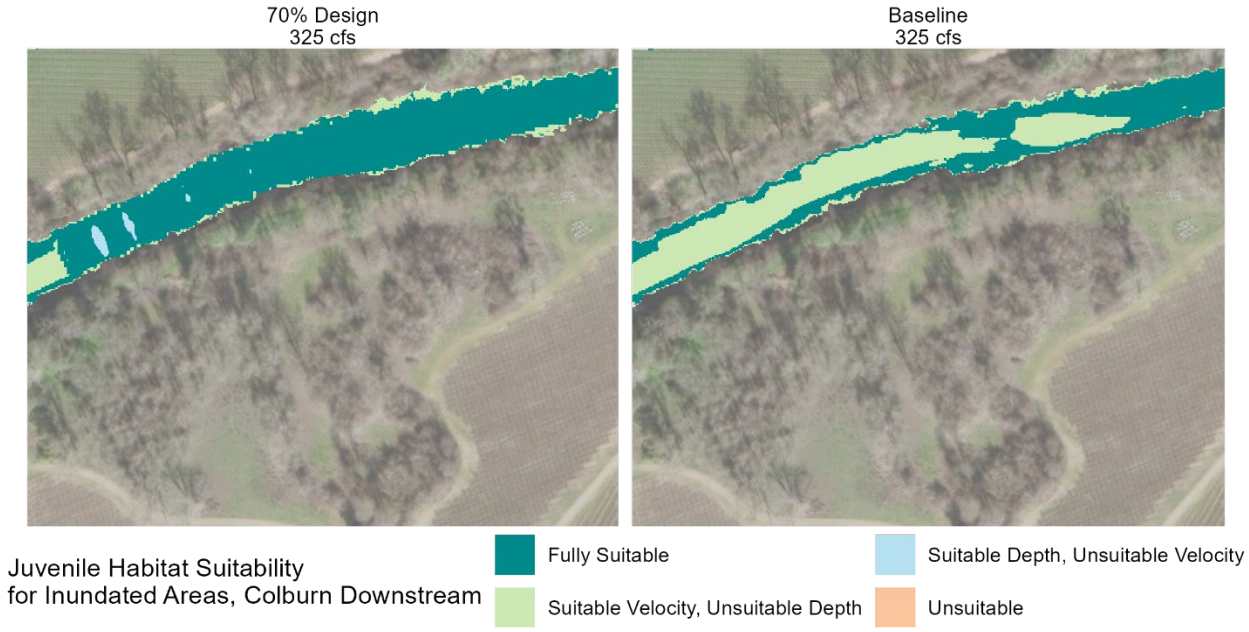


FIGURE 20: COLBURN DOWNSTREAM SUITABLE HABITAT AT 325 CFS

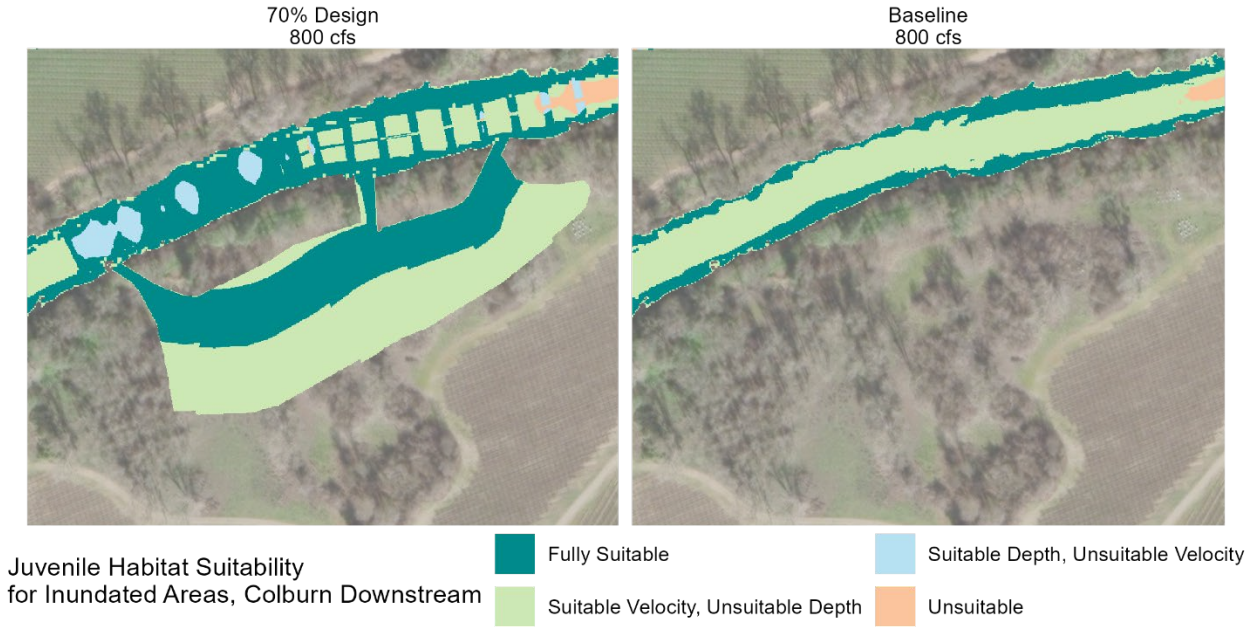


FIGURE 21: COLBURN DOWNSTREAM SUITABLE HABITAT AT 800 CFS

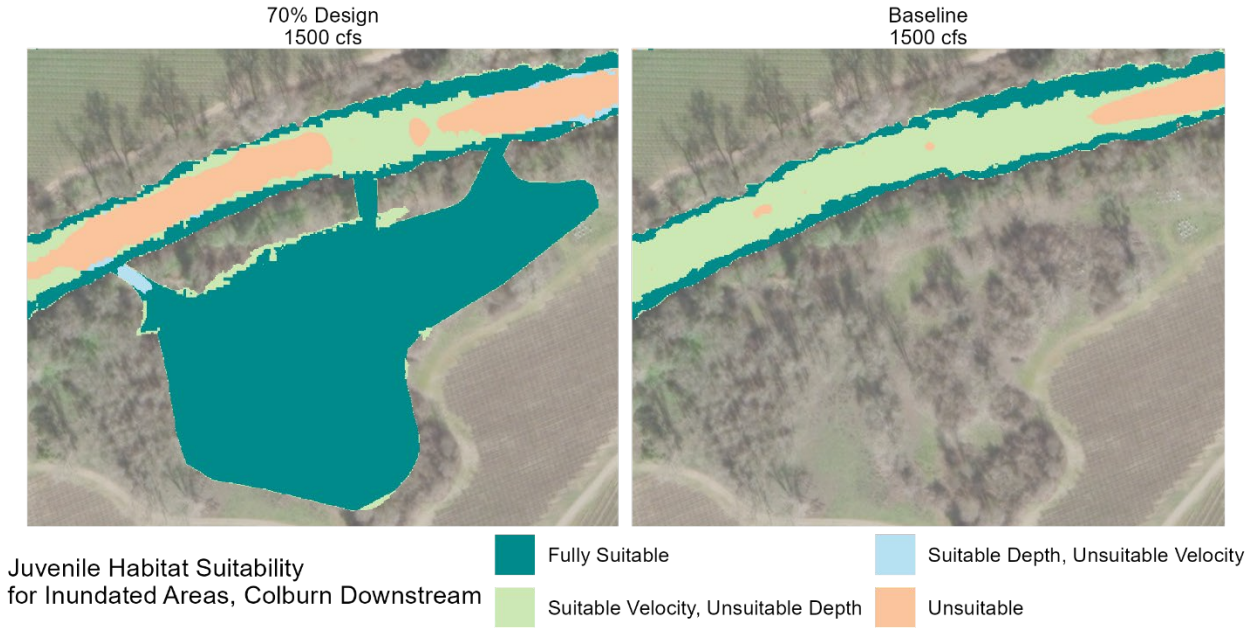


FIGURE 22: COLBURN DOWNSTREAM SUITABLE HABITAT AREA AT 1500 CFS

Drainage

The drainage characteristics of the proposed floodplain features were assessed using the hydrodynamic model. Input flows for this analysis ramped up to 5600 cfs, then gradually decreased to 200 cfs. Areas in the floodplain design where ponding was observed on the receding limb of the hydrograph were revised, either increasing the slope to facilitate drainage, or adding fill to prevent ponding.

Irregular mining pits in the Colburn Upstream site presented particular risk of fish stranding once flows are allowed to enter the area. The 70% design uses these existing pits to reduce the need for excess excavation. Additionally, some of these pits are too deep to maintain a consistent drainage slope, to facilitate effective drainage on recession of flows, so these floodplain areas were designed with fill placement of spoils to effect better drainage patterns.

FEMA 100-Year Flood Assessment

FlowWest prepared a FEMA "No-Rise" analysis based on instructions provided by CVFPB. This analysis evaluated the water surface elevations resulting from a flow of 9,700 cfs, comparing current conditions to those proposed by the proposed project. It found that there is no rise in WSEs within the FEMA regulatory floodway.

The No Rise Analysis is presented in Appendix G: FEMA No Rise Analysis.

PROJECT PHASING

Project construction is likely to be implemented in several phases. Phased construction will minimize impacts to recreational usability of the Day Use Area in addition to allowing EBMUD to implement the project as funding sources allow. Phased construction is anticipated to last between two to five years.

The Colburn Upstream and Colburn Downstream Sites will be constructed during Phase 1 of the project. Phases 2-4 will occur at the Day Use Area and may be subject to change.

Figure 23 below shows the 70% design phasing at the Day Use Area, beginning with Phase 2. The project is separated into three construction phases. Phase 2 will excavate the North bank floodplain and new side channel inlet at the upstream end of the site, as well as expand the downstream side channel complex. Phase 3 will extend the side channel inlets from upstream and excavate the adjacent low and high floodplain. Phase 4 expands the high floodplain excavation and the secondary side channel feature.

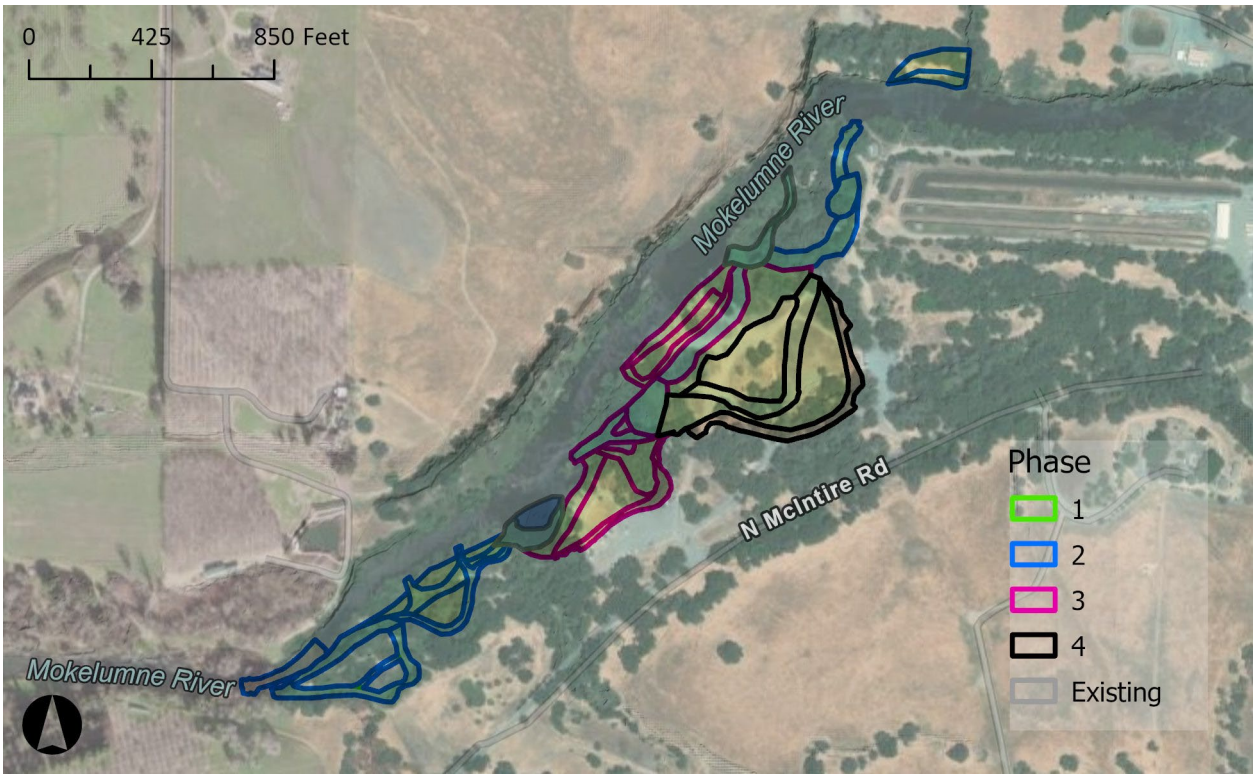


FIGURE 23: DAY USE AREA PROJECT PHASING

Figure 24 shows the Colburn project phasing, which is anticipated to be completed in a single construction season during Phase 1.



FIGURE 24: COLBURN PROJECT PHASING

REFERENCES

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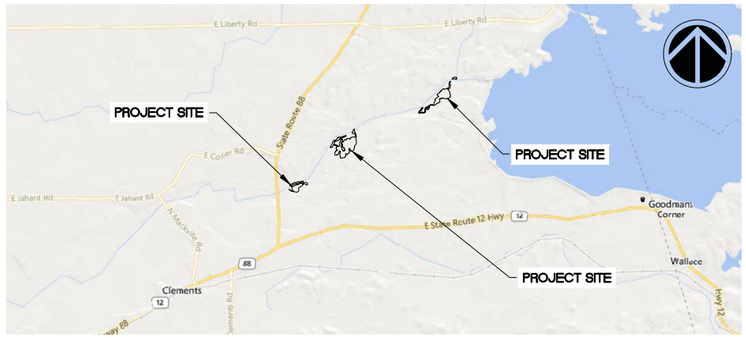
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Sommer, T. R., W. C. Harrell, M. L. Nobriga, R. Brown, P. Moyle, W. Kimmerer, and L. Schemel. 2001. California's Yolo Bypass: Evidence that flood control can be compatible with fisheries, wetlands, wildlife, and agriculture. Fisheries, 26(8), 6-15.

APPENDIX A: 70% DESIGN DRAWINGS

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

70% DESIGN



VICINITY MAP

NOT TO SCALE

UNDERGROUND SERVICE ALERT

CALL 811 UNDERGROUND SERVICE ALERT TO LOCATE EXISTING UTILITIES PRIOR TO CONSTRUCTION.

ELEVATION DATUM

THE VERTICAL DATUM FOR ALL THE ELEVATIONS IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON NATIONAL GEODETIC SURVEY BENCHMARK USGS BM J71497, ELEVATION 191.5 FEET. ALL DIMENSIONS ARE IN FEET, UNLESS OTHERWISE NOTED.

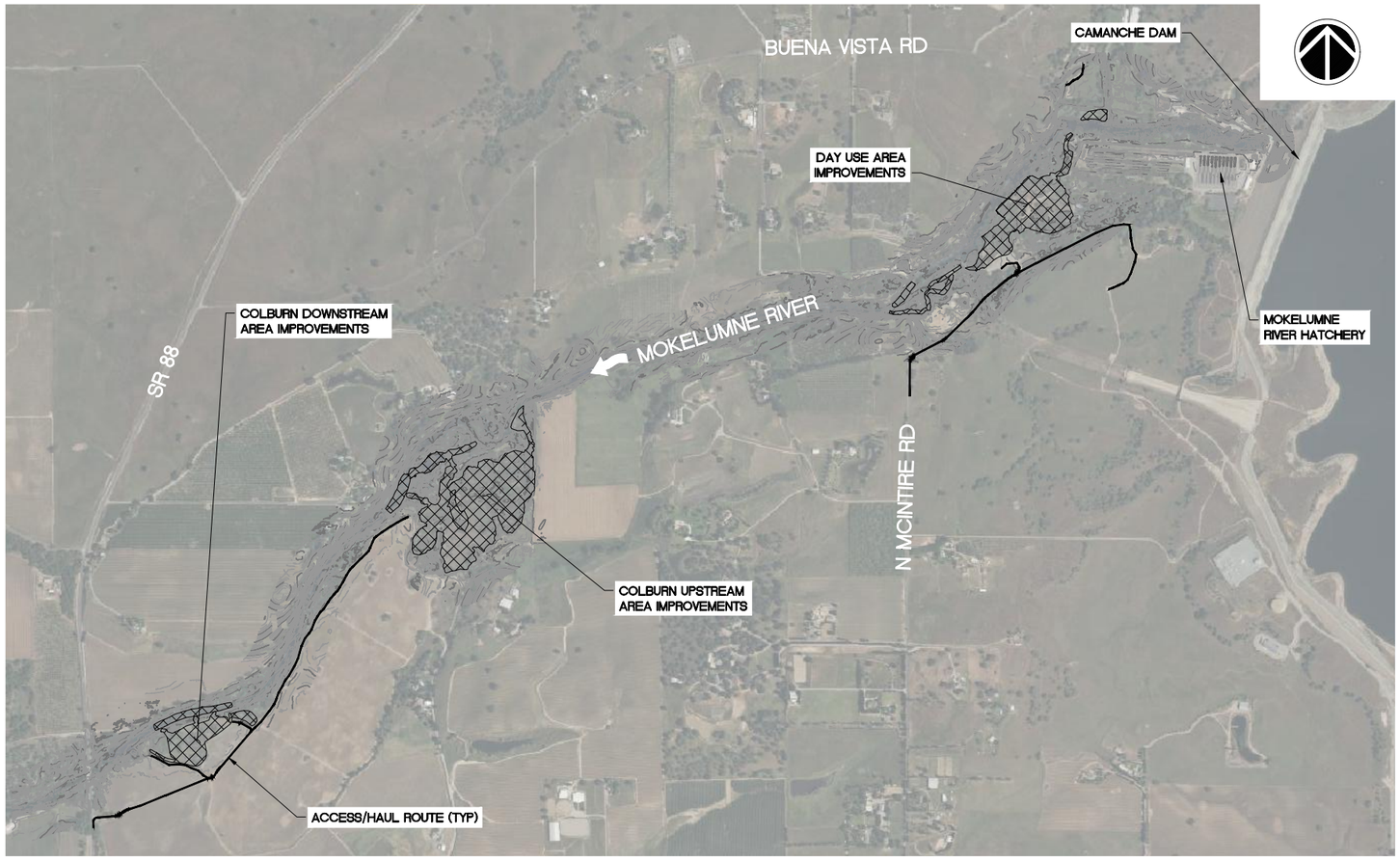
THE SURVEY MONUMENT IS A USGS BENCH MARK DISK, SET IN THE TOP OF A 10–INCH DIAMETER CONCRETE POST, 106.5 FT NORTHEAST OF A POWER POLE IN THE SAME QUADRANT AT THE STATION.

THE STATION IS ABOUT 17.8 MILES NORTHEAST OF STOCKTON, 10.6 MILES EAST OF LODI, AND 3.1 MILES SOUTH OF CLEMENTS.

NORTHING: 6,395,483.68
EASTING: 2,241,088.14
ELEVATION: 191.5'

HORIZONTAL PROJECTION

THE HORIZONTAL PROJECTION IS CALIFORNIA STATE PLANE, ZONE III, FEET, 2011 EPOCH DATE.



PROJECT OVERVIEW

SCALE: 1" = 800'

0 400' 800' 1600'

REVISION NO.	DATE	DESCRIPTION

DRAFT

FlowWest

PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:

EAST BAY MUNICIPAL UTILITY DISTRICT

TITLE SHEET

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

70% DESIGN
NOT FOR CONSTRUCTION

DRAWN BY: DNA
CHECKED BY: PFRANK

DATE: 6/10/2026

SHEET NO. 1 OF 31

DRAWING NO. G1

Y:\Shared\Active_Projects\100-01_Mokelumne_River\CAD\DWG\Mokelumne_Title-Staging.dwg

SHEET INDEX

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G2	GENERAL NOTES LEGEND ABBREVIATIONS AND SYMBOLS
C1	DAY USE STAGING AND ACCESS PLAN
C2	COLBURN DOWNSTREAM STAGING AND ACCESS PLAN
C3	COLBURN UPSTREAM STAGING AND ACCESS PLAN
C4	DAY USE AREA OVERVIEW
C5	DAY USE GRADING PLAN
C6	DAY USE GRADING PLAN (2)
C7	DAY USE GRADING PLAN (3)
C8	DAY USE SECTIONS
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C20	COLBURN UPSTREAM SECTIONS (3)
C21	COLBURN UPSTREAM SECTIONS (4)
C22	COLBURN UPSTREAM SECTIONS (5)
C23	COLBURN DOWNSTREAM OVERVIEW
C24	COLBURN DOWNSTREAM GRADING PLAN
C25	COLBURN DOWNSTREAM SECTIONS
C26	COLBURN DOWNSTREAM SECTIONS (2)
C27	DAY USE PLANTING PLAN
C28	COLBURN UPSTREAM PLANTING PLAN
C29	COLBURN DOWNSTREAM PLANTING PLAN

LEGEND

EXISTING GROUND CONTOURS — 31 — 30 — 29 —

FINISHED GRADE CONTOURS — 31 — 30 — 29 —

SURVEYED POINT × 32.22 (DESCRIPTION)

PARCEL LINE

DEFINITIONS

PROPERTY OWNER: EAST BAY MUNICIPAL UTILITY DISTRICT
1 WINEMASTERS WAY, SUITE K2
LODI, CA 95240
CONTACT: JAMES PEARSON
(209) 269-6357

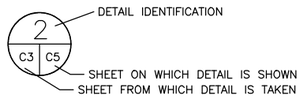
DESIGN ENGINEER: FLOWWEST
PO BOX 29392
OAKLAND, CA 94604
CONTACT: NICHOLAS STEINKE
(510) 454-9378 EXT 116

OWNER'S REPRESENTATIVE: THE OWNER-DESIGNATED CONSTRUCTION MANAGER OR PRIMARY CONTACT FOR THE CONTRACTOR (TO BE IDENTIFIED PRIOR TO CONSTRUCTION). THE OWNER'S REPRESENTATIVE WILL COORDINATE AS NEEDED BETWEEN THE OWNER AND DESIGN ENGINEER.

ABBREVIATIONS

AB	AGGREGATE BASE	L	LENGTH
APN	ASSESSOR'S PARCEL NUMBER	LF	LINEAR FEET
BMP	BEST MANAGEMENT PRACTICE	LW	LARGE WOOD
CMP	CORRUGATED METAL PIPE	MIN	MINIMUM
CC	CONCRETE	NO	NUMBER
CY	CUBIC YARD	NTS	NOT TO SCALE
DIA	DIAMETER	PROP	PROPOSED
DWG	DRAWING	R	RADIUS
EX	EXISTING	RD	ROAD
EG	EXISTING GROUND	RSP	ROCK SLOPE PROTECTION
EL	ELEVATION	SHT	SHEET
EP	EDGE OF PAVEMENT	STA	STATION
ESM	ENGINEERED STREAMBED MATERIAL	TBD	TO BE DETERMINED
FG	FINISHED GRADE	TEMP	TEMPORARY
H	HORIZONTAL	TYP	TYPICAL
ID	INSIDE DIAMETER	V	VERTICAL

DETAIL REFERENCE CONVENTION



GENERAL NOTES

GENERAL

1. THE CONSTRUCTION WINDOW IS BETWEEN MAY 15 AND OCTOBER 15.
2. THE PLANS AND SPECIFICATIONS DESCRIBE IN GENERAL THE QUALITY AND CHARACTER OF THE MATERIALS, SHAPE AND CONFIGURATION OF THE IMPROVEMENTS AND DESIGN INTENT OF THE COMPLETED, INSTALLED WORK. MISCELLANEOUS ITEMS OF WORK, MATERIAL, EQUIPMENT, ETC. NECESSARY TO COMPLETE THE WORK SHALL BE PROVIDED BY THE CONTRACTOR WHETHER OR NOT MENTIONED IN THE SPECIFICATIONS OR SHOWN ON THE PLANS. SPECIFIC NOTES AND DETAILS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
3. A SET OF SIGNED WORKING PLANS AND SPECIFICATIONS SHALL BE KEPT AT THE JOB SITE AT ALL TIMES ON WHICH ALL CHANGES OR VARIATIONS IN THE WORK ARE TO BE RECORDED AND/OR CORRECTED DAILY AND SUBMITTED TO THE OWNER UPON COMPLETION OF WORK.
4. ANY REVISIONS OR ADDITIONAL WORK REQUIRED AS A RESULT OF FIELD CONDITIONS OR OWNER STANDARDS AND/OR REQUIREMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE. WORK PERFORMED BY THE CONTRACTOR WITHOUT WRITTEN AUTHORIZATION SHALL BE THE FULL RESPONSIBILITY OF THE CONTRACTOR WHO SHALL BEAR ALL COSTS. ALL REVISIONS SHALL BE IN WRITTEN CHANGE ORDER FORM AND APPROVED AND AUTHORIZED BY OWNER BEFORE BEGINNING WORK.
5. THE CONTRACTOR SHALL CONFORM TO ALL GOVERNING LAWS, CODES, AND ORDINANCES.
6. OWNER'S REPRESENTATIVE ACCEPTS NO RESPONSIBILITY BEYOND THE ADEQUACY OF THE DESIGN CONTAINED HEREIN. SHOULD IT APPEAR THAT THE WORK TO BE DONE, OR ANY MATTER RELATIVE THERETO, IS NOT SUFFICIENTLY DETAILED OR EXPLAINED ON THESE PLANS AND THE SPECIFICATIONS THE CONTRACTOR SHALL CONTACT THE OWNER OR OWNER'S REPRESENTATIVE FOR FURTHER EXPLANATION AS MAY BE NECESSARY.
7. ANY DEVIATIONS OR CHANGES TO THESE PLANS, WITHOUT OFFICIAL APPROVAL OF THE OWNER'S REPRESENTATIVE SHALL ABSOLVE THE OWNER'S REPRESENTATIVE OF ANY AND ALL RESPONSIBILITY OF SAID DEVIATION OR CHANGE.
8. CONTRACTOR AGREES TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD OWNER AND ITS REPRESENTATIVES HARMLESS FROM ANY AND ALL LIABILITY, REAL AND/OR ALLEGED, IN CONJUNCTION WITH THE PERFORMANCE OF THIS PROJECT.
9. GENERAL SUBMITTAL REQUIREMENTS: THE CONTRACTOR SHALL MAKE SUBMITTALS WHERE INDICATED. SUBMITTALS SHALL BE NEAT, TYPE-WRITTEN AND INCLUDE: THE PROJECT NAME, CONTRACTOR'S NAME, DATE, SUBMITTAL NUMBER, AND INDICATE WHETHER IT IS A RESUBMITTAL. ALLOW FIVE BUSINESS DAYS FOR SUBMITTAL REVIEW AND COMMENT. THE CONTRACTOR SHALL NOT COMMENCE WITH THE STIPULATED WORK UNTIL IT HAS RECEIVED FAVORABLE REVIEW FROM THE OWNER'S REPRESENTATIVE.
10. GOVERNING SPECIFICATIONS: ALL WORK SHALL CONFORM TO THE "STANDARD SPECIFICATIONS OF THE STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION," MOST RECENT EDITION (HEREINAFTER REFERRED TO AS STANDARD SPECS), EXCEPT AS MODIFIED IN THE DRAWINGS OR THE TECHNICAL SPECIFICATIONS, OR AS DESCRIBED IN WRITING BY THE OWNER'S REPRESENTATIVE.
11. THE CONTRACTOR SHALL CONFIRM DIMENSIONS OF ALL GRADING ACTIVITIES WITH THE OWNER'S REPRESENTATIVE BEFORE WORK COMMENCEMENT. IF DIMENSIONING IS UNCLEAR OR INSUFFICIENT CONTACT THE OWNER'S REPRESENTATIVE FOR CLARIFICATION.
12. CONTRACTOR TO FIELD INVESTIGATE, VERIFY, AND BE RESPONSIBLE FOR ALL CONDITIONS, ELEVATIONS, AND DIMENSIONS OF THE PROJECT, AS SHOWN ON OR REFERENCED ON THE PLANS, AND NOTIFY THE OWNER'S REPRESENTATIVE ABOUT ANY CONDITION REQUIRING MODIFICATION OR CHANGE PRIOR TO BIDDING. EXAMINE THE PLANS AND SPECIFICATIONS AND CLEARLY UNDERSTAND THE EXISTING CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED PRIOR TO BIDDING. NO ALLOWANCES OF ANY KIND WILL BE MADE FOR ANY EXTRA COST DUE TO THE CONTRACTOR'S FAILURE TO INFORM THE OWNER OF DISCREPANCIES IN TIME TO ISSUE CORRECTIVE ADDENDA PRIOR TO BIDDING.

ACCESS AND STAGING

13. PRIOR TO CONSTRUCTION, THE LIMITS OF WORK FOR CONSTRUCTION, ACCESS AND STAGING WILL BE CLEARLY DELINEATED IN THE FIELD WITH TEMPORARY CONSTRUCTION FENCING, FLAGGING OR STAKES TO ENSURE THAT ALL PROJECT ACTIVITIES ARE RESTRICTED TO AUTHORIZED AREAS.
14. THE CONTRACTOR SHALL ONLY OPERATE EQUIPMENT ON ACCESS ROUTES, STAGING AREAS AND WITHIN PROJECT LIMITS INDICATED ON THE DRAWINGS.
15. A PRELIMINARY STAGING AREA IS SHOWN ON THE PLANS. CONTRACTOR SHALL OBTAIN OWNER APPROVAL FOR FINAL STAGING AREA PRIOR TO MOBILIZATION.
16. ALL TRAFFIC CONTROL REQUIRED FOR CONSTRUCTION ACTIVITIES SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST EDITION OF THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

UTILITIES

17. THE CONTRACTOR SHALL FIELD LOCATE ALL EXISTING UTILITIES IN THE PROJECT AREA PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT ALL APPROPRIATE AGENCIES AND THE UNDERGROUND SERVICE ALERT TO FIELD LOCATE ALL UNDERGROUND UTILITIES.
18. CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT (USA) AT 1-800-227-2600, OR 811, 48 HOURS PRIOR TO ANY START OF CONSTRUCTION.

ENVIRONMENTAL PROTECTION

19. THE SEQUENCE AND TIMING OF CONSTRUCTION ARE RESTRICTED DUE TO THE PRESENCE OF THREATENED OR ENDANGERED SPECIES AND OTHER CONSTRAINTS – SEE SPECIFICATIONS AND PERMITS.
20. THE CONTRACTOR SHALL PERFORM ALL WORK IN A MANNER THAT COMPLIES WITH ALL PERMITS AND IS PROTECTIVE OF THE ENVIRONMENT, INCLUDING AIR AND WATER QUALITY, WILDLIFE, VEGETATION, AND HUMAN HEALTH.
21. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY AND ALL DAMAGES TO EXISTING VEGETATION, STRUCTURES AND UTILITIES DURING CONSTRUCTION.
22. THE CONTRACTOR SHALL UTILIZE BEST MANAGEMENT PRACTICES TO PREVENT WIND- OR WATER-BORNE EROSION, AND SEDIMENT LADEN RUNOFF FROM LEAVING THE CONSTRUCTION SITE.
23. FLOW MAY BE PRESENT WITHIN THE PROJECT REACH DURING CONSTRUCTION. IF THERE IS STREAM FLOW WITHIN THE WORK AREA, THE CONTRACTOR SHALL INSTALL A COFFER DAM AND BYPASS SYSTEM OR EQUIVALENT TO ROUTE FLOWS AROUND THE WORK AREA.
24. CONTRACTOR SHALL ELIMINATE OR MINIMIZE NON-STORM DRAINAGE FROM THE CONSTRUCTION SITE TO OTHER WATER BODIES. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN A MANNER THAT MINIMIZES, TO THE EXTENT PRACTICABLE, ANY POLLUTANTS ENTERING DIRECTLY OR INDIRECTLY INTO SURFACE OR GROUND WATER. ALL MATERIALS THAT COULD CAUSE WATER POLLUTION (I.E., MOTOR OIL, FUELS, PAINTS, ETC.) SHALL BE STORED AND USED IN A MANNER THAT WILL NOT CAUSE ANY POLLUTION. ALL DISCHARGED MATERIAL AND ANY ACCIDENTAL SPILLS SHALL BE REMOVED AND DISPOSED OF AT AN APPROVED DISPOSAL SITE.
25. PROTECT ALL EXISTING IMPROVEMENTS AND VEGETATION NOT SLATED FOR DEMOLITION. PLACE TEMPORARY FENCING, FLAGGING OR EQUIVALENT AT THE PERIMETER OF ALL VEGETATED AREAS AND/OR INDIVIDUAL TREES TO BE PRESERVED, AND ANY OTHER IMPROVEMENTS ONSITE.
26. RESTORE ALL DISTURBED UPLAND AREAS BY SEEDING AND APPLYING EROSION CONTROL MEASURES.

REVISION NO.	DATE	DESCRIPTION

DRAFT

FlowWest
PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:
EAST BAY MUNICIPAL UTILITY DISTRICT

GENERAL NOTES LEGEND ABBREVIATIONS AND SYMBOLS

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

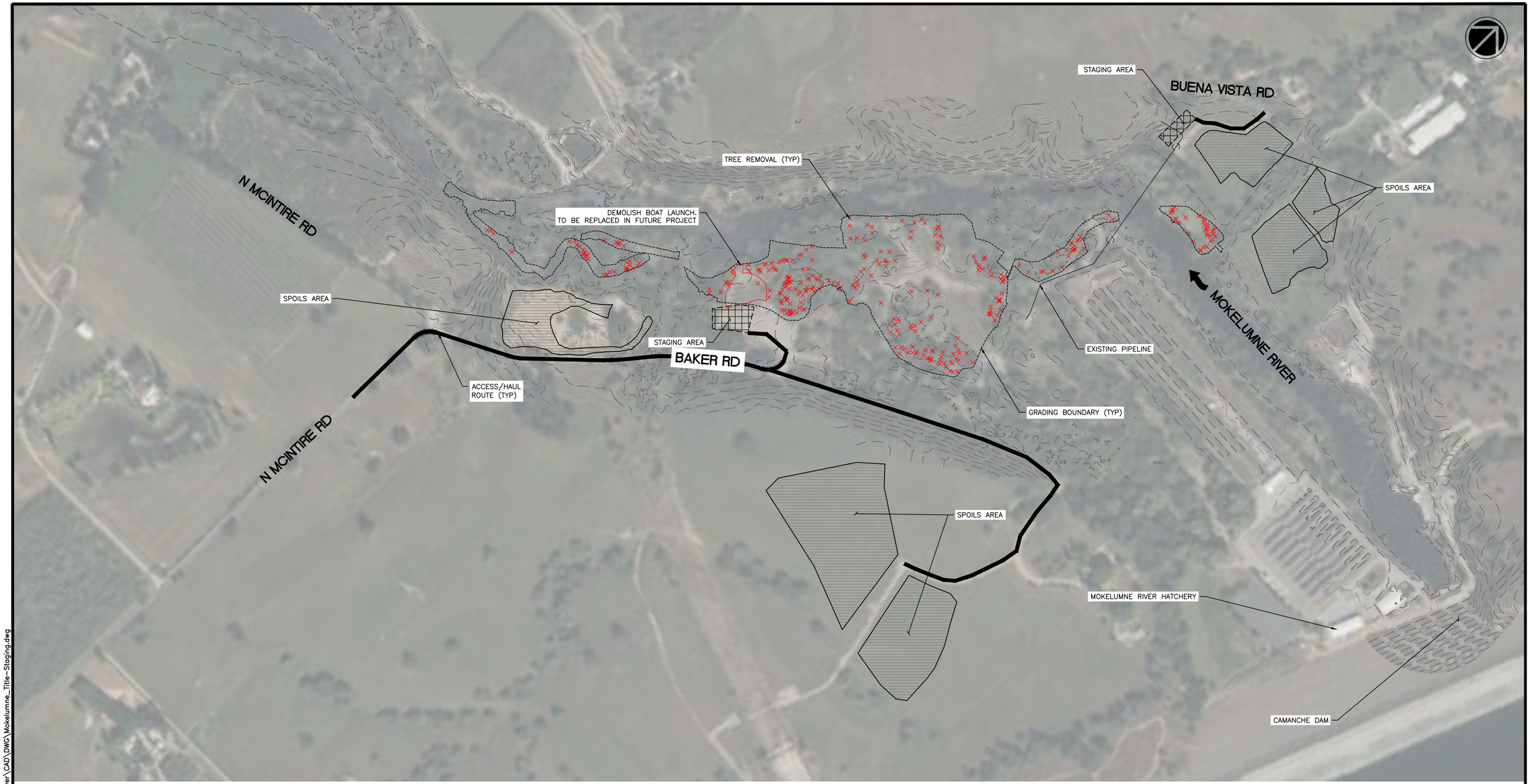
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SHEET NO. 2 OF 31

DRAWING NO. G2

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DAY USE AREA STAGING, ACCESS, AND DEMO PLAN

SCALE: 1" = 200'

0 100' 200' 400'

REVISION NO.	DATE	DESCRIPTION

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FlowWest
PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:

EAST BAY MUNICIPAL UTILITY DISTRICT

DAY USE STAGING AND ACCESS PLAN

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

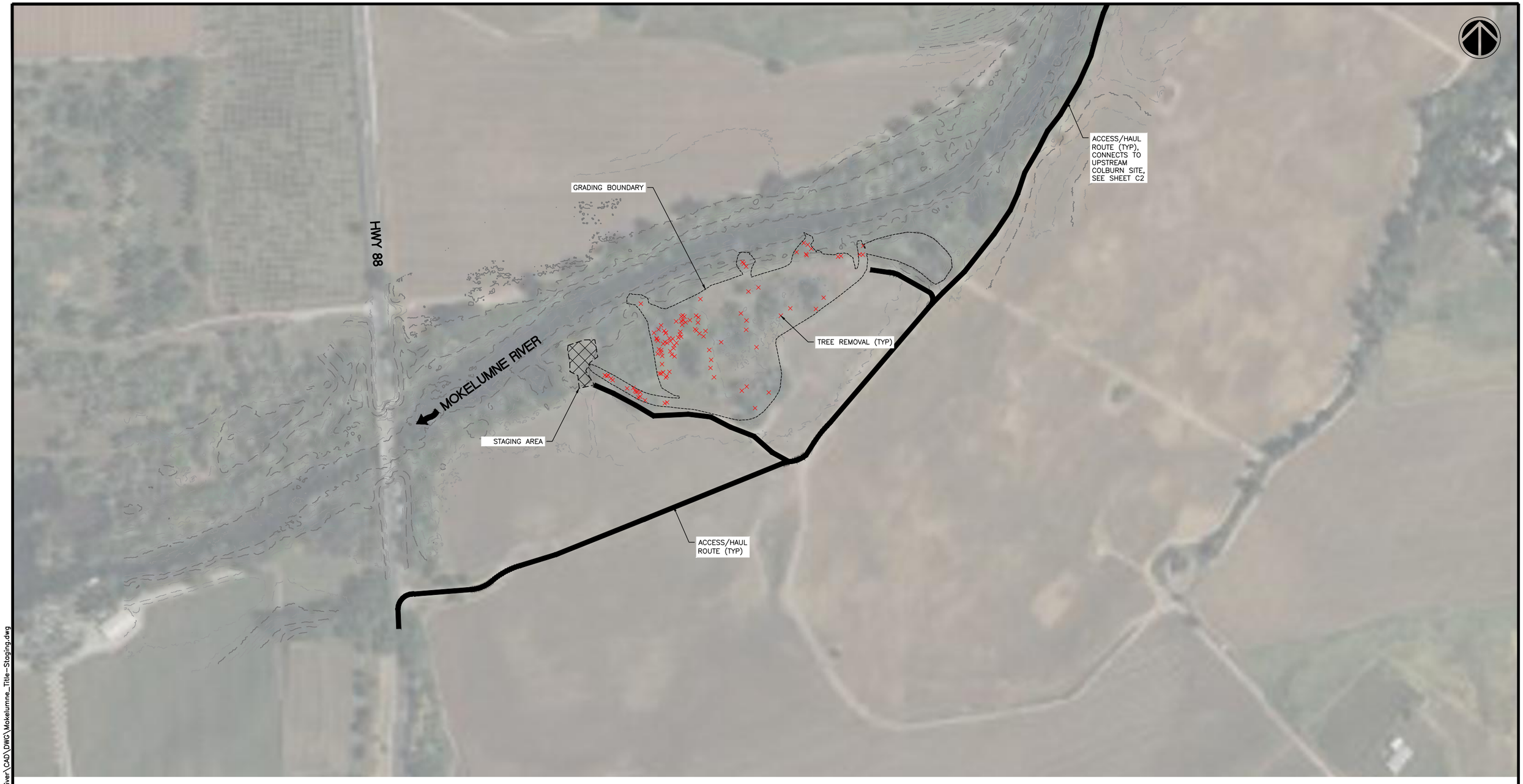
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SHEET NO. 3 OF 31

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COLBURN DOWNSTREAM STAGING, ACCESS, AND DEMO PLAN

SCALE: 1" = 150'

0 75' 150' 300'

REVISION NO.	DATE	DESCRIPTION

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PREPARED FOR:

EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN DOWNSTREAM STAGING AND ACCESS PLAN

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

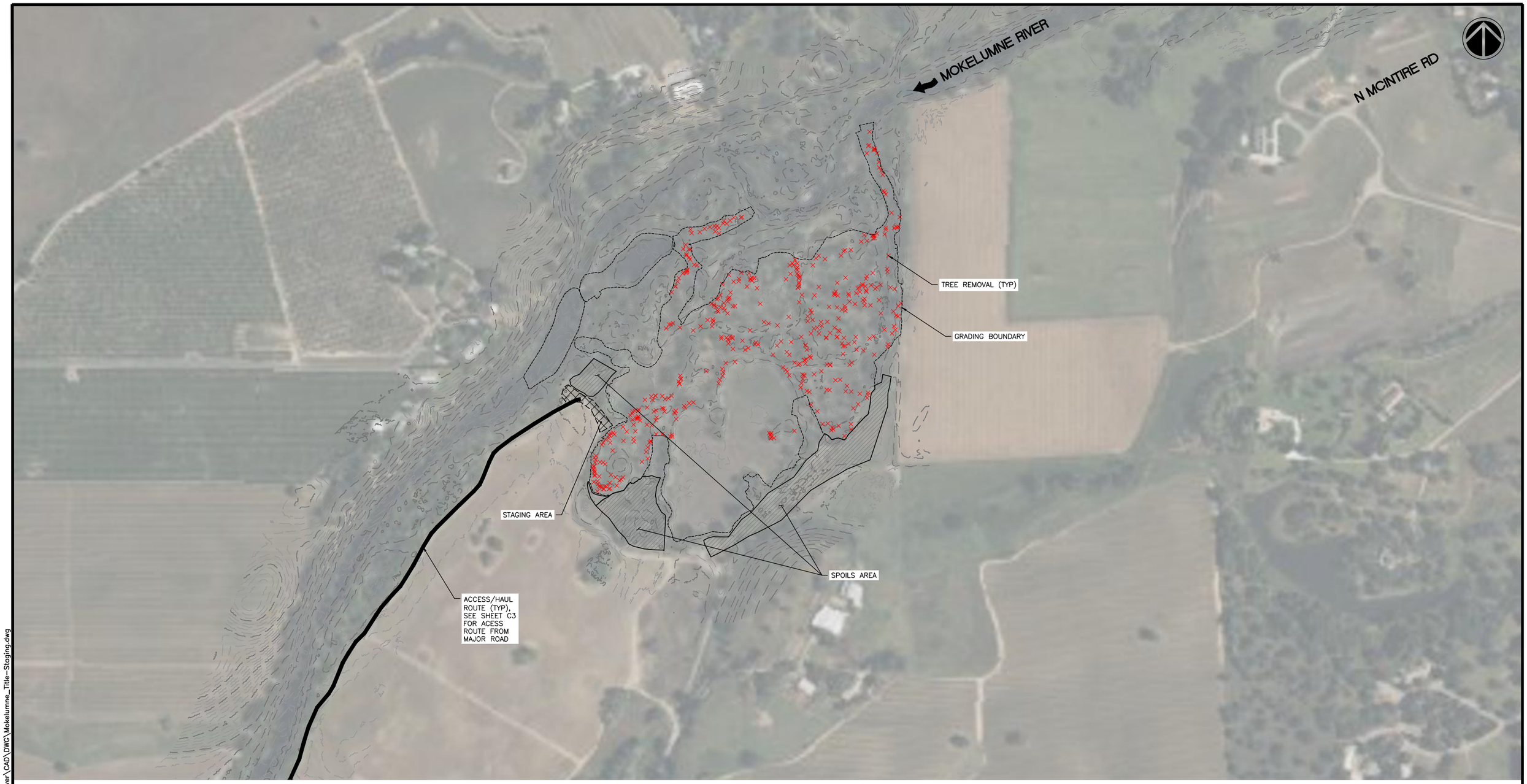
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SHEET NO. 4 OF 31

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COLBURN UPSTREAM STAGING, ACCESS, AND DEMO PLAN

SCALE: 1" = 200'

0 100' 200' 400'

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PREPARED FOR:

EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN UPSTREAM STAGING AND ACCESS PLAN

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

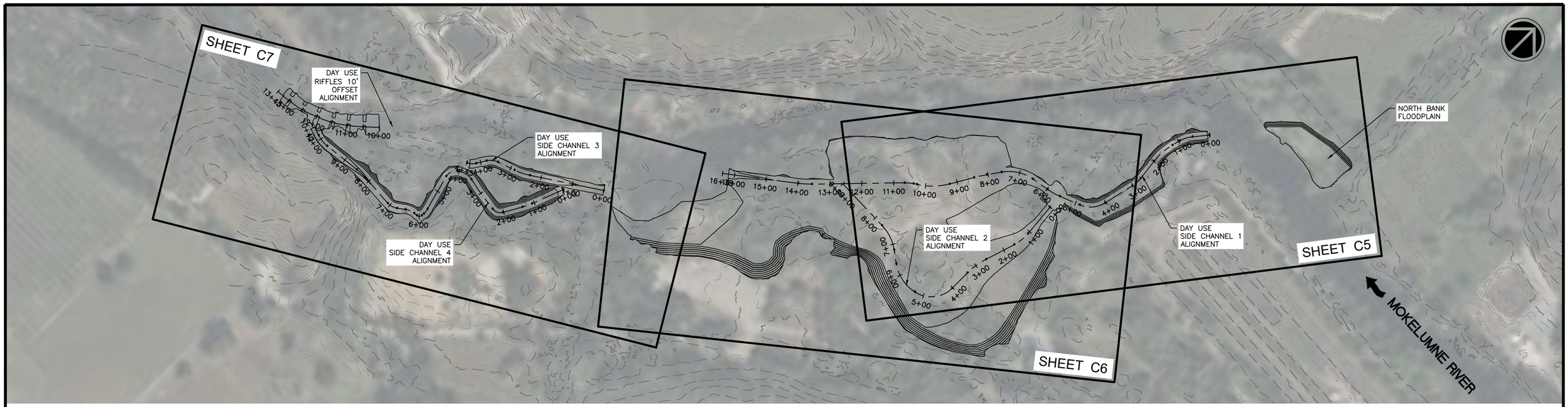
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SHEET NO. 5 OF 31

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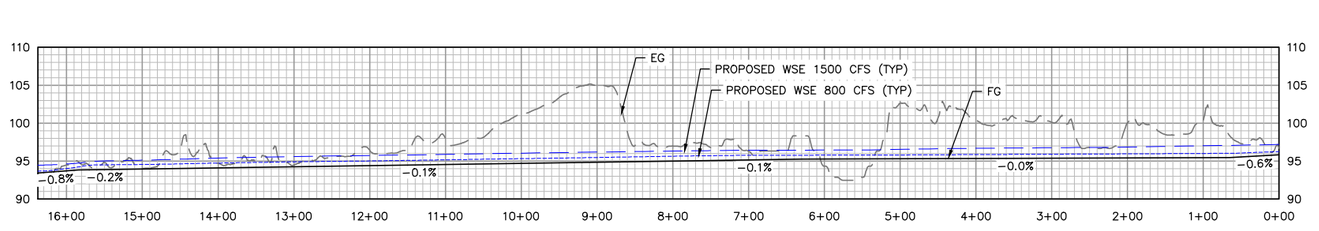
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DAY USE AREA OVERVIEW

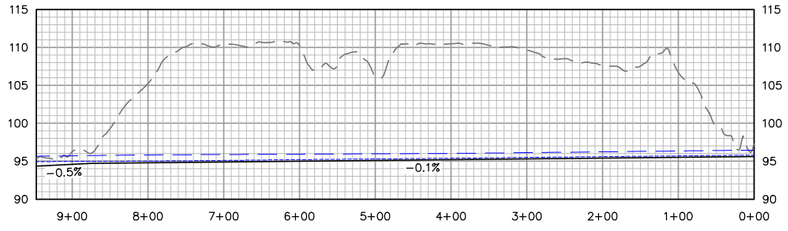
SCALE: 1" = 150'

0 75' 150' 300'



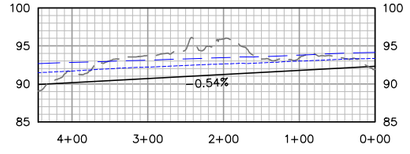
DAY USE SIDE CHANNEL 1 GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



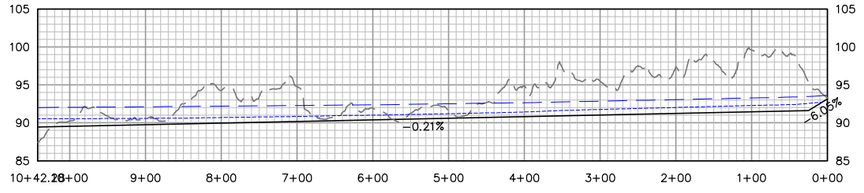
DAY USE SIDE CHANNEL 2 GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



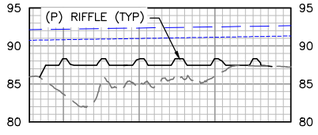
DAY USE SIDE CHANNEL 3 GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



DAY USE SIDE CHANNEL 4 GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



DAY USE RIFFLES AREA GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

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PREPARED FOR:

EAST BAY MUNICIPAL UTILITY DISTRICT

DAY USE OVERVIEW

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

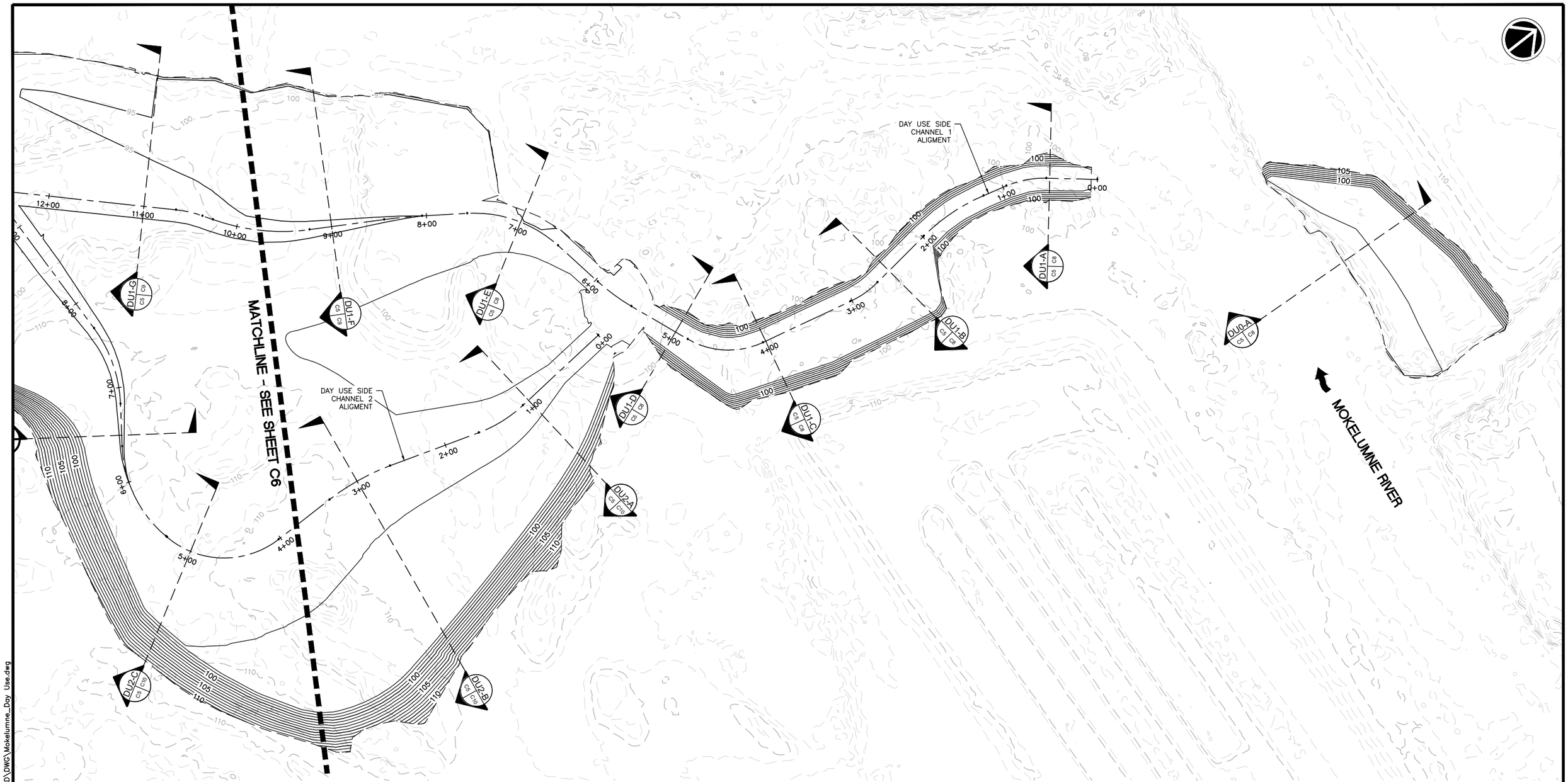
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SHEET NO. 6 OF 31

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DAY USE AREA GRADING PLAN

SCALE: 1" = 50'

0 25' 50' 100'

REVISION NO.	DATE	DESCRIPTION

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EAST BAY MUNICIPAL UTILITY DISTRICT

DAY USE GRADING PLAN

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

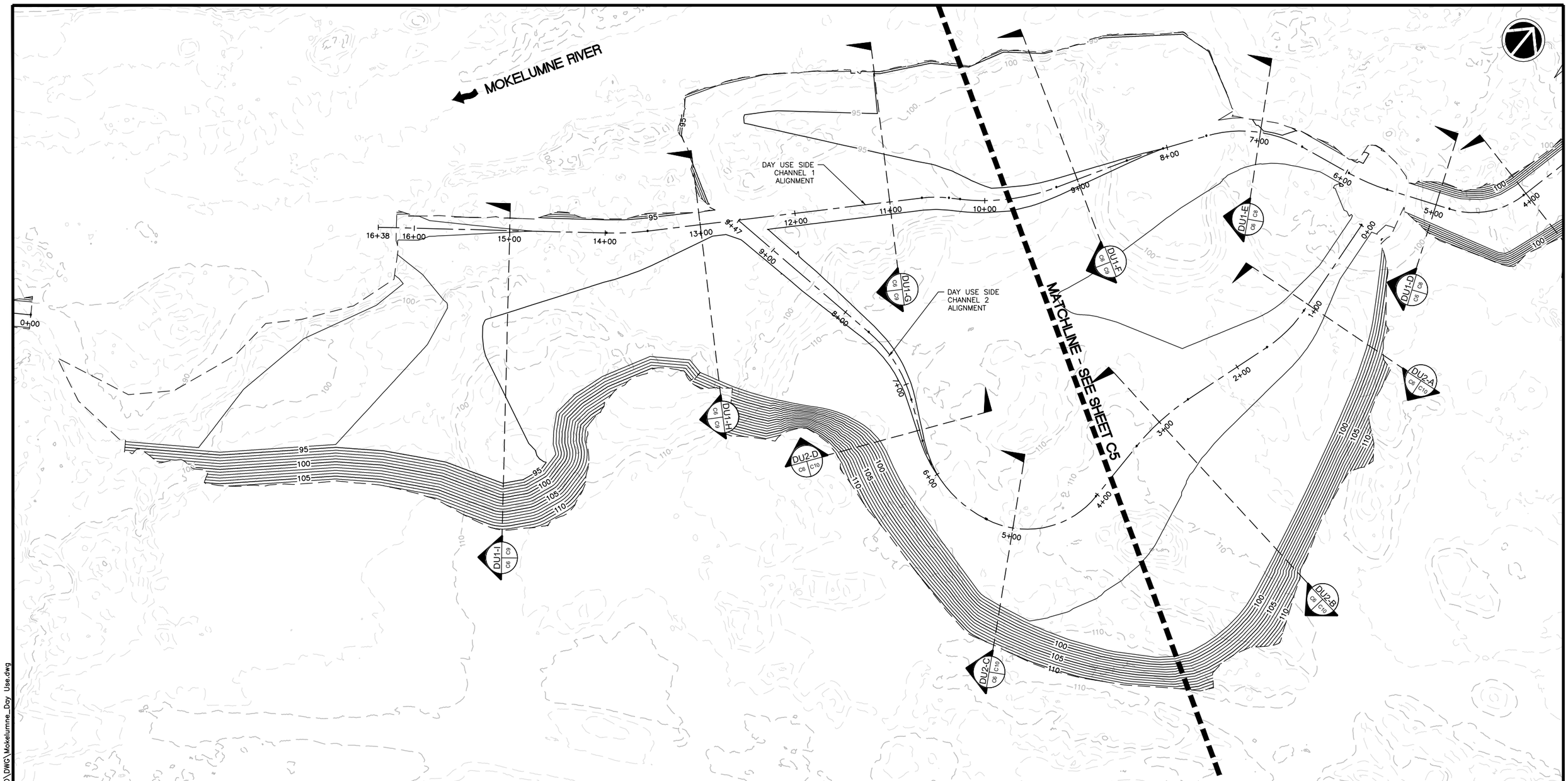
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SHEET NO. 7 OF 31

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DAY USE AREA GRADING PLAN

SCALE: 1" = 50'

0 25' 50' 100'

REVISION NO.	DATE	DESCRIPTION

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OAKLAND, CA 94604
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PREPARED FOR:
EAST BAY MUNICIPAL UTILITY DISTRICT

DAY USE GRADING PLAN (2)

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

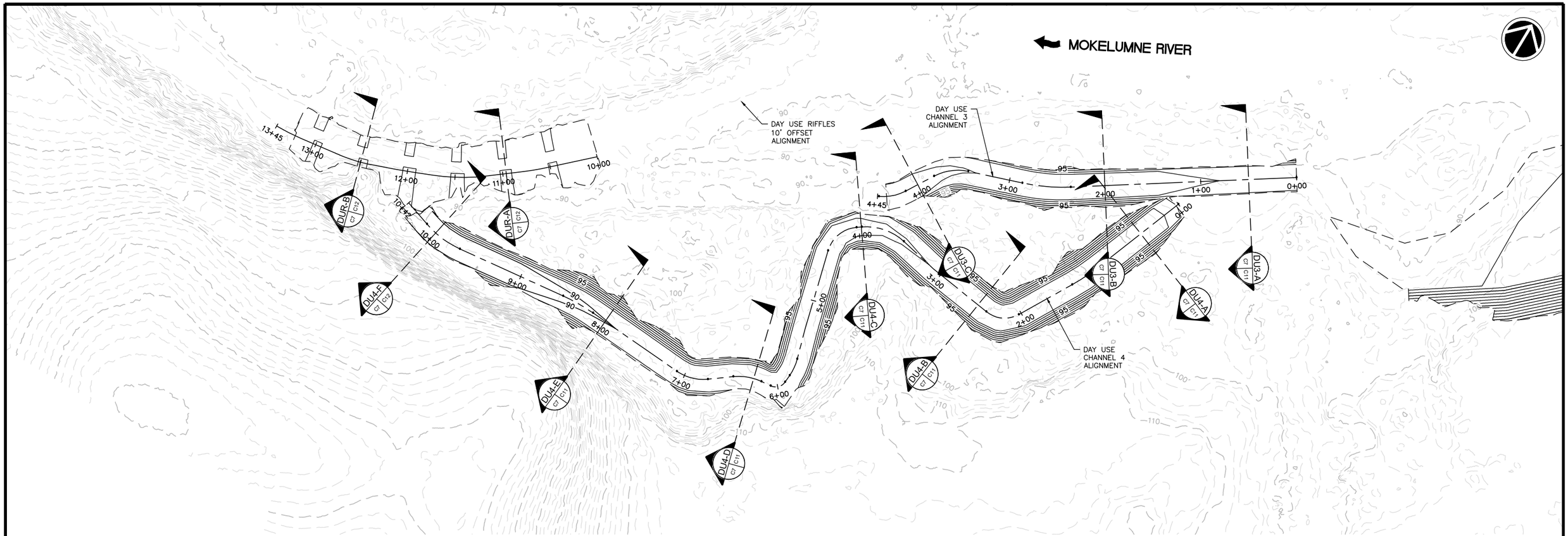
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SHEET NO. 8 OF 31

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DAY USE AREA GRADING PLAN

SCALE: 1" = 50'

0 25' 50' 100'

REVISION NO.	DATE	DESCRIPTION

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PREPARED FOR:
EAST BAY MUNICIPAL UTILITY DISTRICT

DAY USE GRADING PLAN (3)

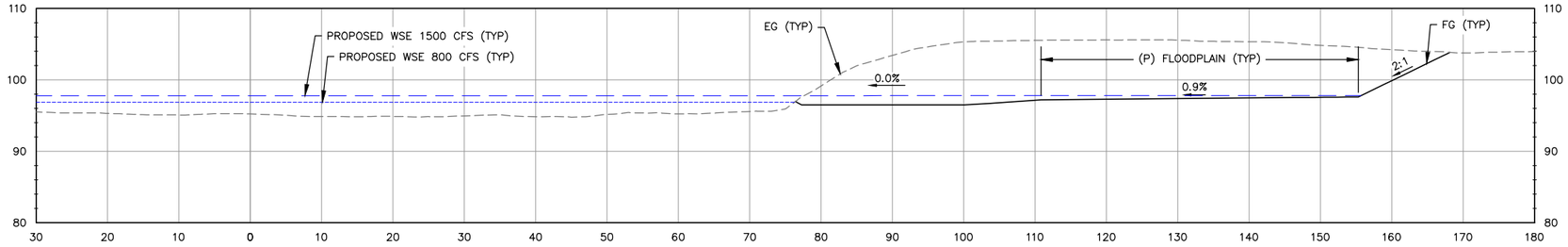
MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

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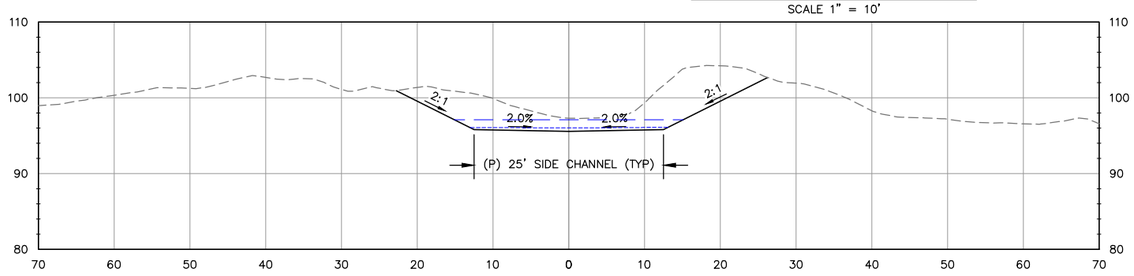
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SHEET NO. 9 OF 31
DRAWING NO. C7

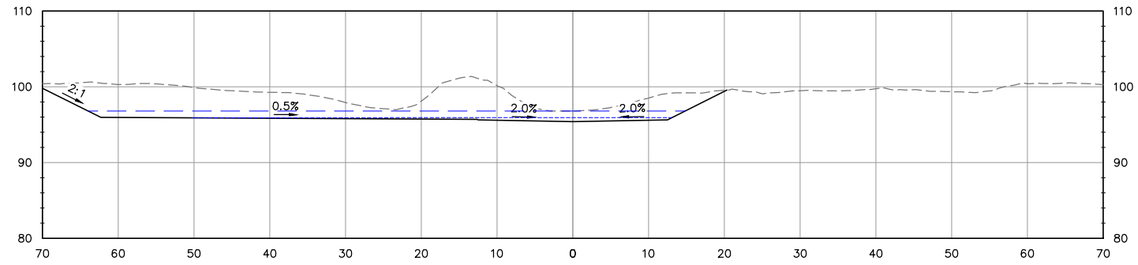
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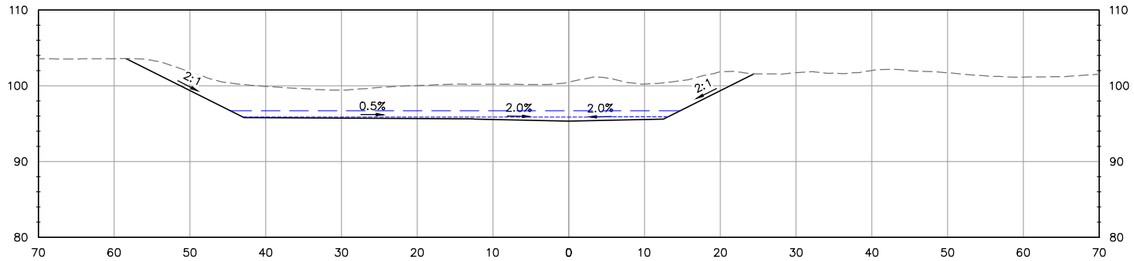
SECTION DU0-A - STA 1+56
SCALE 1" = 10'



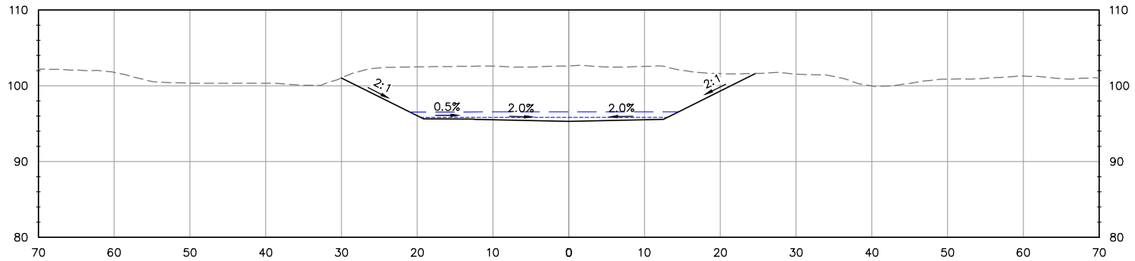
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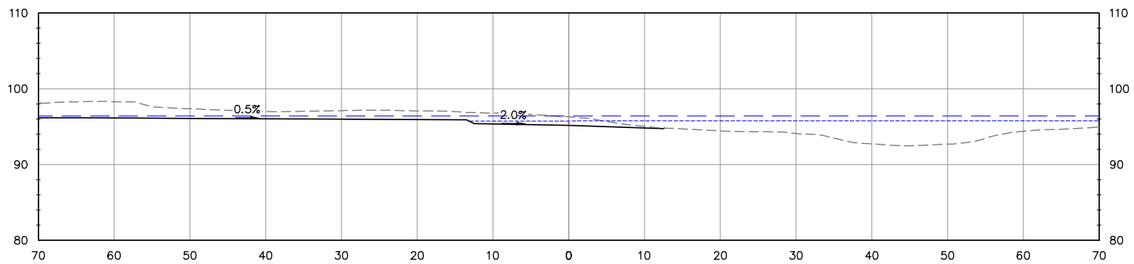
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SCALE 1" = 10'



SECTION DU1-C - STA 4+00
SCALE 1" = 10'



SECTION DU1-D - STA 5+00
SCALE 1" = 10'



SECTION DU1-E - STA 7+00
SCALE 1" = 10'

REVISION NO.	DATE	DESCRIPTION

DRAFT

FlowWest
PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:
EAST BAY MUNICIPAL UTILITY DISTRICT

DAY USE SECTIONS

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

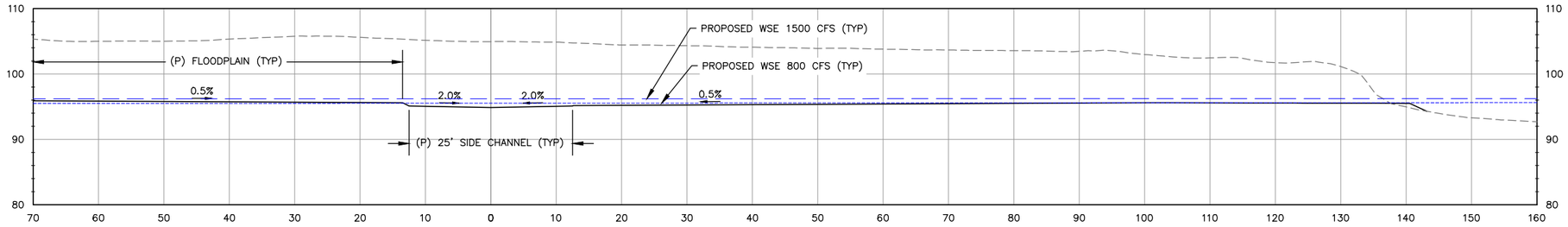
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SHEET NO.
10 OF 31

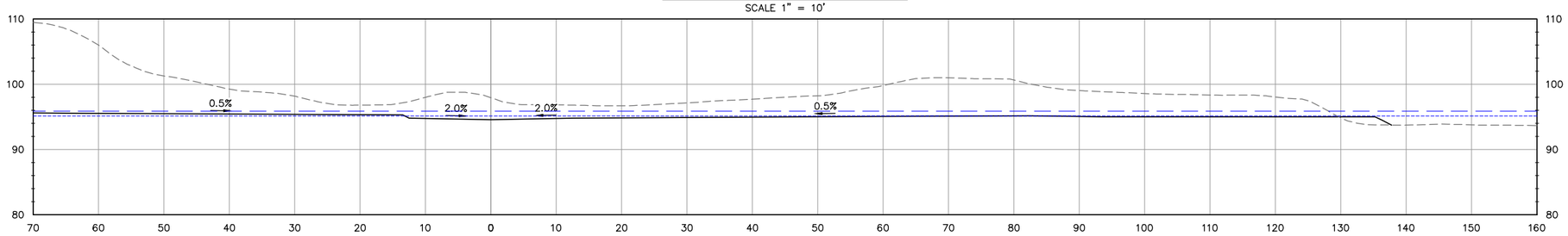
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C8

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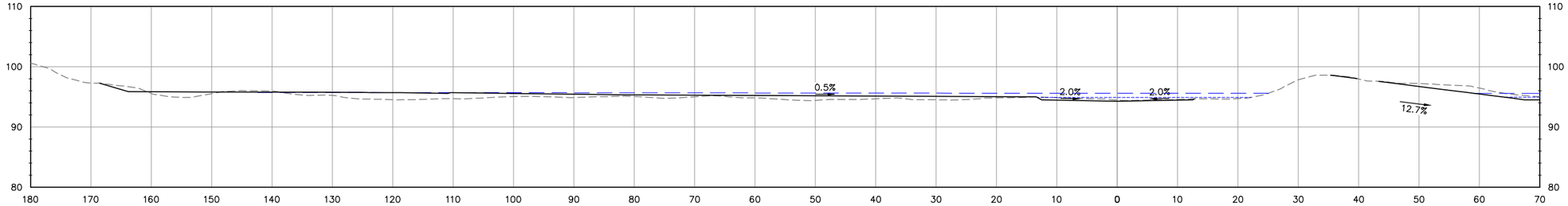
SECTION DU1-F - STA 9+00

SCALE 1" = 10'



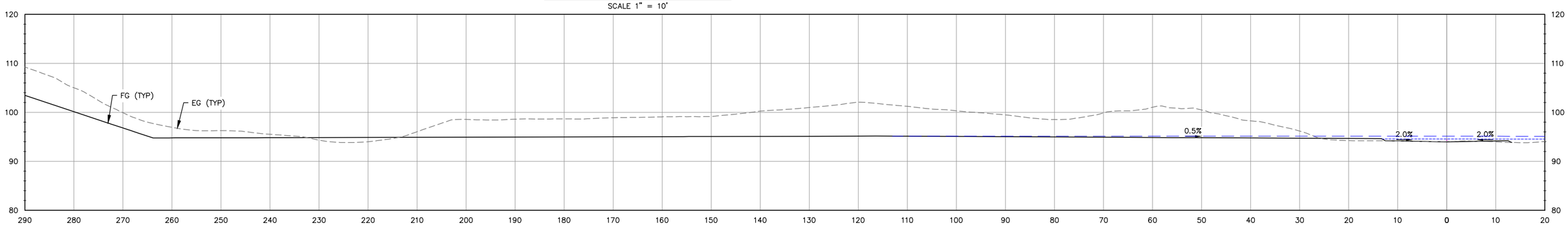
SECTION DU1-G - STA 11+00

SCALE 1" = 10'



SECTION DU1-H - STA 13+00

SCALE 1" = 10'



SECTION DU1-I - STA 15+00

SCALE 1" = 10'

REVISION NO.	DATE	DESCRIPTION

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PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:

EAST BAY MUNICIPAL UTILITY DISTRICT

DAY USE SECTIONS (2)

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

70% DESIGN
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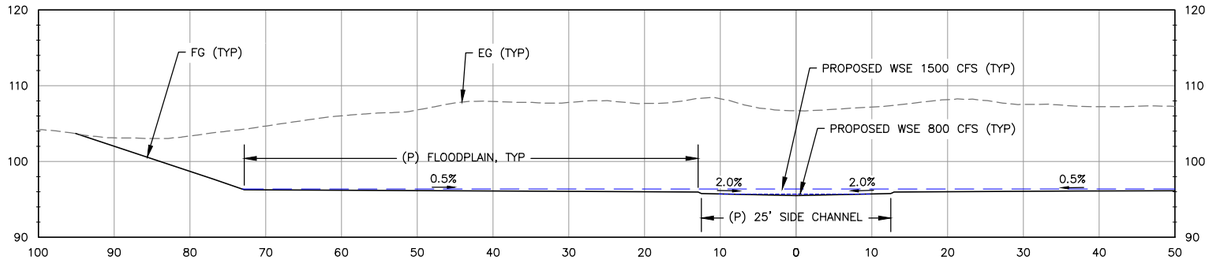
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DATE: 6/10/2026

SHEET NO. 11 OF 31

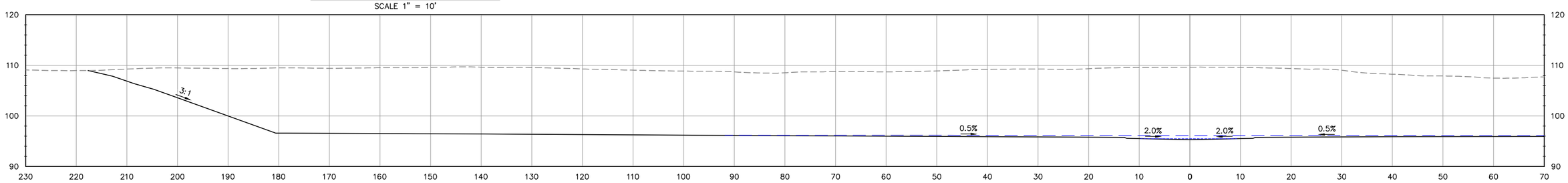
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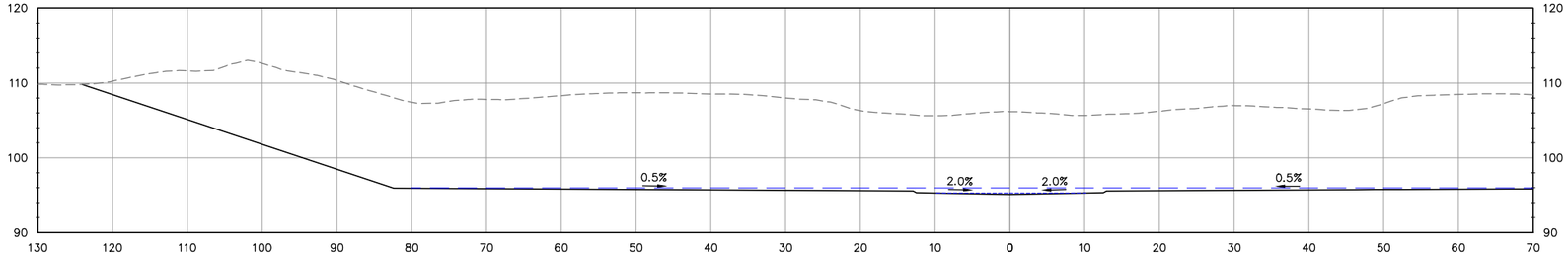
SECTION DU2-A - STA 1+00

SCALE 1" = 10'



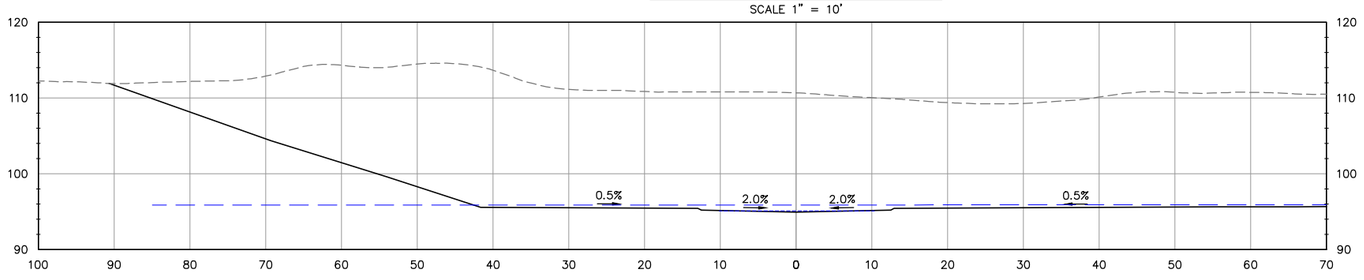
SECTION DU2-B - STA 3+00

SCALE 1" = 10'



SECTION DU2-C - STA 5+00

SCALE 1" = 10'



SECTION DU2-D - STA 7+00

SCALE 1" = 10'

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DAY USE SECTIONS (3)

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

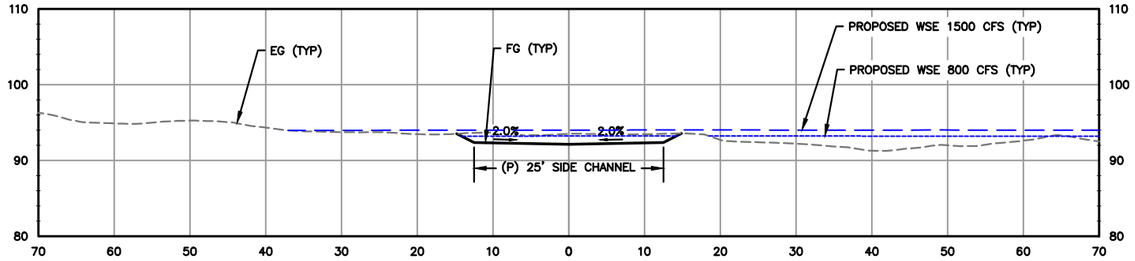
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DATE: 6/10/2026

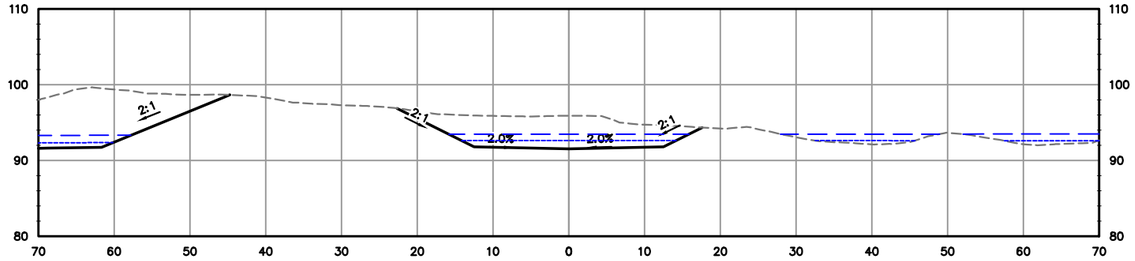
SHEET NO. 12 OF 31

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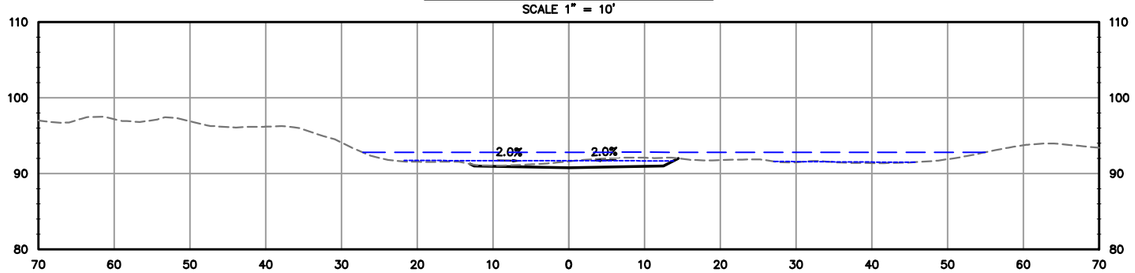
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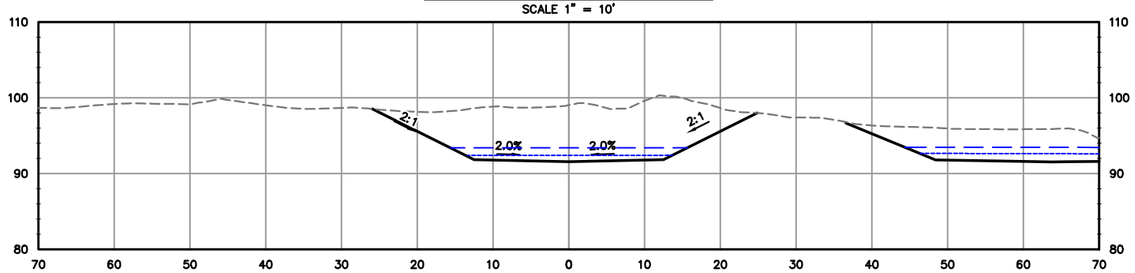
SECTION DU3-A - STA 0+50
SCALE 1" = 10'



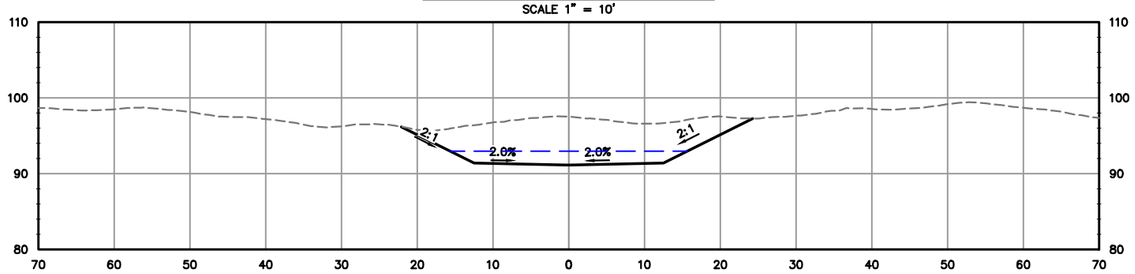
SECTION DU3-B - STA 2+00
SCALE 1" = 10'



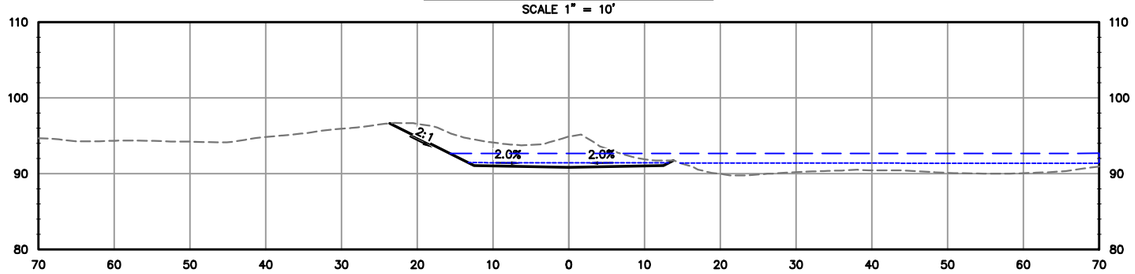
SECTION DU3-C - STA 4+00
SCALE 1" = 10'



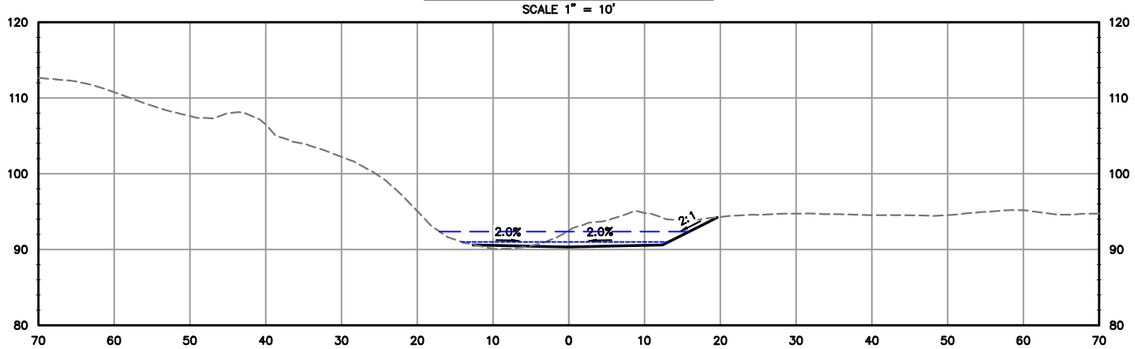
SECTION DU4-A - STA 0+50
SCALE 1" = 10'



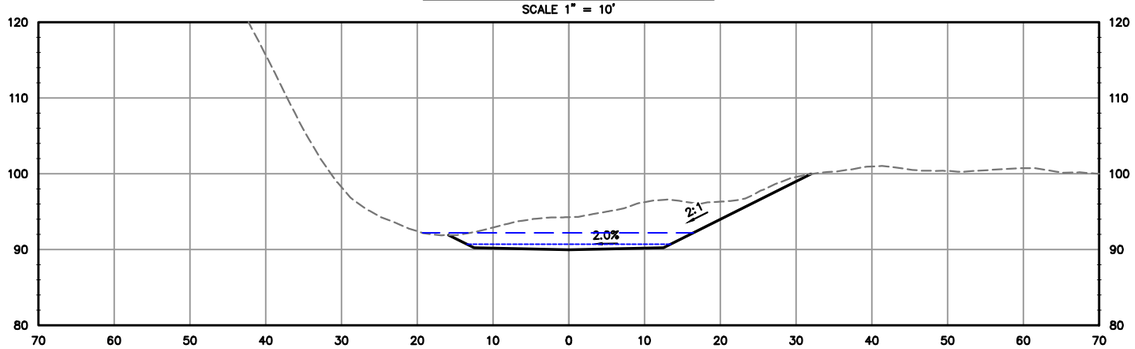
SECTION DU4-B - STA 2+50
SCALE 1" = 10'



SECTION DU4-C - STA 4+00
SCALE 1" = 10'



SECTION DU4-D - STA 6+00
SCALE 1" = 10'



SECTION DU4-E - STA 8+00
SCALE 1" = 10'

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OAKLAND, CA 94604
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DAY USE SECTIONS (4)

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

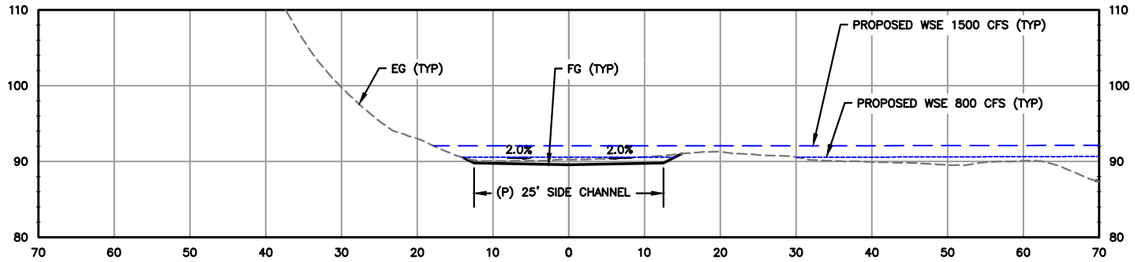
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DATE: 6/10/2026	

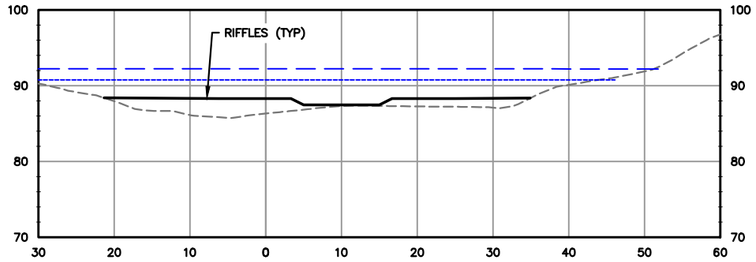
SHEET NO. 13 OF 31

DRAWING NO. C11

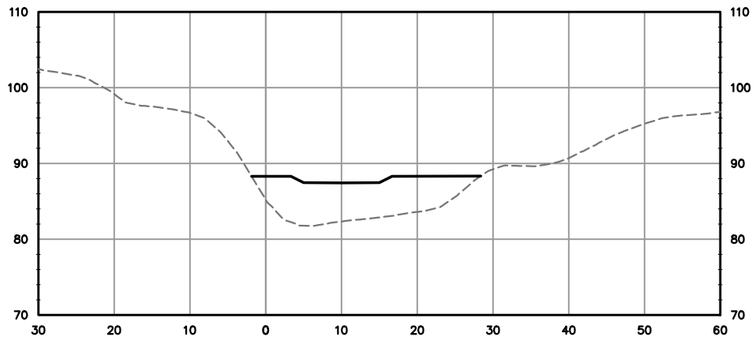
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SECTION DU4-F - STA 10+00
SCALE 1" = 10'



SECTION DUR-A - STA 10+96
SCALE 1" = 10'



SECTION DUR-B - STA 12+50
SCALE 1" = 10'

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EAST BAY MUNICIPAL UTILITY DISTRICT

DAY USE SECTIONS (5)

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

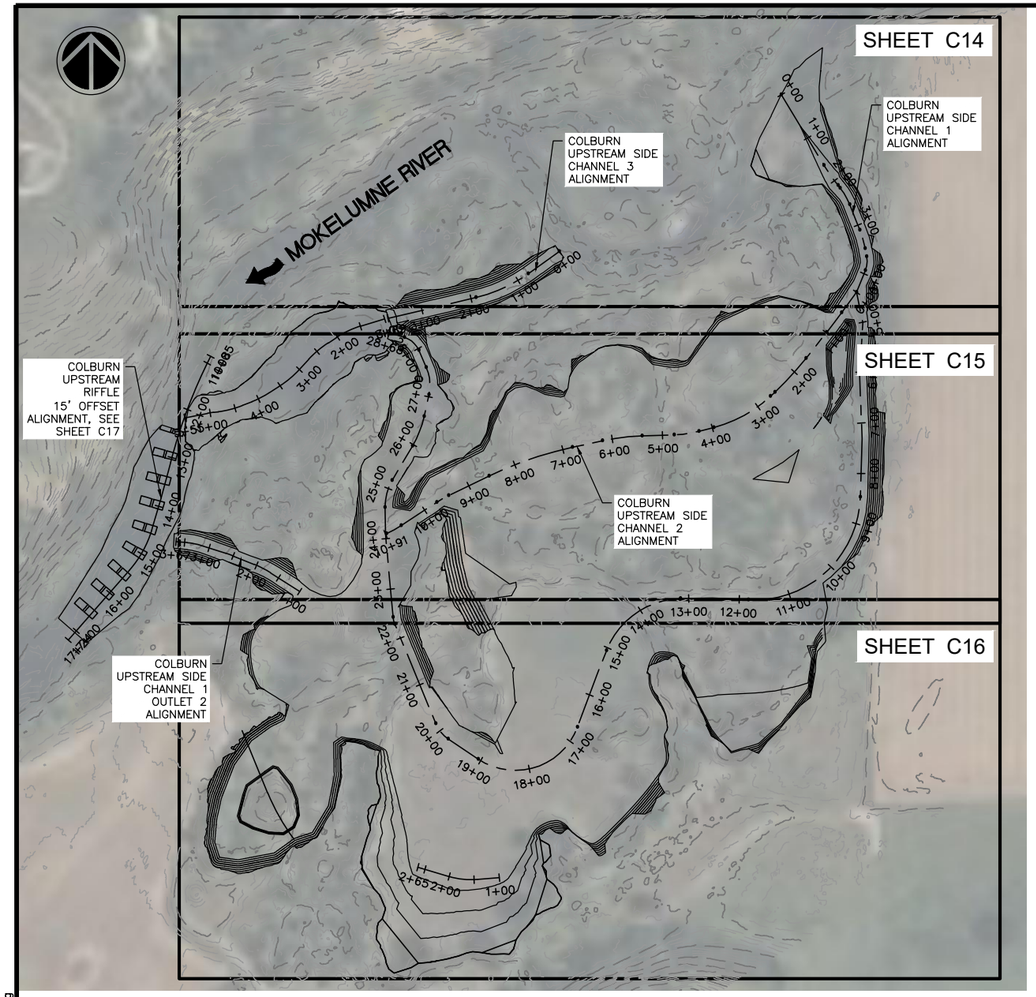
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NOT FOR CONSTRUCTION

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CHECKED BY:	PFRANK
DATE: 6/10/2026	

SHEET NO. 14 OF 31

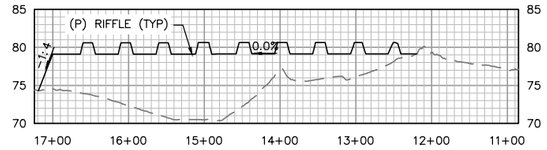
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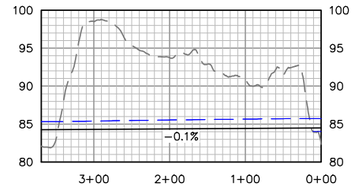
COLBURN UPSTREAM OVERVIEW

SCALE: 1" = 150'
0 75' 150' 300'



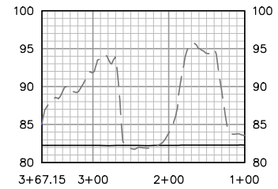
COLBURN UPSTREAM RIFFLES GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



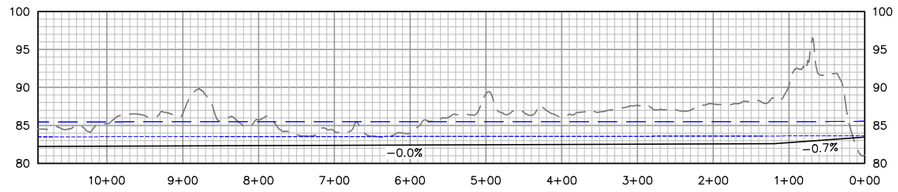
COLBURN UPSTREAM SIDE CHANNEL 3 GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



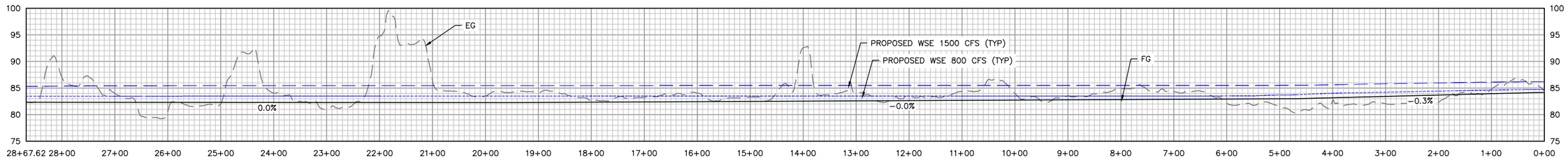
COLBURN UPSTREAM SIDE CHANNEL 1 OUTLET 2 GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



COLBURN UPSTREAM SIDE CHANNEL 2 GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



COLBURN UPSTREAM SIDE CHANNEL 1 GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

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COLBURN UPSTREAM OVERVIEW

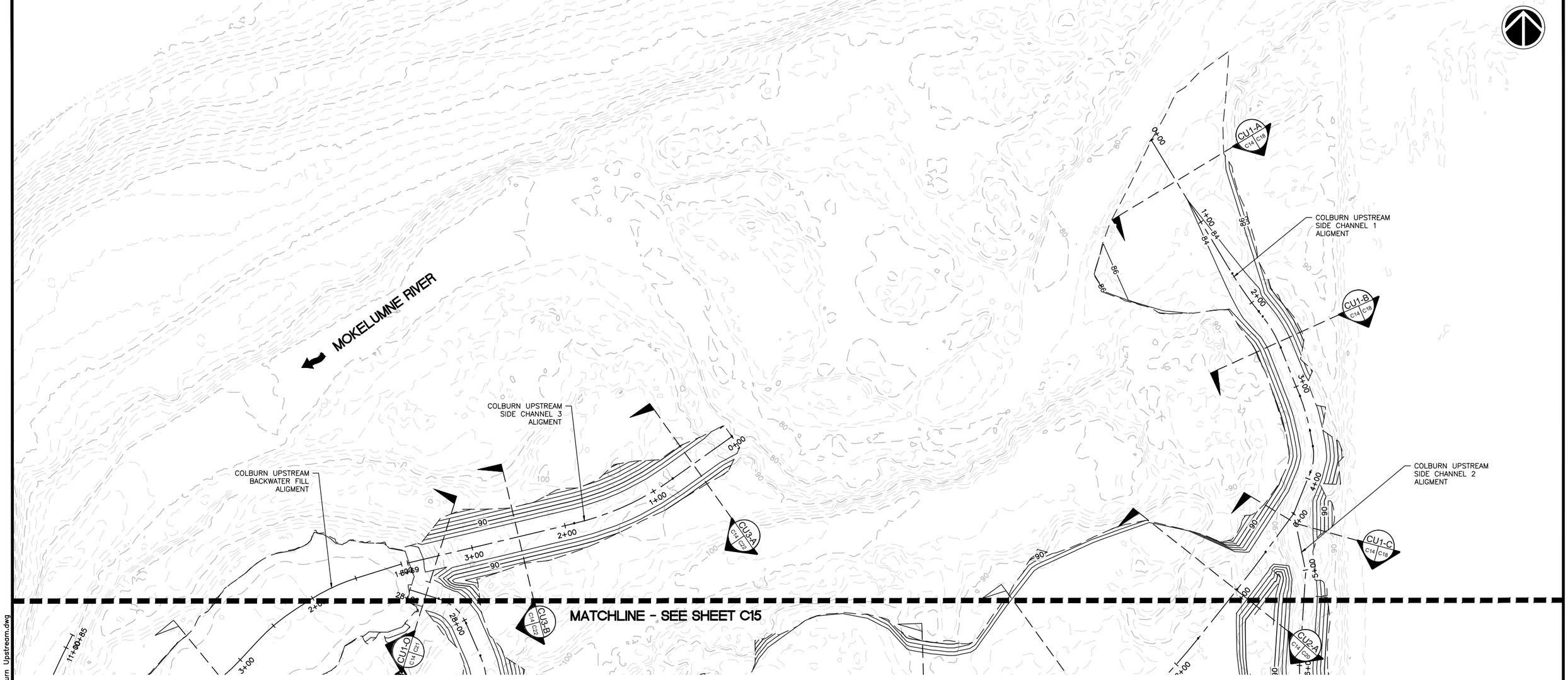
MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

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SHEET NO. 15 OF 31
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COLBURN UPSTREAM GRADING PLAN

SCALE: 1" = 50'

0 25' 50' 100'

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EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN UPSTREAM GRADING PLAN

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

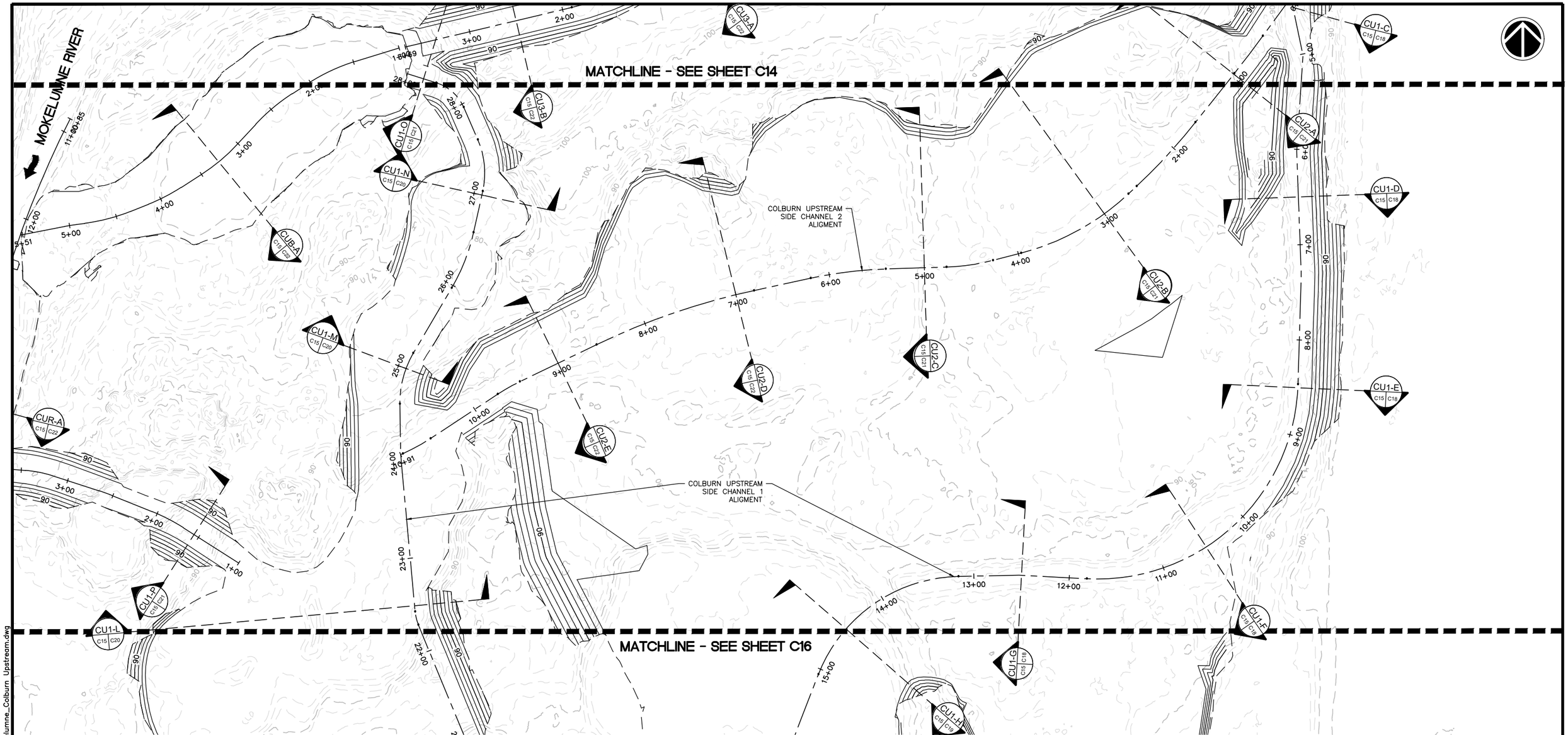
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SHEET NO. 16 OF 31

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COLBURN UPSTREAM GRADING PLAN

SCALE: 1" = 50'

0 25' 50' 100'

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COLBURN UPSTREAM GRADING PLAN (2)

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

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SHEET NO. 17 OF 31

DRAWING NO. C15

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MATCHLINE - SEE SHEET C15

CU1-L C16 C20
CU1-P C16 C21
CU1-K1 C16 C20
CU1-K2 C16 C20
CU1-J1 C16 C19
CU1-J2 C16 C19
CU1-I C16 C19
CU1-H C16 C19
CU1-G C16 C18
CU1-F C16 C19

12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00

COLBURN UPSTREAM SIDE CHANNEL 1 ALIGNMENT

COLBURN UPSTREAM GRADING PLAN

SCALE: 1" = 50'

0 25' 50' 100'

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COLBURN UPSTREAM GRADING PLAN (3)

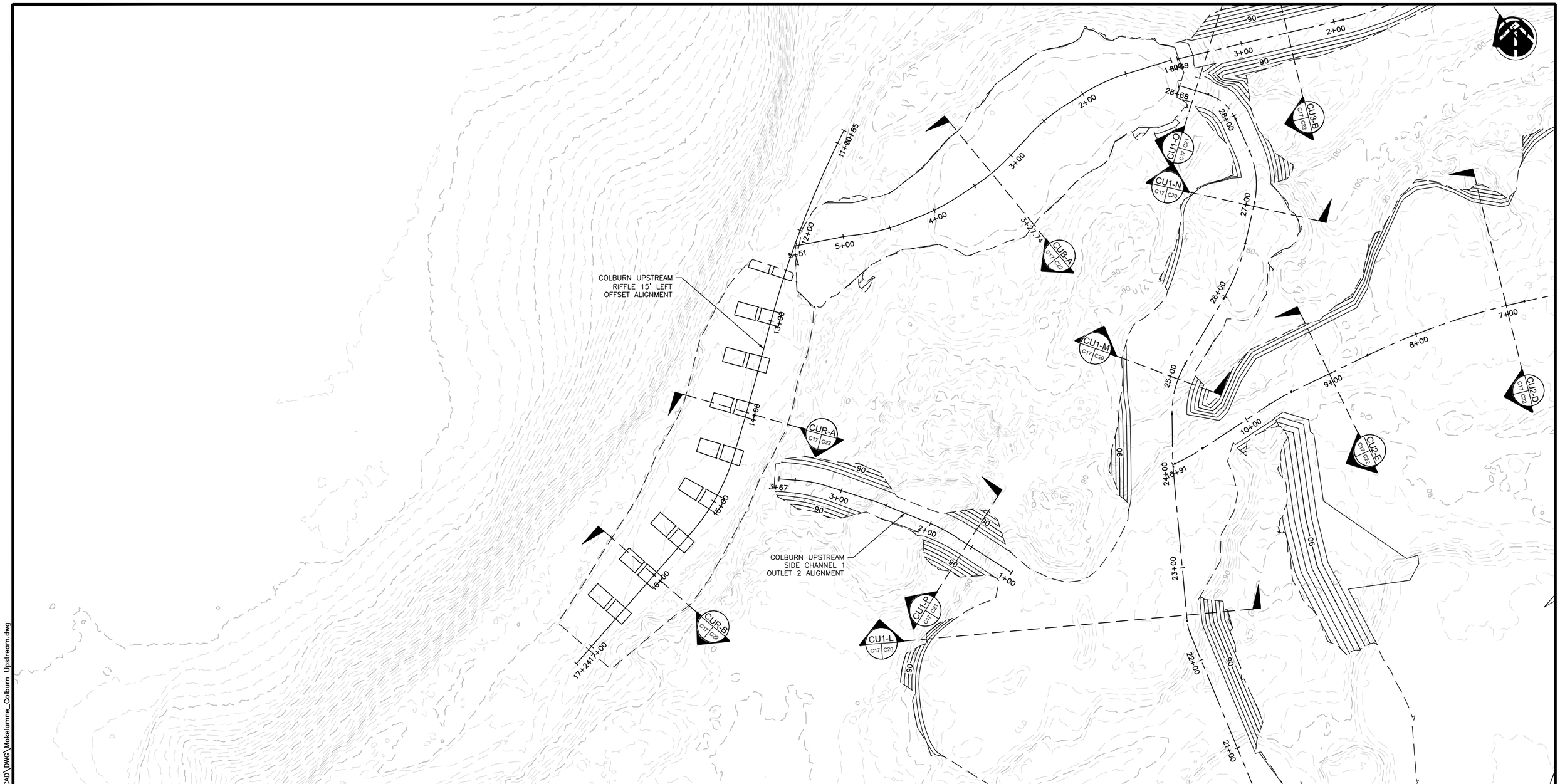
MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

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DATE: 6/10/2026

SHEET NO. 18 OF 31
DRAWING NO. C16

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COLBURN UPSTREAM RIFFLES GRADING PLAN

SCALE: 1" = 50'

0 25' 50' 100'

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EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN UPSTREAM GRADING PLAN (4)

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

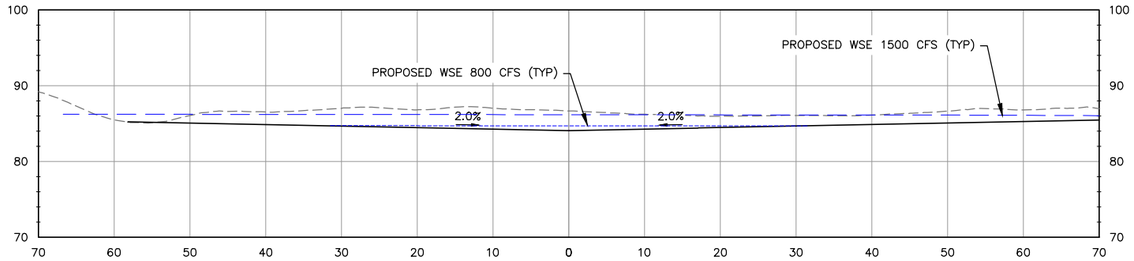
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CHECKED BY:	PFRANK
DATE: 6/10/2026	

SHEET NO. 19 OF 31

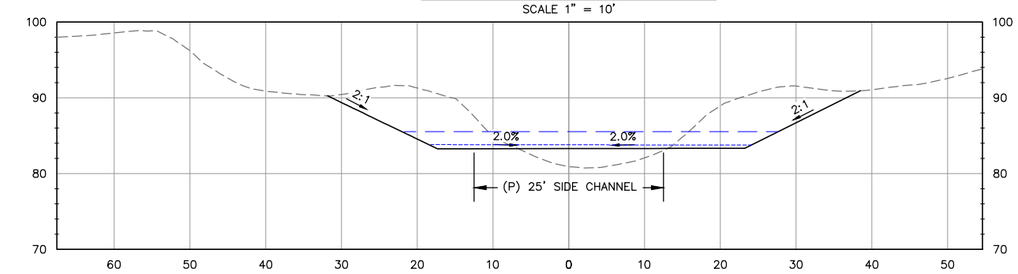
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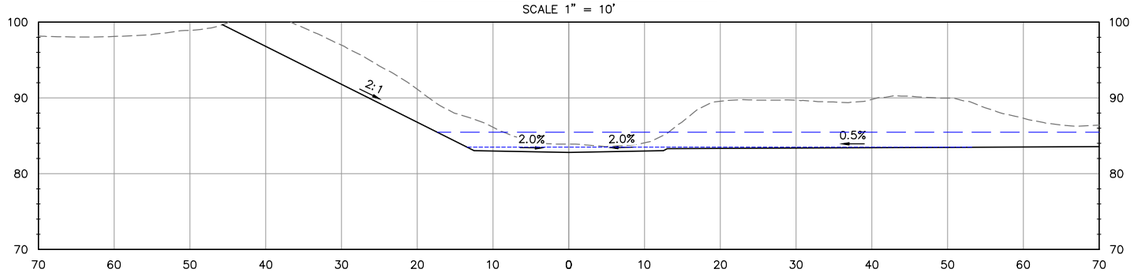
SECTION CU1-A - STA 0+50

SCALE 1" = 10'



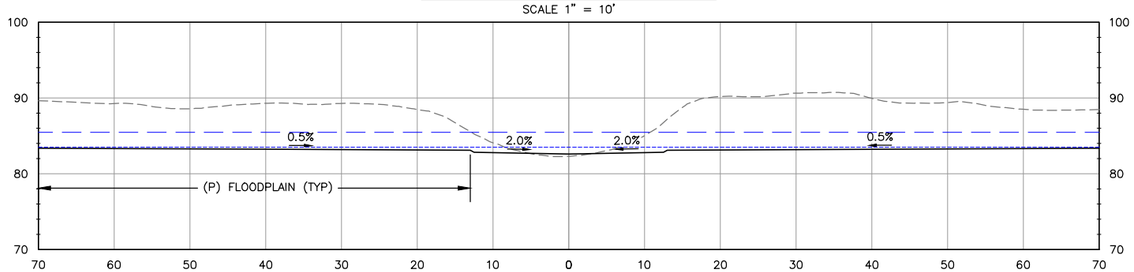
SECTION CU1-C - STA 4+50

SCALE 1" = 10'



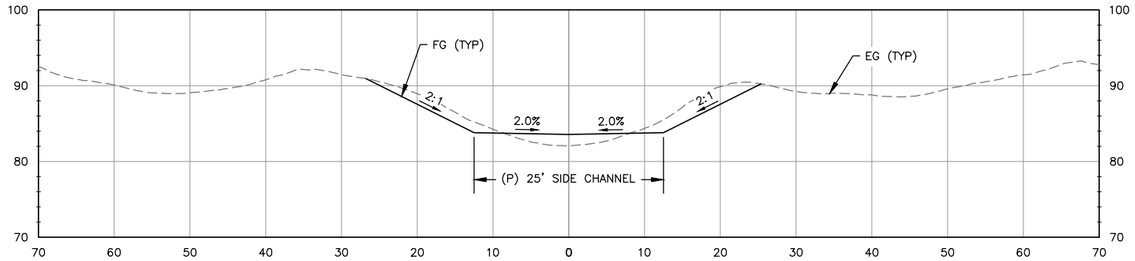
SECTION CU1-E - STA 8+50

SCALE 1" = 10'



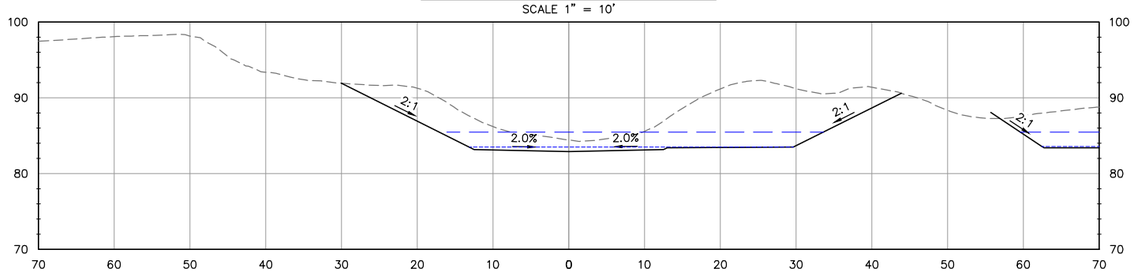
SECTION CU1-G - STA 12+50

SCALE 1" = 10'



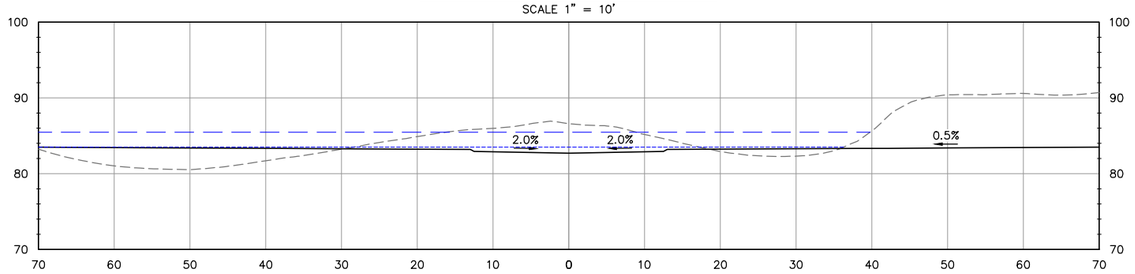
SECTION CU1-B - STA 2+50

SCALE 1" = 10'



SECTION CU1-D - STA 6+50

SCALE 1" = 10'



SECTION CU1-F - STA 10+50

SCALE 1" = 10'

REVISION NO.	DATE	DESCRIPTION

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PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:

EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN UPSTREAM SECTIONS

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

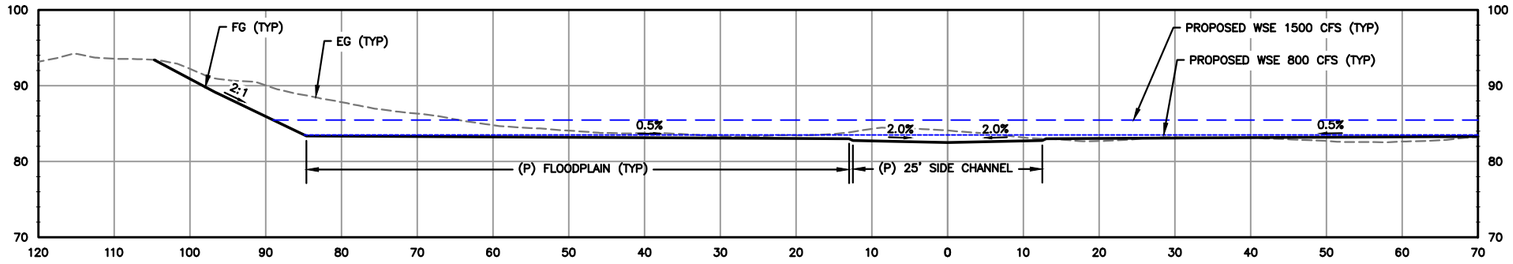
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SHEET NO. 20 OF 31

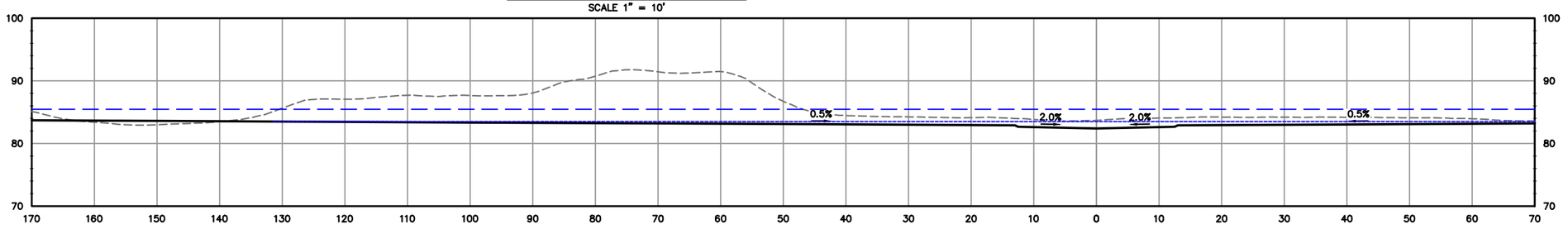
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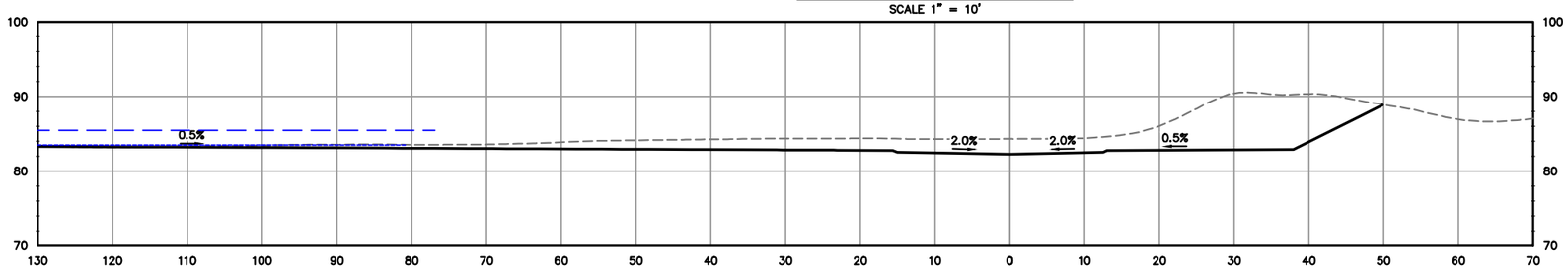
SECTION CU1-H - STA 14+50

SCALE 1" = 10'



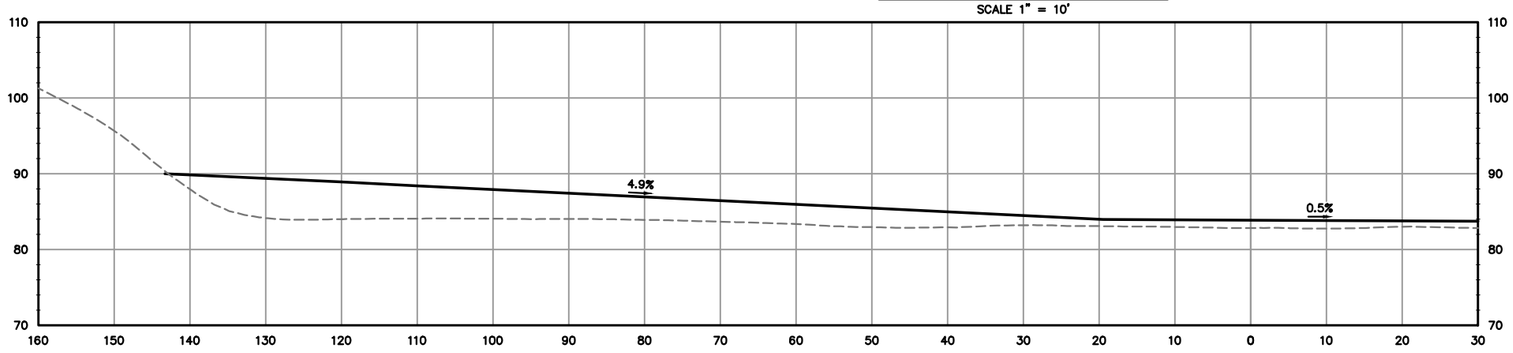
SECTION CU1-I - STA 16+50

SCALE 1" = 10'



SECTION CU1-J1 - STA 19+24

SCALE 1" = 10'



SECTION CU1-J2 - STA 19+24

SCALE 1" = 10'

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EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN UPSTREAM SECTIONS (2)

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

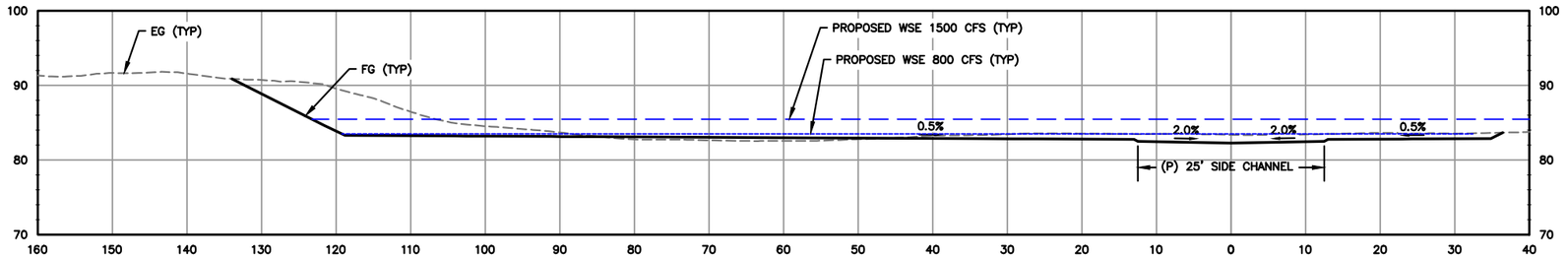
70% DESIGN
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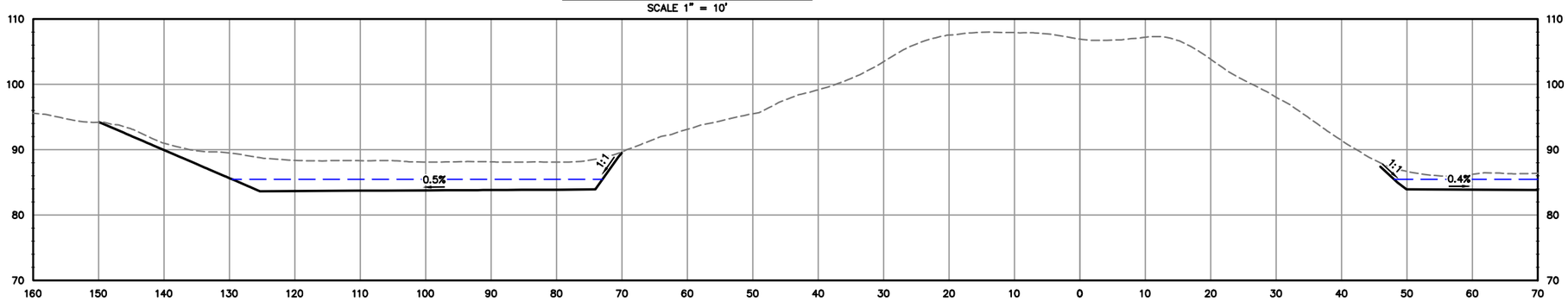
SHEET NO. 21 OF 31

DRAWING NO. C19

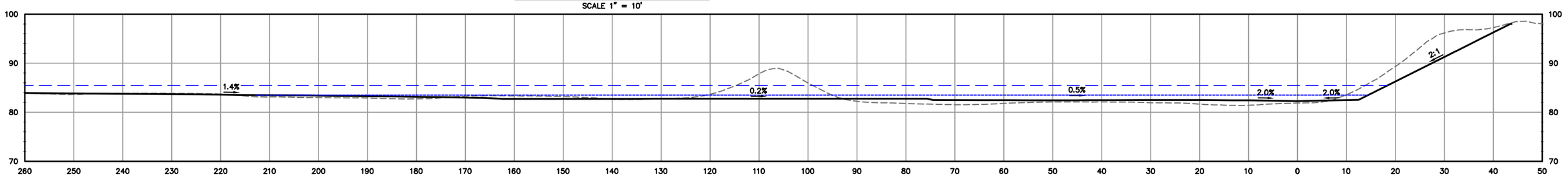
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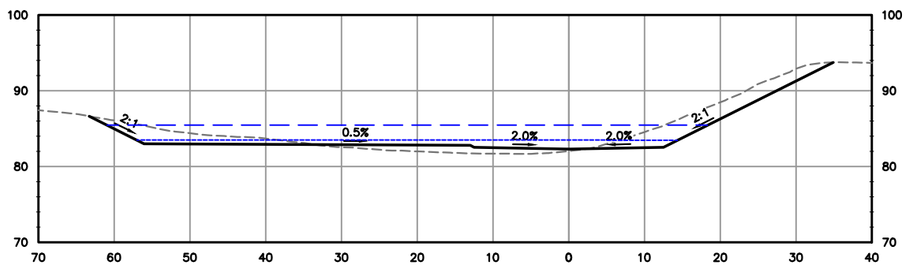
SECTION CU1-K1 - STA 20+17
SCALE 1" = 10'



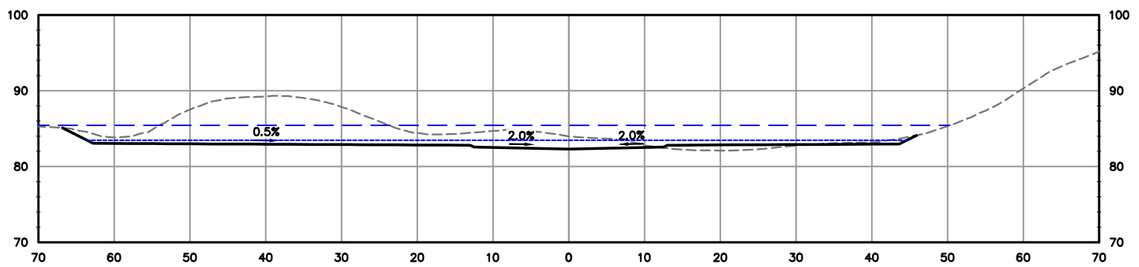
SECTION CU1-K2 - STA 20+17
SCALE 1" = 10'



SECTION CU1-L - STA 22+50
SCALE 1" = 10'



SECTION CU1-M - STA 25+00
SCALE 1" = 10'



SECTION CU1-N - STA 27+00
SCALE 1" = 10'

REVISION NO.	DATE	DESCRIPTION

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FlowWest
PO BOX 29392
OAKLAND, CA 94604
510.842.0538

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COLBURN UPSTREAM SECTIONS (3)

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

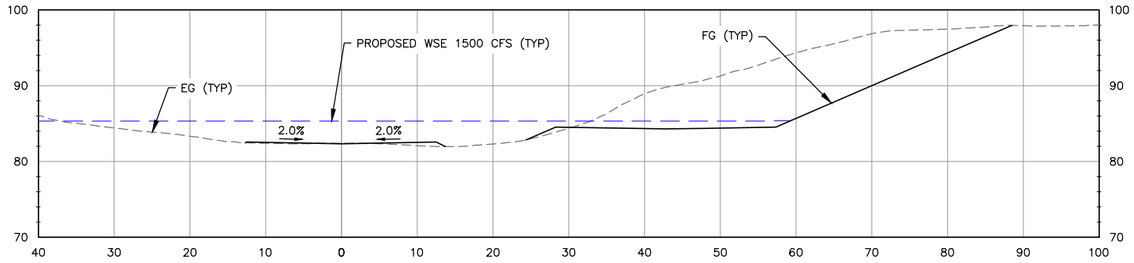
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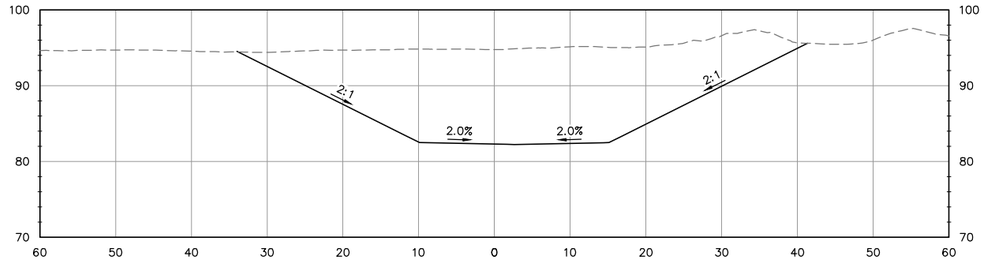
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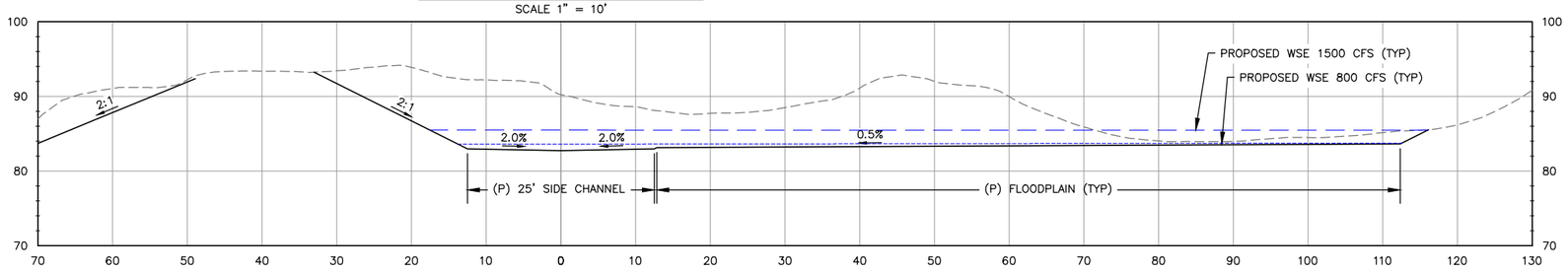
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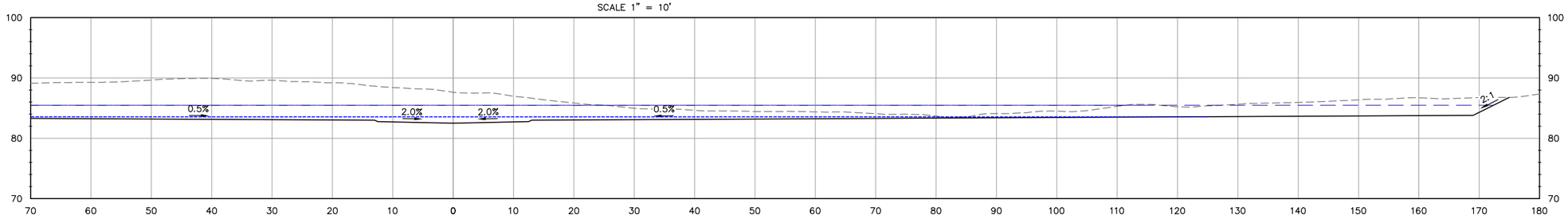
SECTION CU1-O - STA 28+50
SCALE 1" = 10'



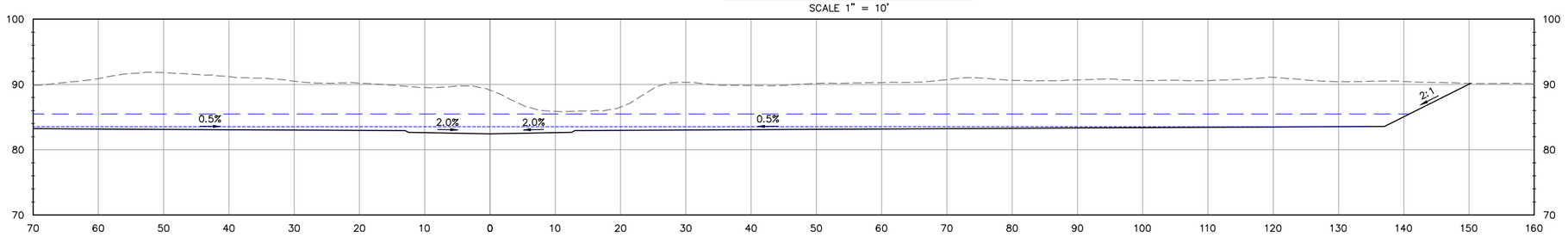
SECTION CU1-P
SCALE 1" = 10'



SECTION CU2-A - STA 1+00
SCALE 1" = 10'



SECTION CU2-B - STA 3+00
SCALE 1" = 10'



SECTION CU2-C - STA 5+00
SCALE 1" = 10'

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PO BOX 29392
OAKLAND, CA 94604
510.842.0538

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COLBURN UPSTREAM SECTIONS (4)

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

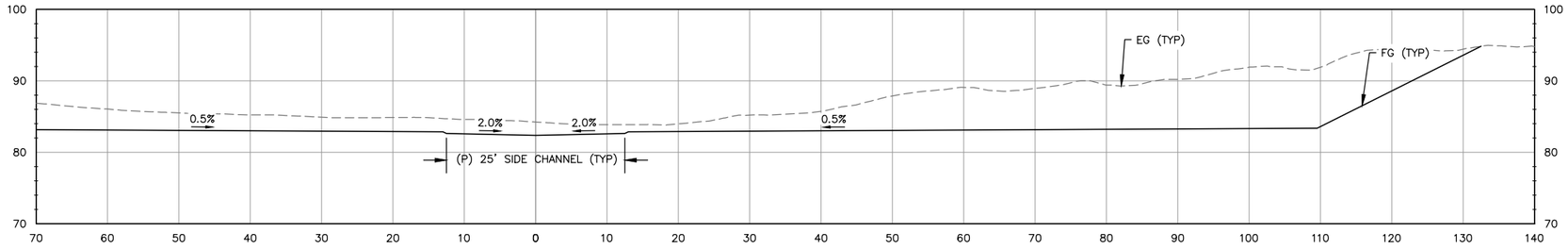
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DATE: 6/10/2026	

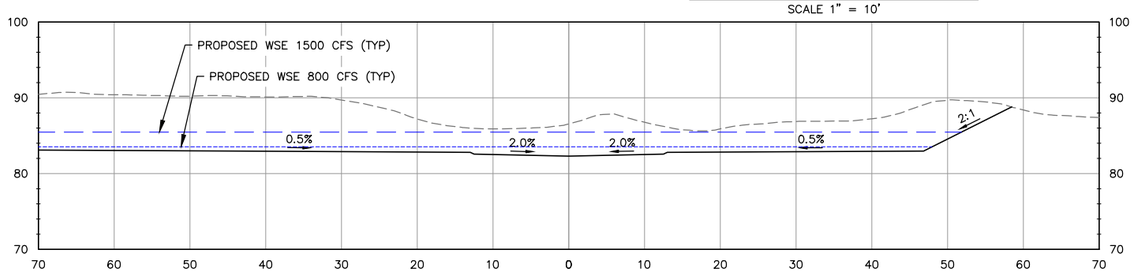
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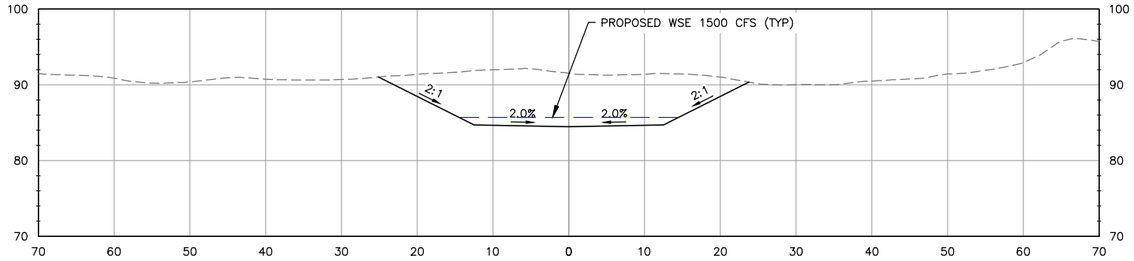
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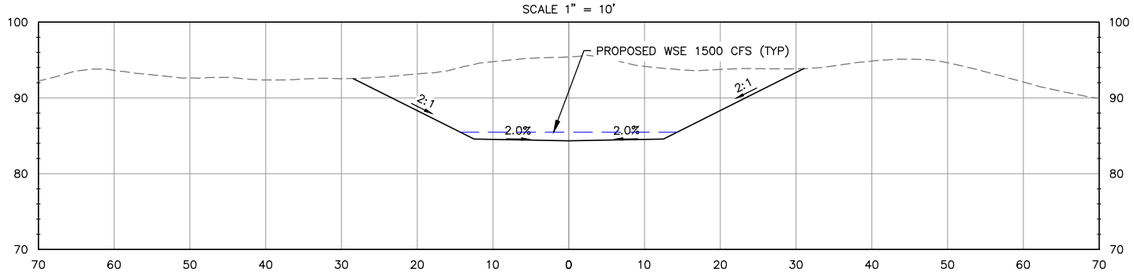


SECTION CU2-D - STA 7+00
SCALE 1" = 10'

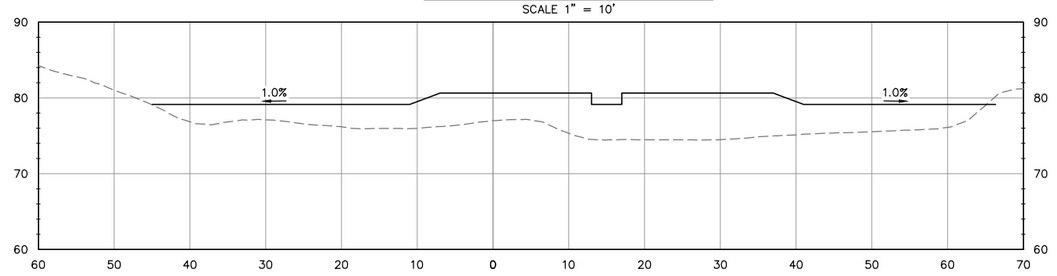




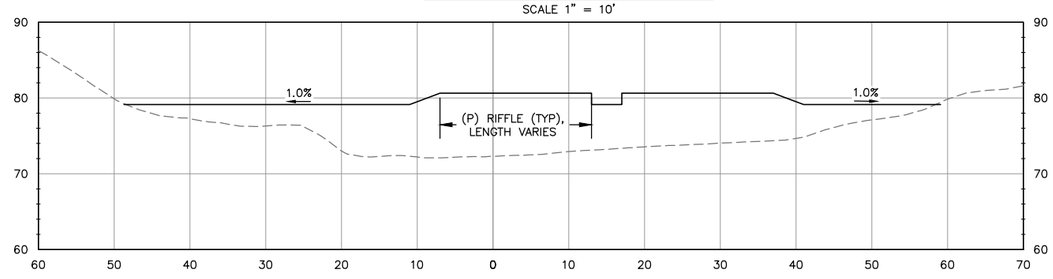
SECTION CU2-E - STA 9+00
SCALE 1" = 10'



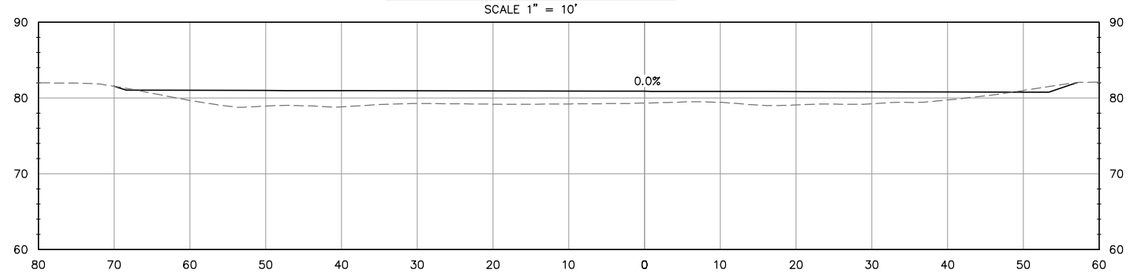
SECTION CU3-A - STA 0+50
SCALE 1" = 10'



SECTION CU3-B - STA 2+50
SCALE 1" = 10'



SECTION CUR-A - STA 14+00
SCALE 1" = 10'



SECTION CUR-B - STA 16+00
SCALE 1" = 10'

SECTION CUB-A - STA 3+28
SCALE 1" = 10'

REVISION NO.	DATE	DESCRIPTION

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FlowWest
PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:
EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN UPSTREAM SECTIONS (5)

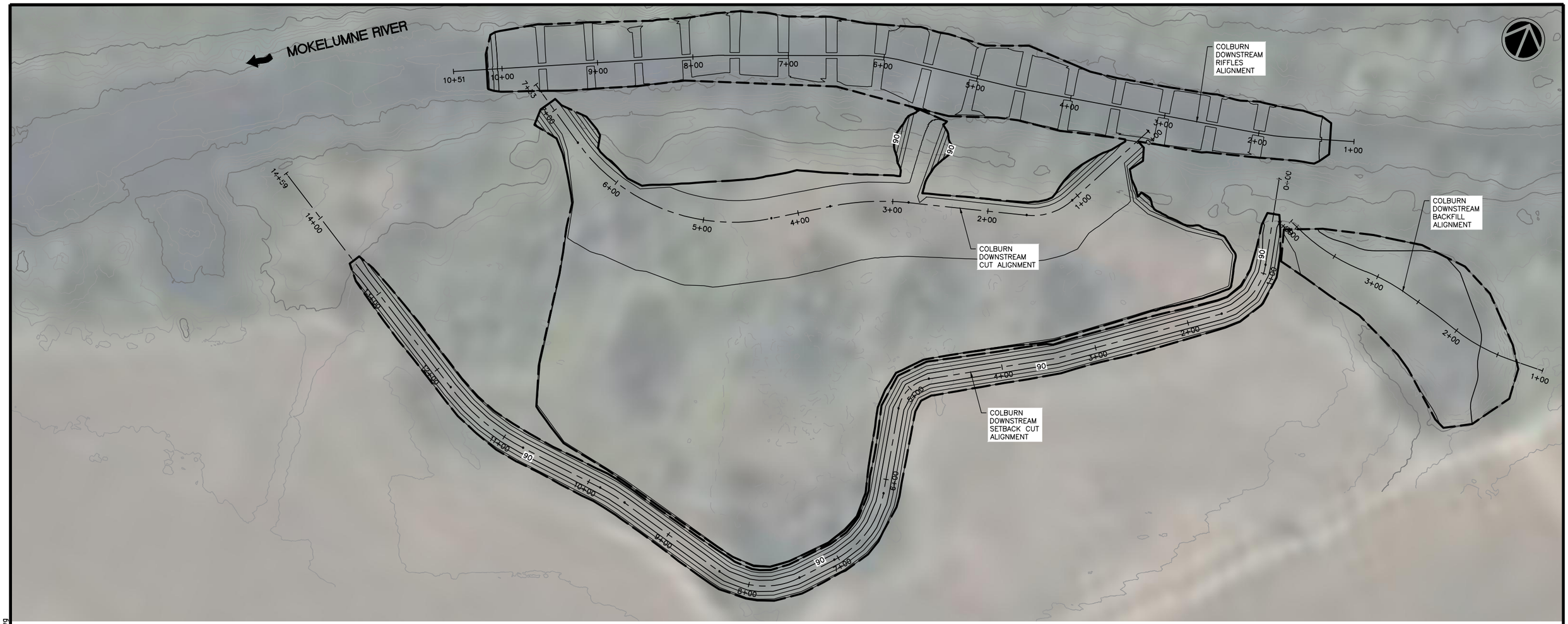
MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

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SHEET NO. 24 OF 31
DRAWING NO. C22

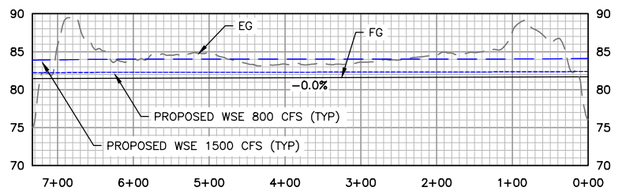
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COLBURN DOWNSTREAM OVERVIEW

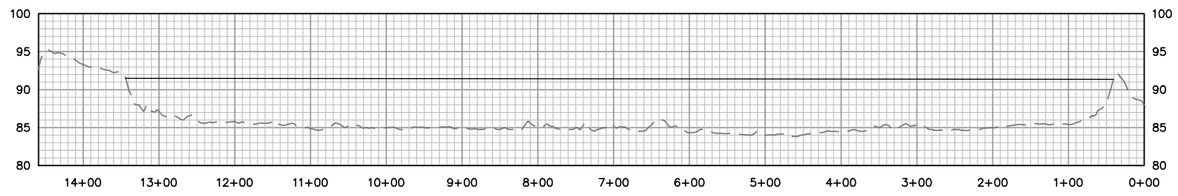
SCALE: 1" = 50'

0 25' 50' 100'



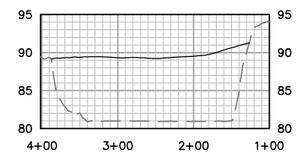
COLBURN DOWNSTREAM CUT GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



COLBURN DOWNSTREAM SETBACK GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



BACKFILL GRADING PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

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COLBURN DOWNSTREAM OVERVIEW

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

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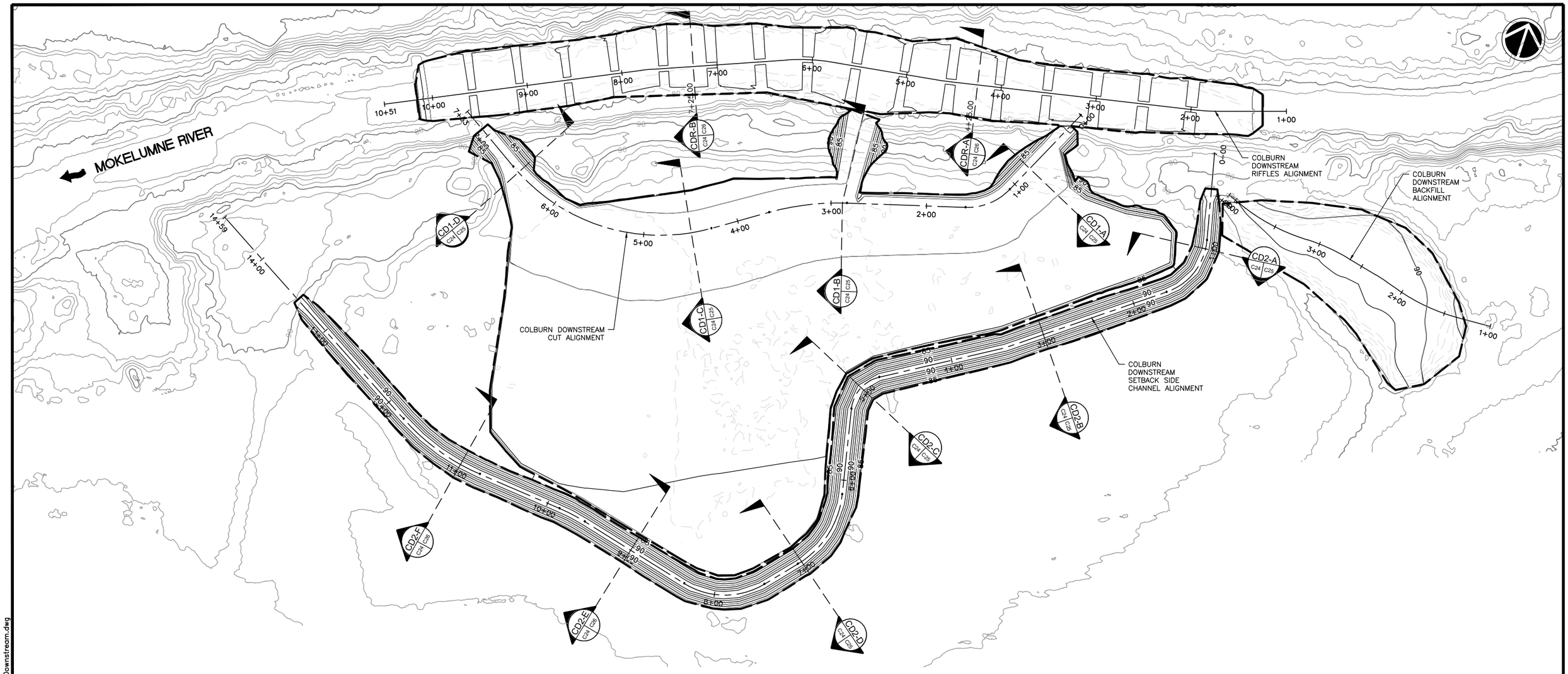
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SHEET NO. 25 OF 31

DRAWING NO. C23

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COLBURN DOWNSTREAM GRADING PLAN

SCALE: 1" = 50'

0 25' 50' 100'

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COLBURN DOWNSTREAM GRADING PLAN

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

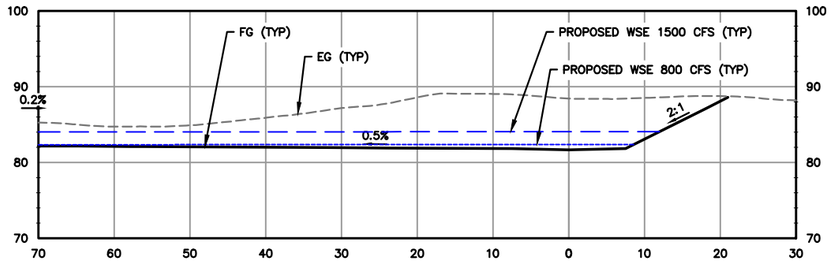
70% DESIGN
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DATE: 6/10/2026	

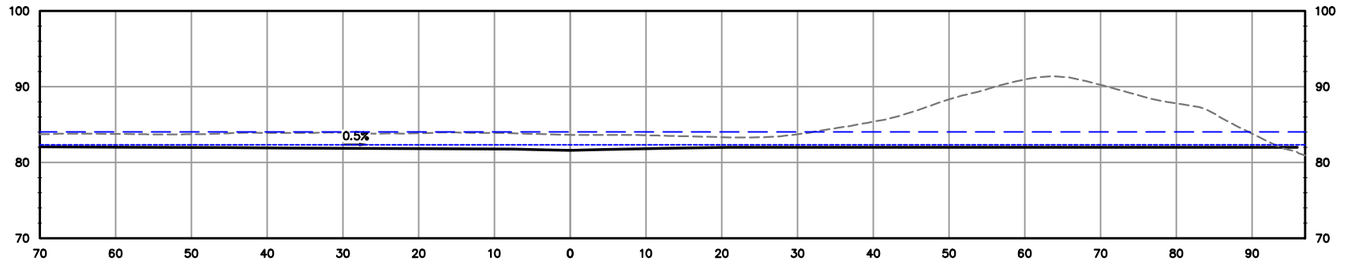
SHEET NO. 26 OF 31

DRAWING NO. C24

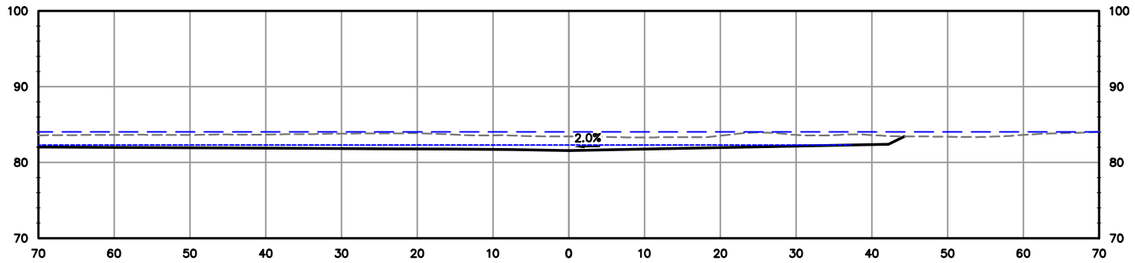
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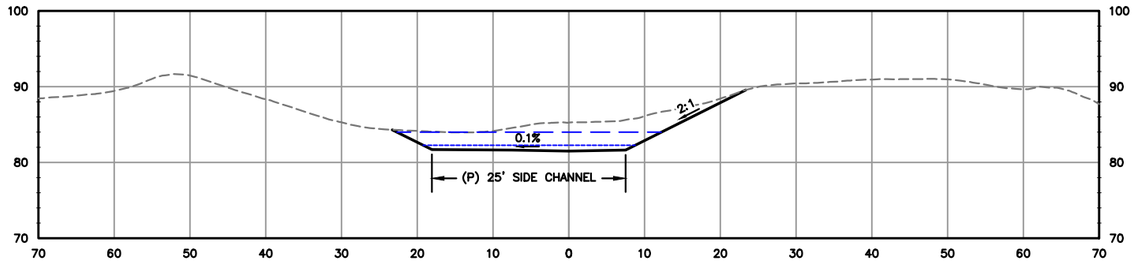
SECTION CD1-A - STA 0+77
SCALE 1" = 10'



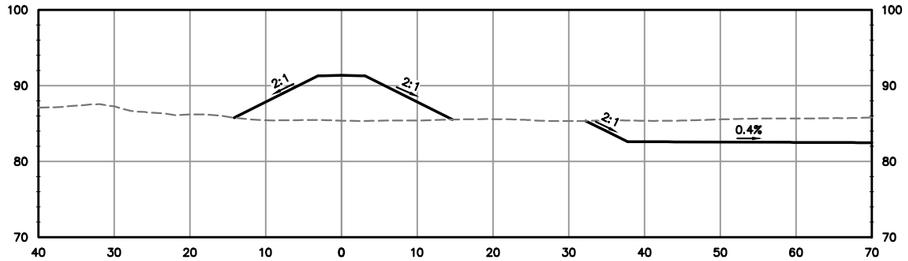
SECTION CD1-B - STA 2+88
SCALE 1" = 10'



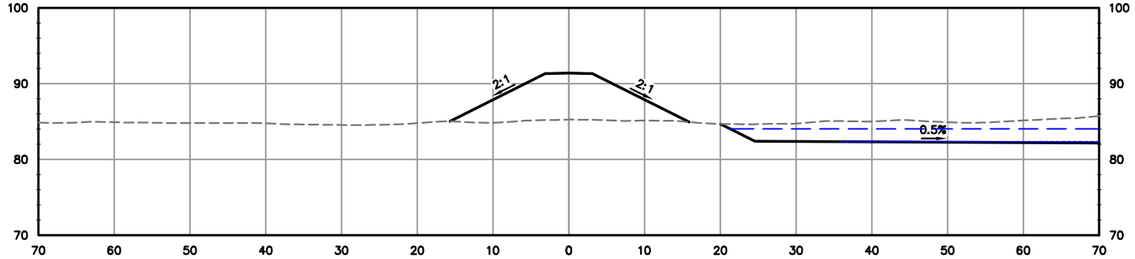
SECTION CD1-C - STA 4+50
SCALE 1" = 10'



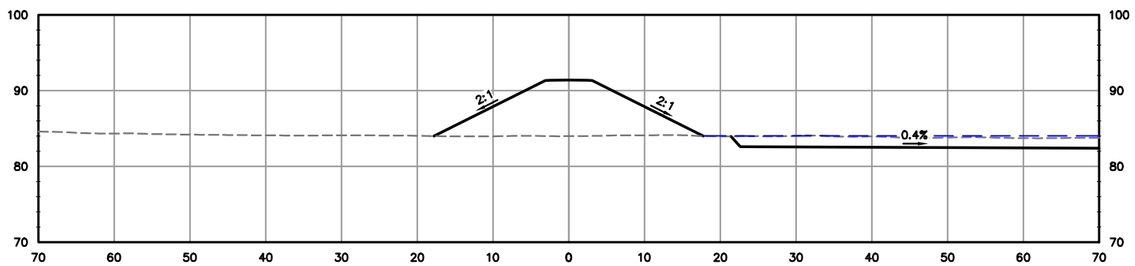
SECTION CD1-D - STA 6+50
SCALE 1" = 10'



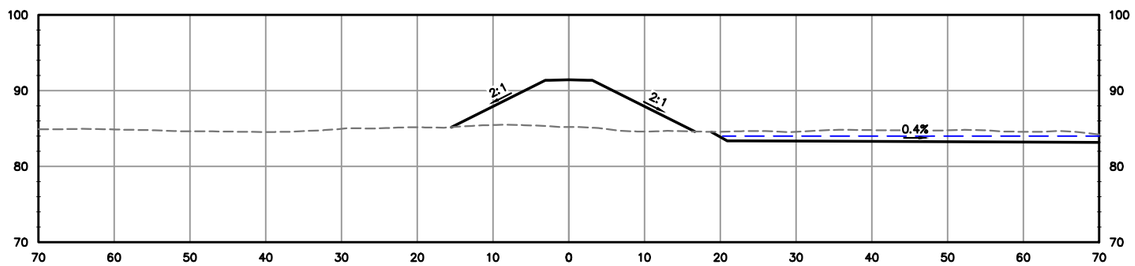
SECTION CD2-A - STA 1+00
SCALE 1" = 10'



SECTION CD2-B - STA 3+00
SCALE 1" = 10'



SECTION CD2-C - STA 5+00
SCALE 1" = 10'



SECTION CD2-D - STA 7+00
SCALE 1" = 10'

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PO BOX 29392
OAKLAND, CA 94604
510.842.0538

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COLBURN DOWNSTREAM SECTIONS

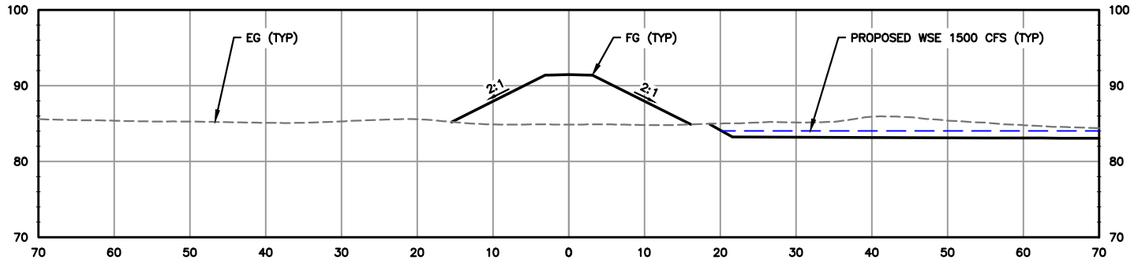
MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

70% DESIGN
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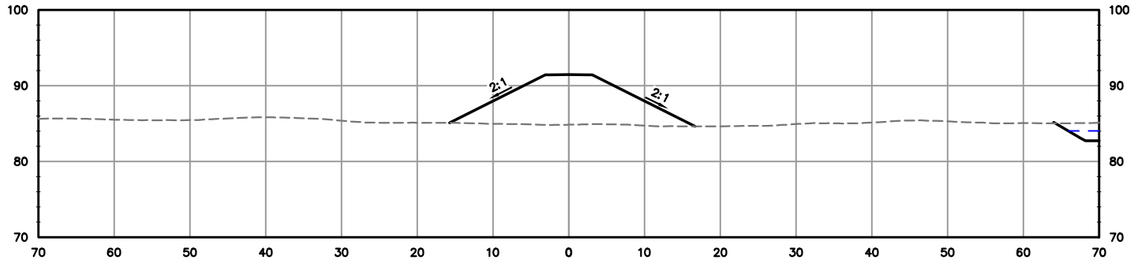
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SHEET NO. 27 OF 31
DRAWING NO. C25

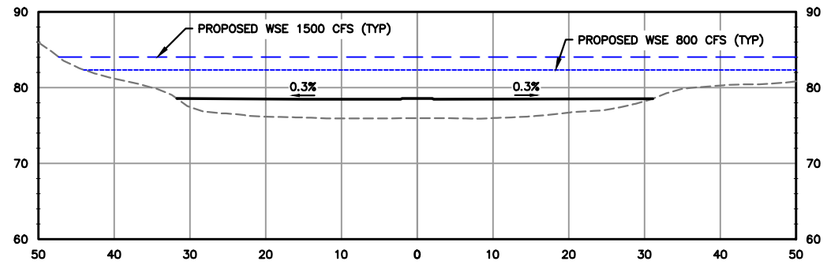
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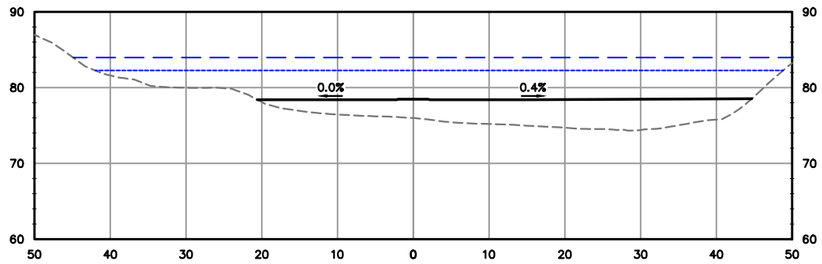
SECTION CD2-E - STA 9+00
SCALE 1" = 10'



SECTION CD2-F - STA 11+00
SCALE 1" = 10'



SECTION CDR-A - STA 4+25
SCALE 1" = 10'



SECTION CDR-B - STA 7+25
SCALE 1" = 10'

REVISION NO.	DATE	DESCRIPTION

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OAKLAND, CA 94604
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PREPARED FOR:
EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN DOWNSTREAM SECTIONS (2)

MOKELUMNE RIVER FLOODPLAIN
HABITAT RESTORATION PROJECT

70% DESIGN
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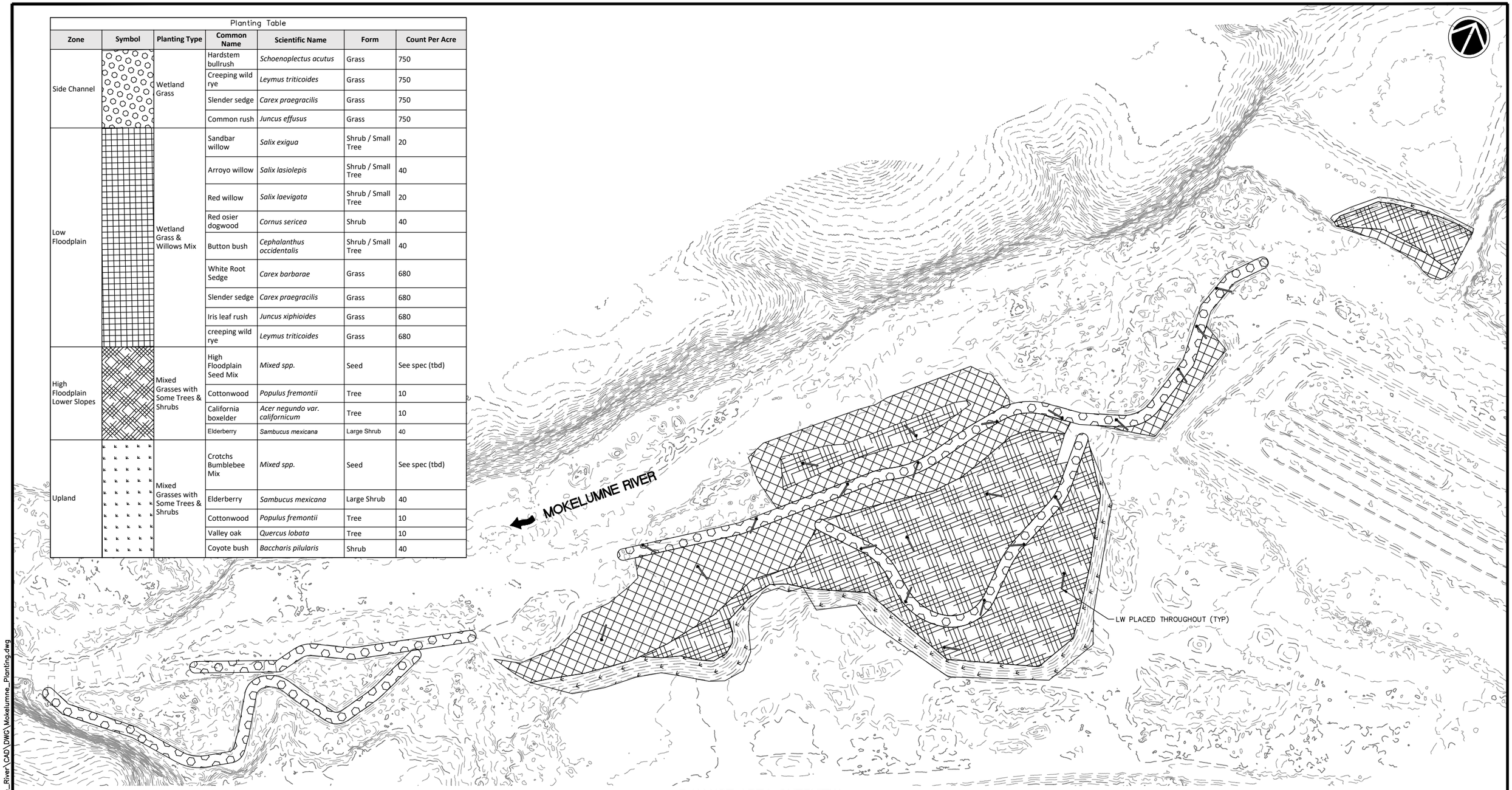
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DATE: 6/10/2026

SHEET NO. 28 OF 31
DRAWING NO. C26

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Planting Table

Zone	Symbol	Planting Type	Common Name	Scientific Name	Form	Count Per Acre
Side Channel		Wetland Grass	Hardstem bullrush	*Schoenoplectus acutus*	Grass	750
			Creeping wild rye	*Leymus triticoides*	Grass	750
			Slender sedge	*Carex praegracilis*	Grass	750
			Common rush	*Juncus effusus*	Grass	750
Low Floodplain		Wetland Grass & Willows Mix	Sandbar willow	*Salix exigua*	Shrub / Small Tree	20
			Arroyo willow	*Salix lasiolepis*	Shrub / Small Tree	40
			Red willow	*Salix laevigata*	Shrub / Small Tree	20
			Red osier dogwood	*Cornus sericea*	Shrub	40
			Button bush	*Cephalanthus occidentalis*	Shrub / Small Tree	40
			White Root Sedge	*Carex barbarae*	Grass	680
			Slender sedge	*Carex praegracilis*	Grass	680
			Iris leaf rush	*Juncus xiphioides*	Grass	680
			creeping wild rye	*Leymus triticoides*	Grass	680
High Floodplain Lower Slopes		Mixed Grasses with Some Trees & Shrubs	High Floodplain Seed Mix	*Mixed spp.*	Seed	See spec (tbd)
			Cottonwood	*Populus fremontii*	Tree	10
			California boxelder	*Acer negundo var. californicum*	Tree	10
			Elderberry	*Sambucus mexicana*	Large Shrub	40
Upland		Mixed Grasses with Some Trees & Shrubs	Crotchs Bumblebee Mix	*Mixed spp.*	Seed	See spec (tbd)
			Elderberry	*Sambucus mexicana*	Large Shrub	40
			Cottonwood	*Populus fremontii*	Tree	10
			Valley oak	*Quercus lobata*	Tree	10
			Coyote bush	*Baccharis pilularis*	Shrub	40



DAY USE AREA OVERVIEW

SCALE: 1" = 100'

0 50' 100' 200'

REVISION NO.	DATE	DESCRIPTION

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FlowWest
PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:

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DAY USE PLANTING PLAN

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

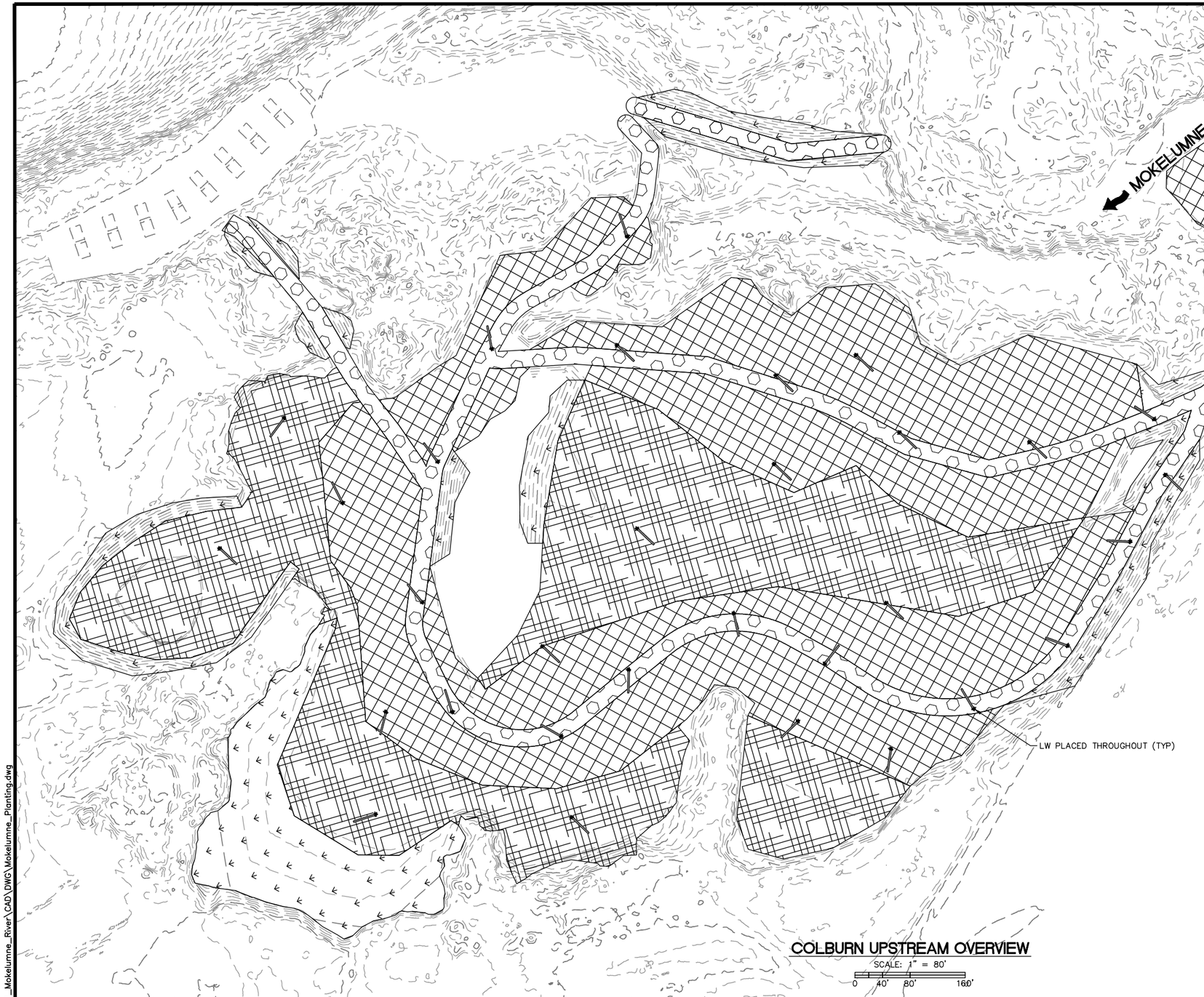
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SHEET NO. 29 OF 31

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COLBURN UPSTREAM OVERVIEW

SCALE: 1" = 80'

0 40' 80' 160'

Planting Table

Zone	Symbol	Planting Type	Common Name	Scientific Name	Form	Count Per Acre
Side Channel		Wetland Grass	Hardstem bullrush	*Schoenoplectus acutus*	Grass	750
			Creeping wild rye	*Leymus triticoides*	Grass	750
			Slender sedge	*Carex praegracilis*	Grass	750
			Common rush	*Juncus effusus*	Grass	750
Low Floodplain		Wetland Grass & Willows Mix	Sandbar willow	*Salix exigua*	Shrub / Small Tree	20
			Arroyo willow	*Salix lasiolepis*	Shrub / Small Tree	40
			Red willow	*Salix laevigata*	Shrub / Small Tree	20
			Red osier dogwood	*Cornus sericea*	Shrub	40
			Button bush	*Cephalanthus occidentalis*	Shrub / Small Tree	40
			White Root Sedge	*Carex barbarae*	Grass	680
			Slender sedge	*Carex praegracilis*	Grass	680
			Iris leaf rush	*Juncus xiphioides*	Grass	680
			creeping wild rye	*Leymus triticoides*	Grass	680
High Floodplain Lower Slopes		Mixed Grasses with Some Trees & Shrubs	High Floodplain Seed Mix	*Mixed spp.*	Seed	See spec (tbd)
			Cottonwood	*Populus fremontii*	Tree	10
			California boxelder	*Acer negundo var. californicum*	Tree	10
			Elderberry	*Sambucus mexicana*	Large Shrub	40
Upland		Mixed Grasses with Some Trees & Shrubs	Crotchs Bumblebee Mix	*Mixed spp.*	Seed	See spec (tbd)
			Elderberry	*Sambucus mexicana*	Large Shrub	40
			Cottonwood	*Populus fremontii*	Tree	10
			Valley oak	*Quercus lobata*	Tree	10
			Coyote bush	*Baccharis pilularis*	Shrub	40

REVISION NO.	DATE	DESCRIPTION

DRAFT

FlowWest
PO BOX 29392
OAKLAND, CA 94604
510.842.0538

PREPARED FOR:

EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN UPSTREAM PLANTING PLAN

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

70% DESIGN
NOT FOR CONSTRUCTION

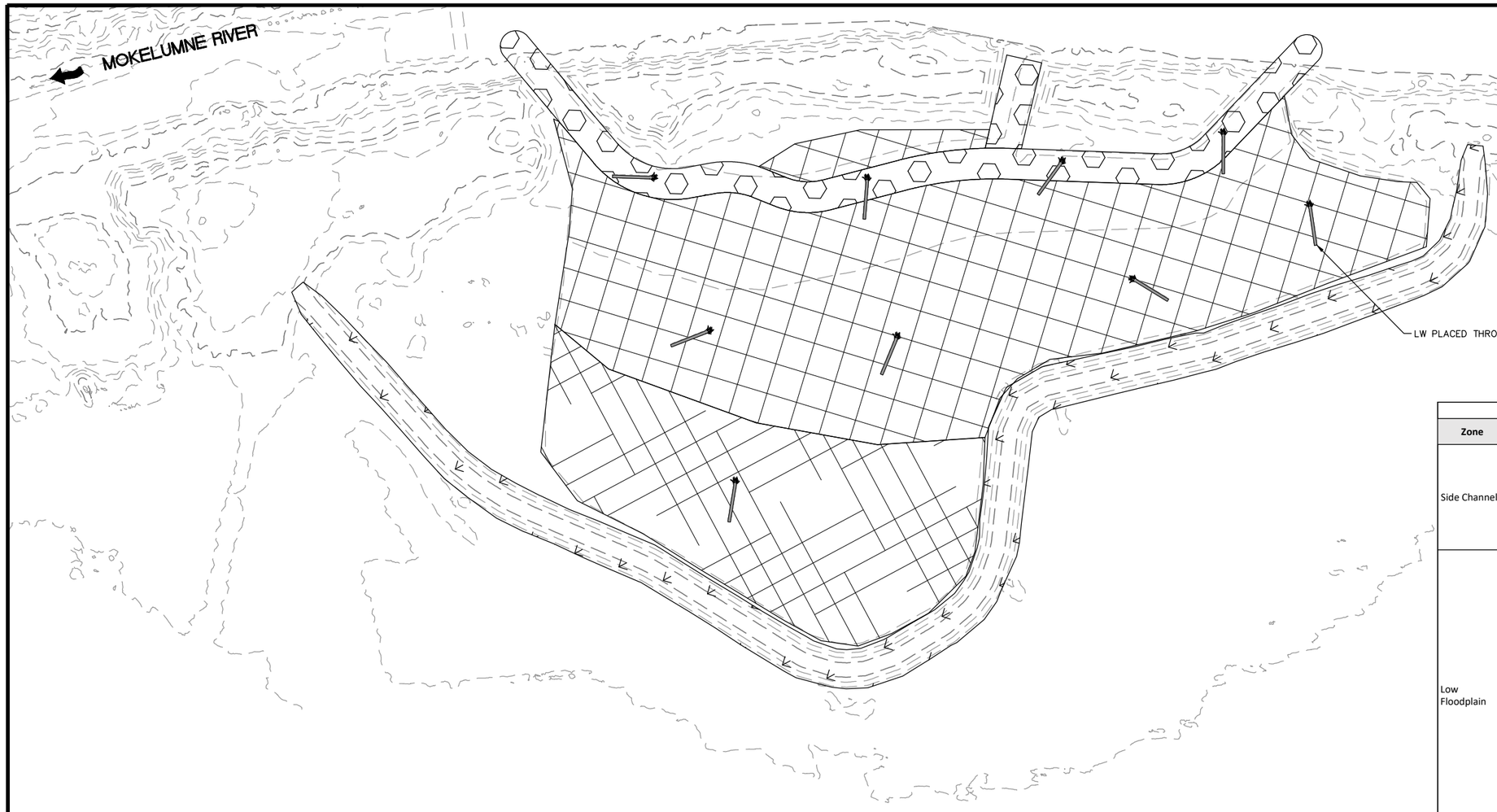
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DATE: 6/10/2026

SHEET NO. 30 OF 31

DRAWING NO. C28

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COLBURN DOWNSTREAM OVERVIEW

SCALE: 1" = 50'

0 25' 50' 100'

Planting Table

Zone	Symbol	Planting Type	Common Name	Scientific Name	Form	Count Per Acre
Side Channel		Wetland Grass	Hardstem bullrush	*Schoenoplectus acutus*	Grass	750
			Creeping wild rye	*Leymus triticoides*	Grass	750
			Slender sedge	*Carex praegracilis*	Grass	750
			Common rush	*Juncus effusus*	Grass	750
Low Floodplain		Wetland Grass & Willows Mix	Sandbar willow	*Salix exigua*	Shrub / Small Tree	20
			Arroyo willow	*Salix lasiolepis*	Shrub / Small Tree	40
			Red willow	*Salix laevigata*	Shrub / Small Tree	20
			Red osier dogwood	*Cornus sericea*	Shrub	40
			Button bush	*Cephalanthus occidentalis*	Shrub / Small Tree	40
			White Root Sedge	*Carex barbarae*	Grass	680
			Slender sedge	*Carex praegracilis*	Grass	680
			Iris leaf rush	*Juncus xiphioides*	Grass	680
			creeping wild rye	*Leymus triticoides*	Grass	680
High Floodplain Lower Slopes		Mixed Grasses with Some Trees & Shrubs	High Floodplain Seed Mix	*Mixed spp.*	Seed	See spec (tbd)
			Cottonwood	*Populus fremontii*	Tree	10
			California boxelder	*Acer negundo var. californicum*	Tree	10
			Elderberry	*Sambucus mexicana*	Large Shrub	40
Upland		Mixed Grasses with Some Trees & Shrubs	Crotchs Bumblebee Mix	*Mixed spp.*	Seed	See spec (tbd)
			Elderberry	*Sambucus mexicana*	Large Shrub	40
			Cottonwood	*Populus fremontii*	Tree	10
			Valley oak	*Quercus lobata*	Tree	10
			Coyote bush	*Baccharis pilularis*	Shrub	40

REVISION NO.	DATE	DESCRIPTION

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FlowWest
PO BOX 29392
OAKLAND, CA 94604
510.842.0538

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EAST BAY MUNICIPAL UTILITY DISTRICT

COLBURN DOWNSTREAM PLANTING PLAN

MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

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APPENDIX B: TREE REMOVALS

APPENDIX B: TREE REMOVALS

This appendix documents the proposed tree removals for the Mokelumne River Floodplain Design and Permitting Project 70% Design Phase. It contains summary tables of the total number of trees proposed to be removed and maps of the removal locations. An .xlsx file transmitted with this appendix tabulates the trees by species and DBH.

The proposed 70% design will remove 895 trees in total. The tables below break down the tree removals by species and project site.

TABLE 1: TREE REMOVAL BY PROJECT SITE

	Day Use Area		Colburn Upstream		Colburn Downstream	
Species	**Remove Count**	**Protect Count**	**Remove Count**	**Protect Count**	**Remove Count**	**Protect Count**
Arroyo Willow	45	17	23	9	0	1
Black Locust	0	0	3	1	0	0
Black Willow	0	0	3	0	0	0
Blue Oak	5	2	1	0	0	0
Box Elder	1	1	9	0	0	0
California Buckeye	0	1	0	0	0	0
Fremont Cottonwood	49	13	98	7	89	65
Interior Live Oak	68	11	116	12	4	10
Mexican Elderberry	6	1	0	0	0	0
Northern California Black Walnut	37	4	7	0	0	5
Oregon Ash	0	1	3	1	1	1
Oregon White Oak	0	0	2	0	0	0
Valley Oak	100	7	184	4	14	42
White Alder	11	12	0	1	1	3
Yellow Willow	0	0	15	1	0	0
Total	**322**	**70**	**464**	**36**	**109**	**127**

TABLE 2: DAY USE AREA TREE REMOVALS BY DBH

	DBH (in)								
Species	<6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	>48
Arroyo Willow	2	16	21	4	1				1
Black Locust									
Black Willow									
Blue Oak		2	1	2					
Box Elder		1							
California Buckeye									
Fremont Cottonwood	2	7	8	9	13	3	2	3	2
Interior Live Oak	1	16	35	9	5	1			1
Mexican Elderberry		3	1		2				

Northern California Black Walnut	1	19	9	3	1	1	3		
Oregon Ash									
Oregon White Oak									
Valley Oak		34	50	16					
White Alder		2	5	1		2	1		
Yellow Willow									
Total	**6**	**100**	**130**	**44**	**22**	**7**	**6**	**3**	**4**

TABLE 3: COLBURN UPSTREAM TREE REMOVALS BY DBH

	DBH (in)								
Species	<6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	>48
Arroyo Willow		7	5	5	3		2	1	
Black Locust			1	2					
Black Willow		2	1						
Blue Oak		1							
Box Elder		4	1	3		1			
California Buckeye									
Fremont Cottonwood		9	22	28	18	3	6	9	3
Interior Live Oak		51	31	24	4	5			1
Mexican Elderberry									
Northern California Black Walnut		4	2	1					
Oregon Ash		1	2						
Oregon White Oak		1			1				
Valley Oak		108	59	14	2	1			
White Alder									
Yellow Willow		7	2	1	1	1	2		1
Total		**195**	**126**	**78**	**29**	**11**	**10**	**10**	**5**

TABLE 4: COLBURN DOWNSTREAM TREE REMOVALS BY DBH

	DBH (in)								
Species	<6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	>48
Arroyo Willow									
Black Locust									
Black Willow									
Blue Oak									
Box Elder									
California Buckeye									
Fremont Cottonwood		23	31	14	7	7	2	1	4
Interior Live Oak		2			2				
Mexican Elderberry									
Northern California Black Walnut									
Oregon Ash			1						
Oregon White Oak									

Valley Oak		5	8	1					
White Alder				1					
Yellow Willow									
Total		**30**	**40**	**16**	**9**	**7**	**2**	**1**	**4**

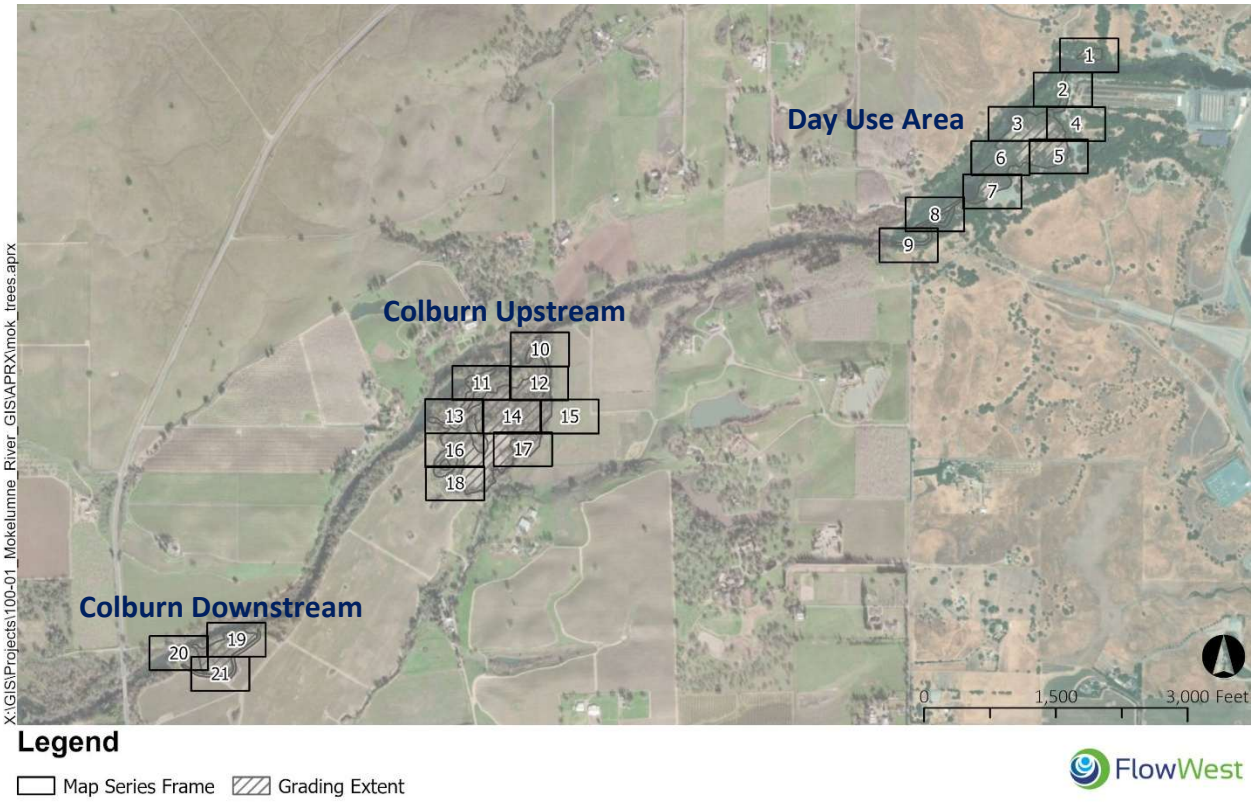
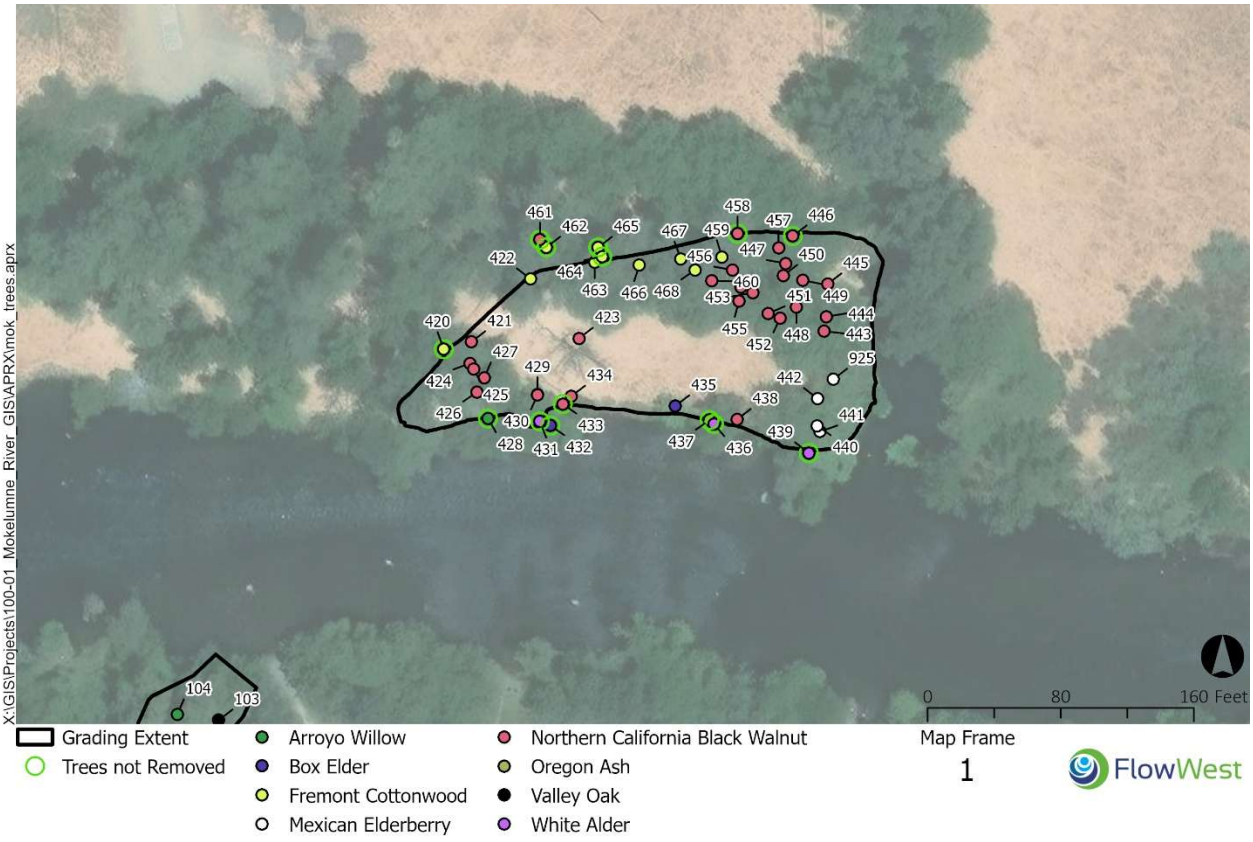
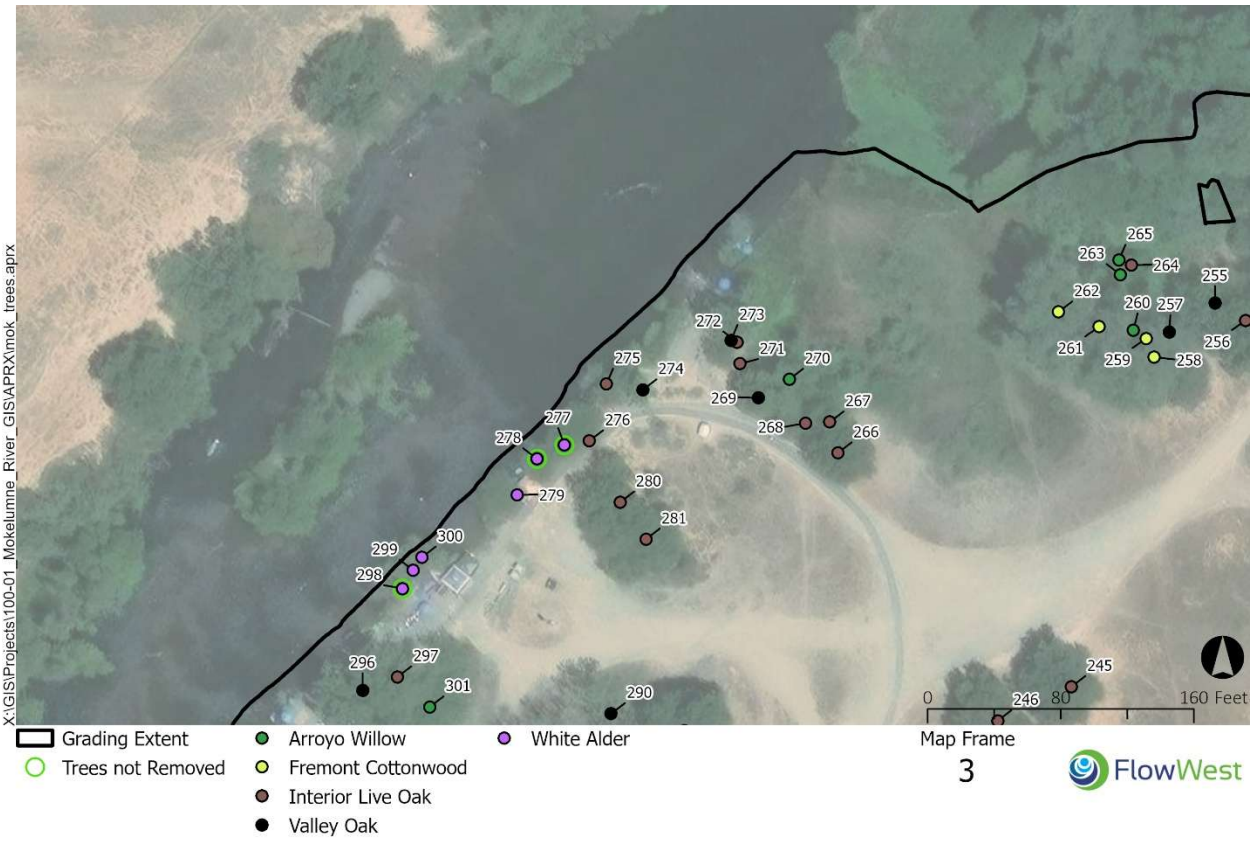
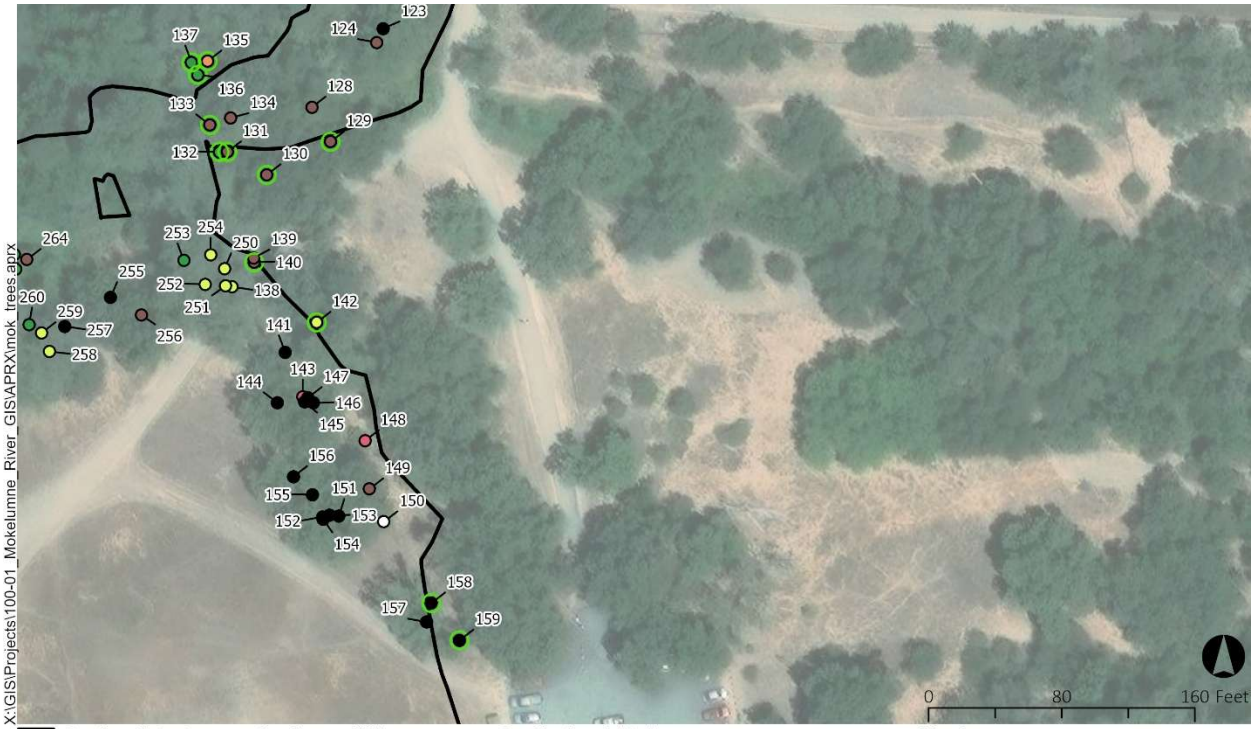


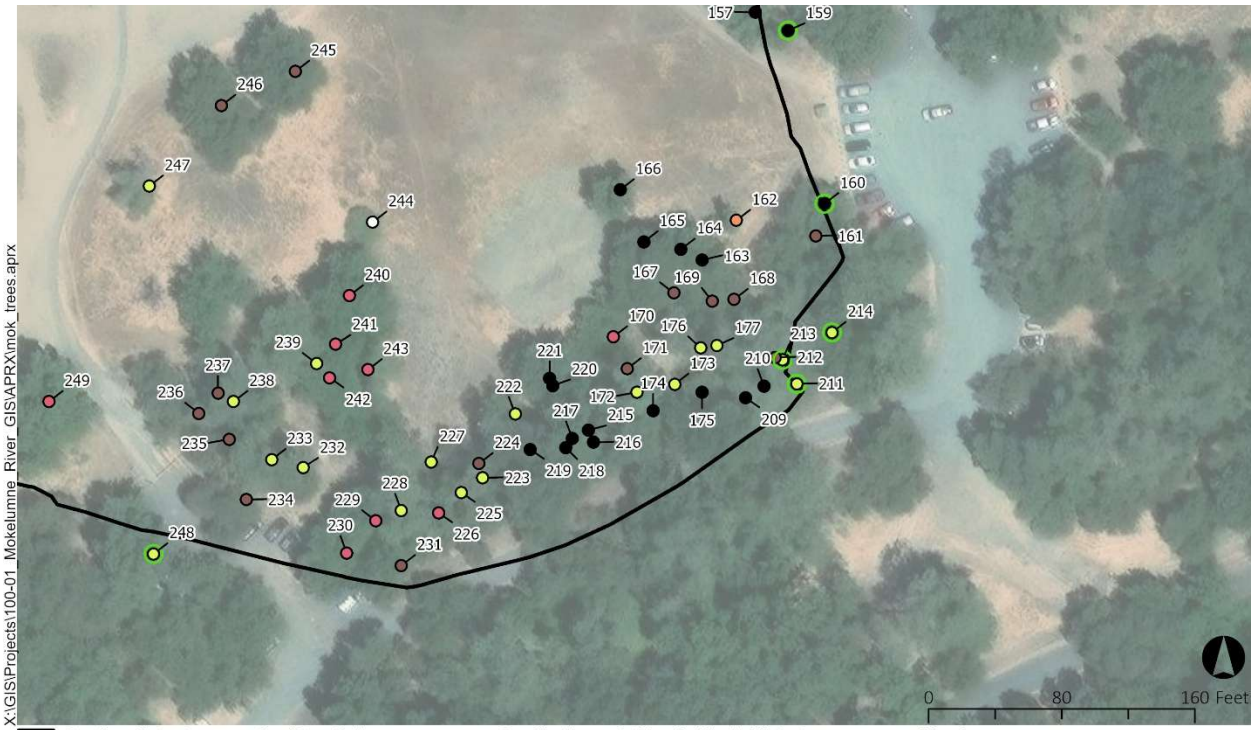
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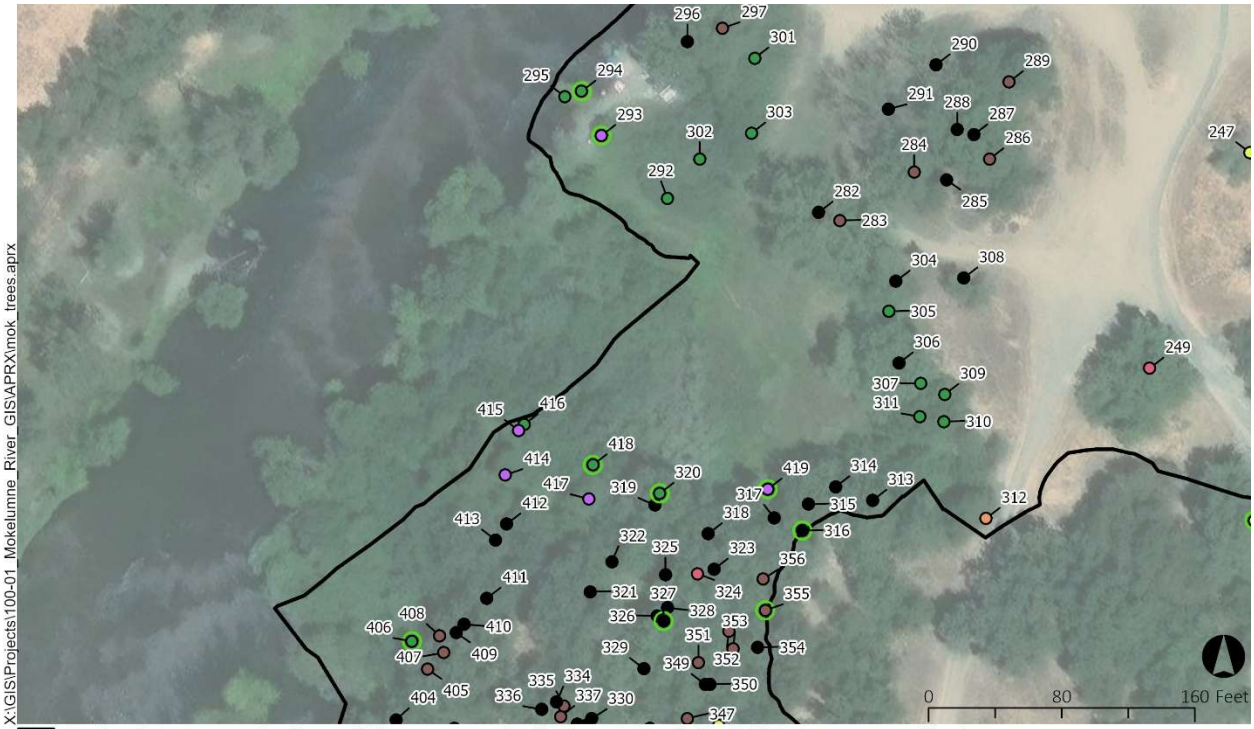

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Grading Extent
Trees not Removed
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Box Elder
Fremont Cottonwood
Mexican Elderberry
Northern California Black Walnut
Oregon Ash
Valley Oak
White Alder
Map Frame
1
FlowWest


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Map Frame
2
FlowWest


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Grading Extent
Trees not Removed
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Fremont Cottonwood
Interior Live Oak
Valley Oak
White Alder
Map Frame
3
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Grading Extent
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Valley Oak
Map Frame
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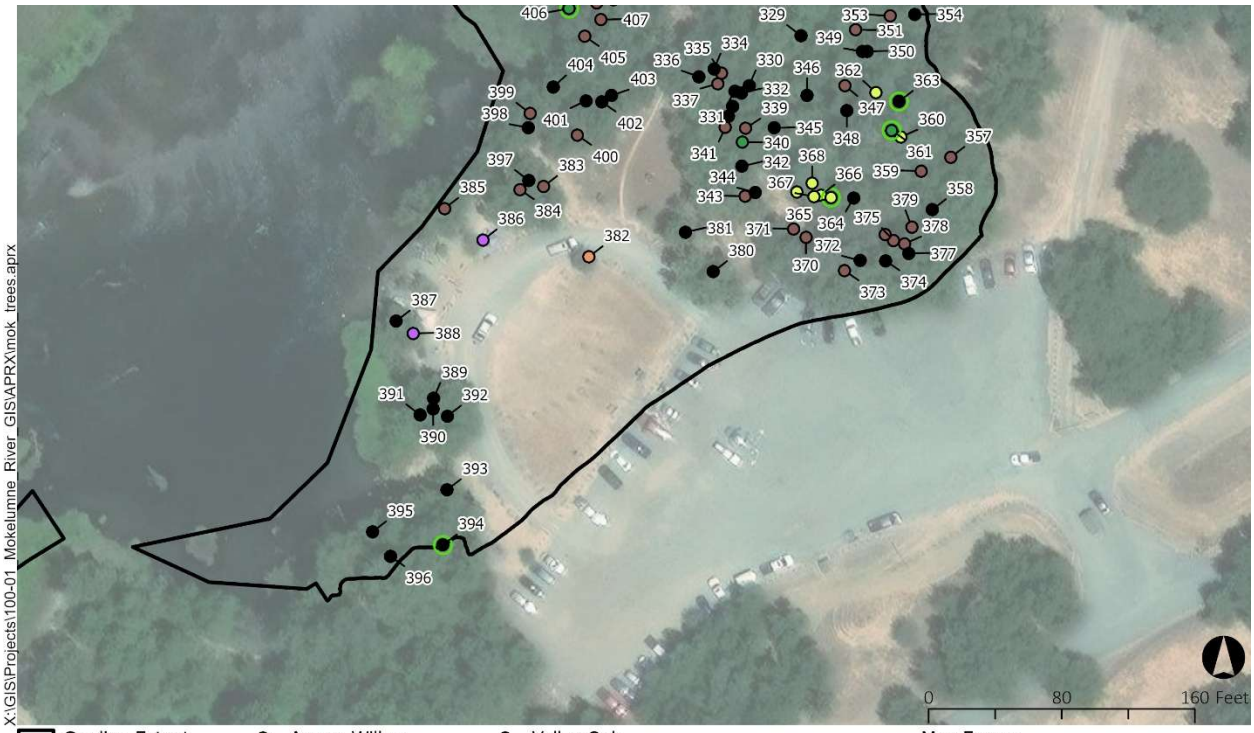

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Grading Extent
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Blue Oak
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Interior Live Oak
Mexican Elderberry
Northern California Black Walnut
Valley Oak
Map Frame
5
FlowWest



Grading Extent
Trees not Removed
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Blue Oak
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Interior Live Oak
Northern California Black Walnut
Valley Oak
White Alder

Map Frame
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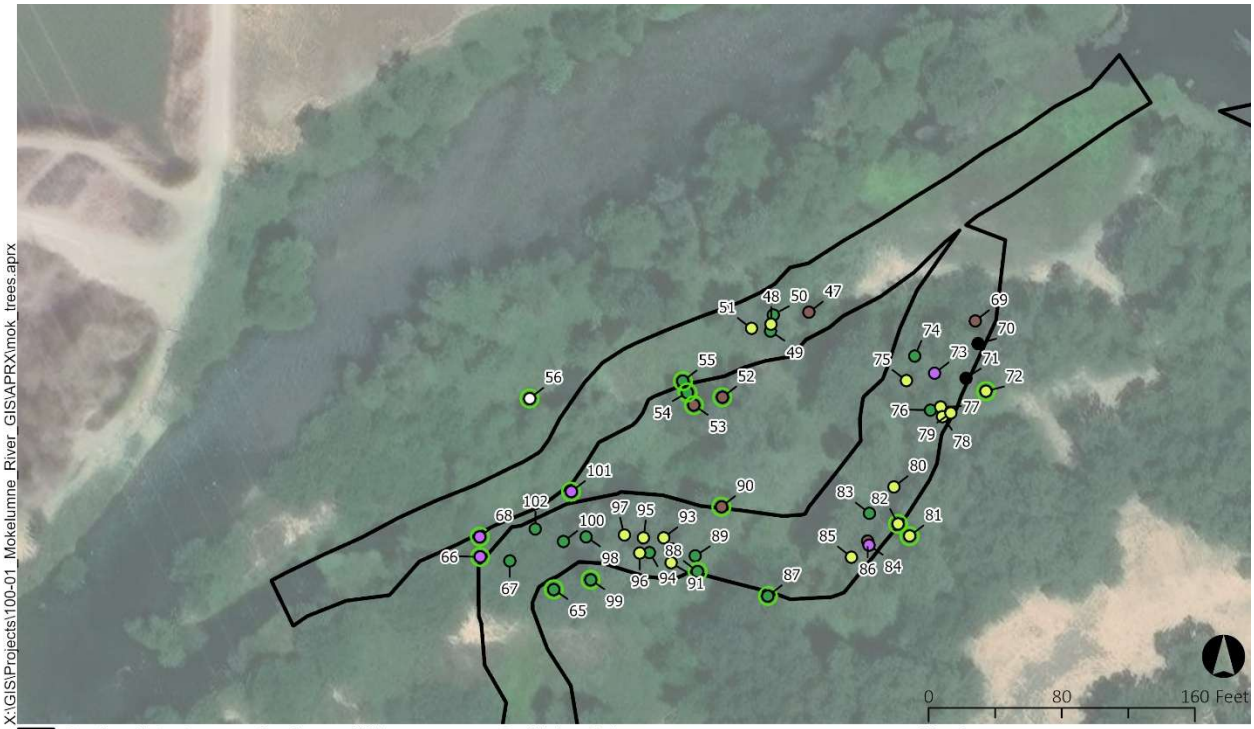
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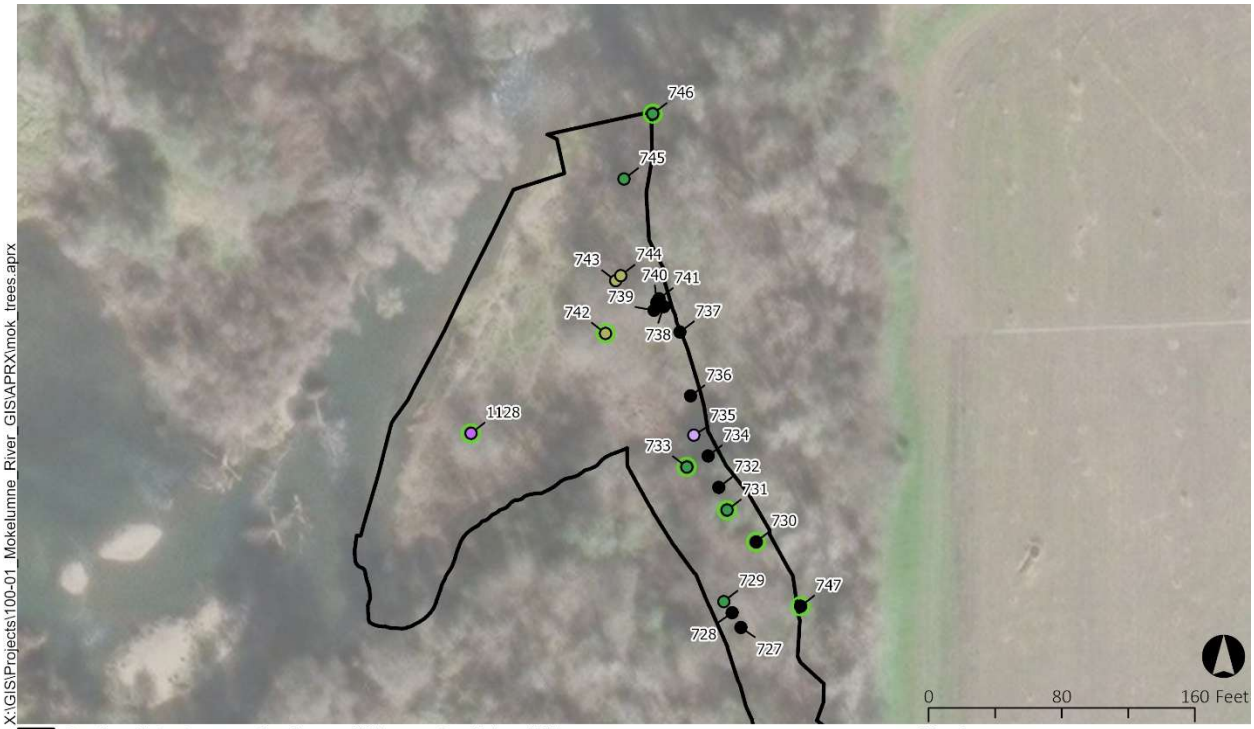
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Interior Live Oak
Valley Oak
White Alder

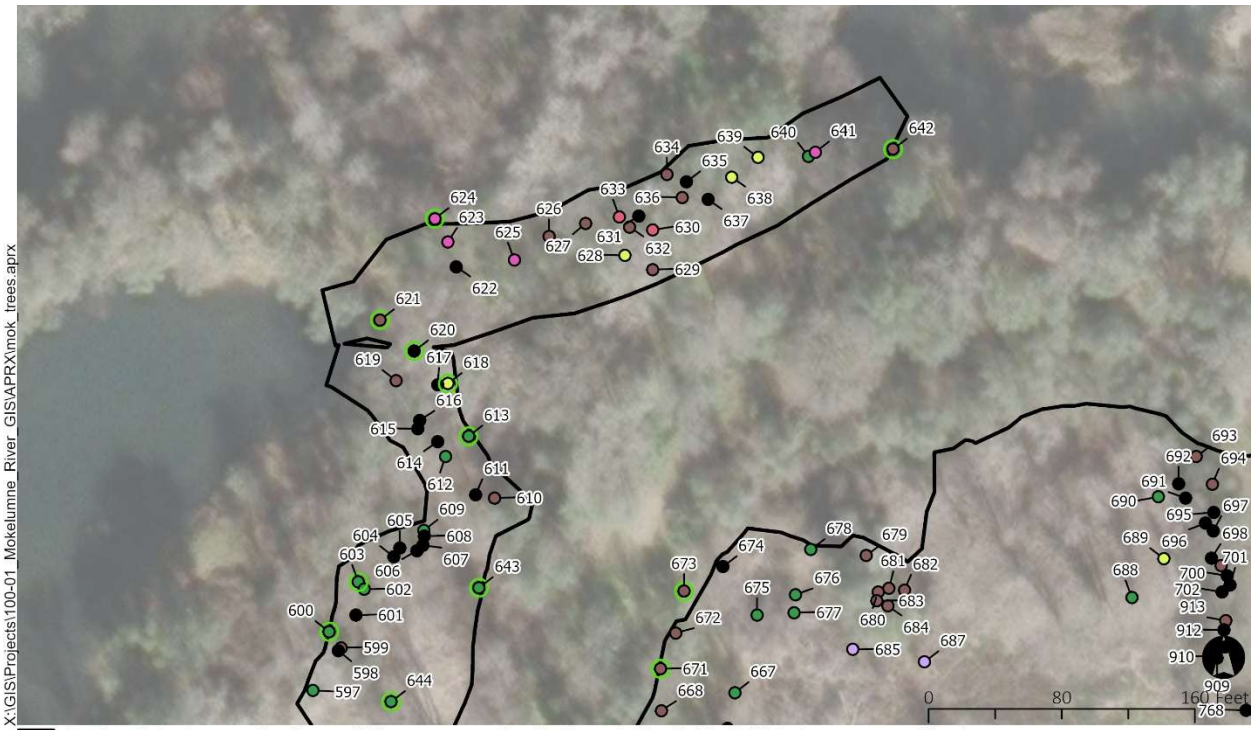
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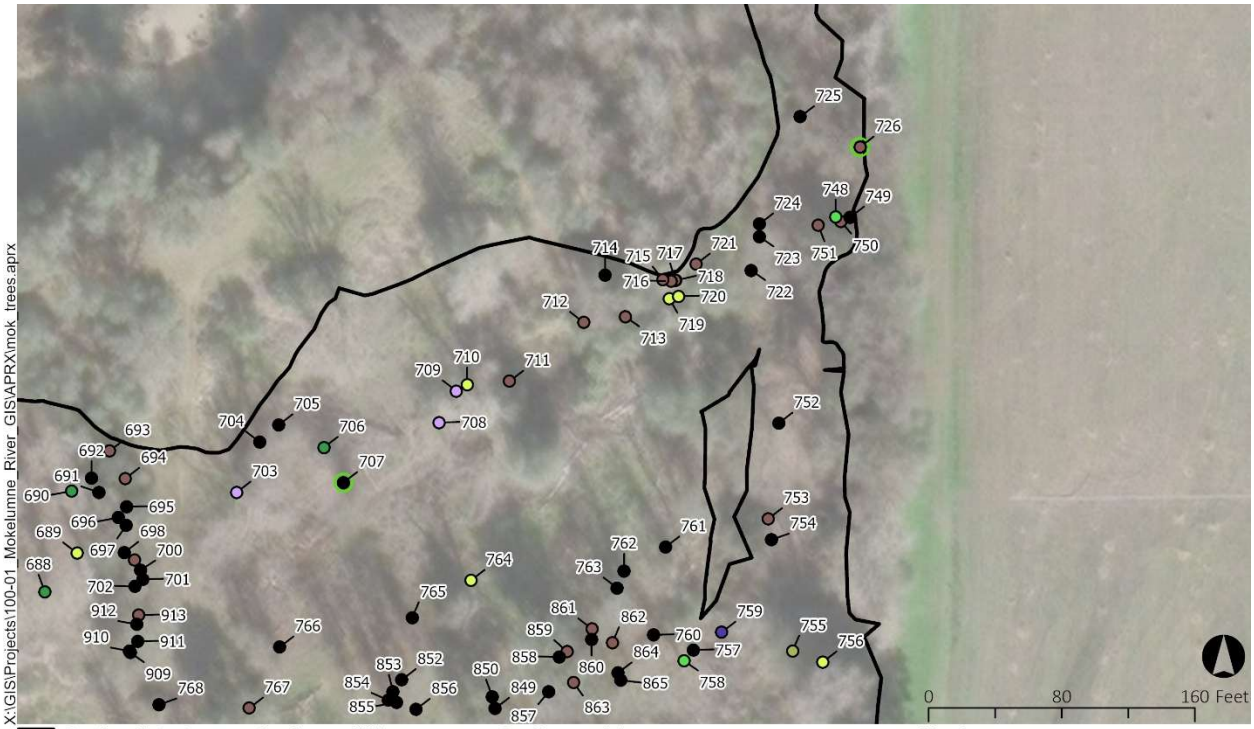
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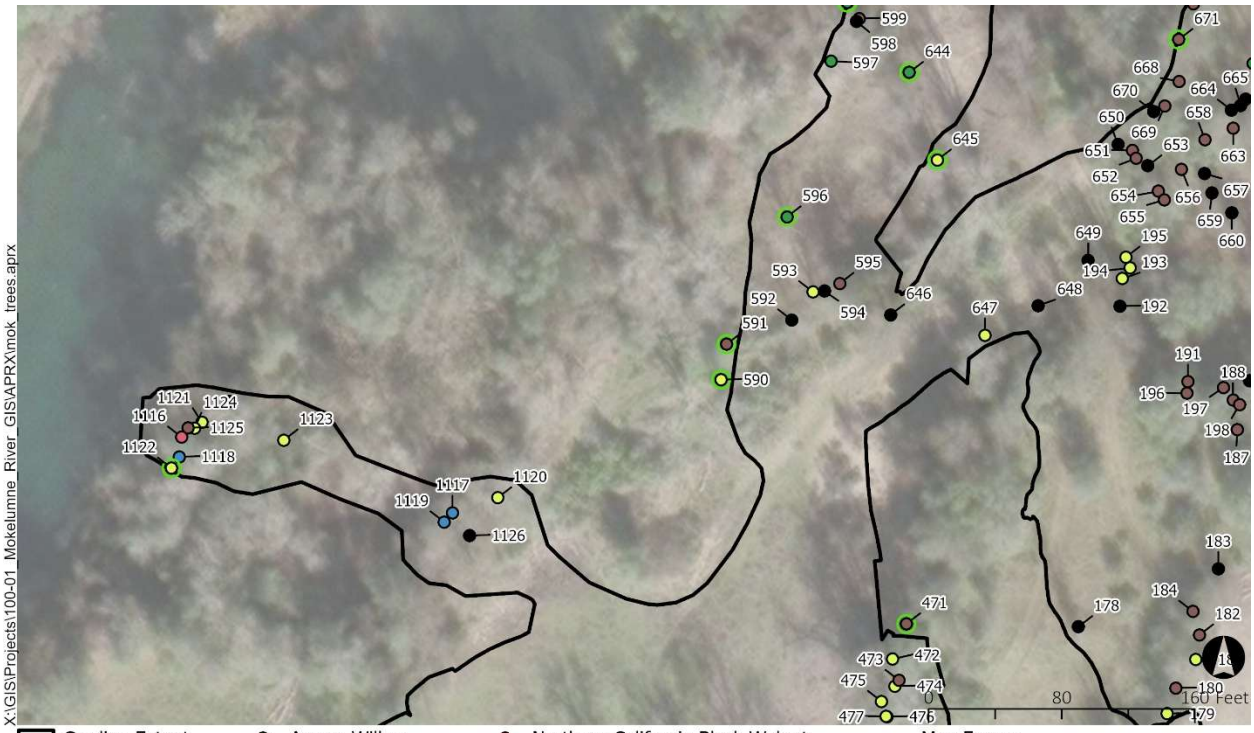

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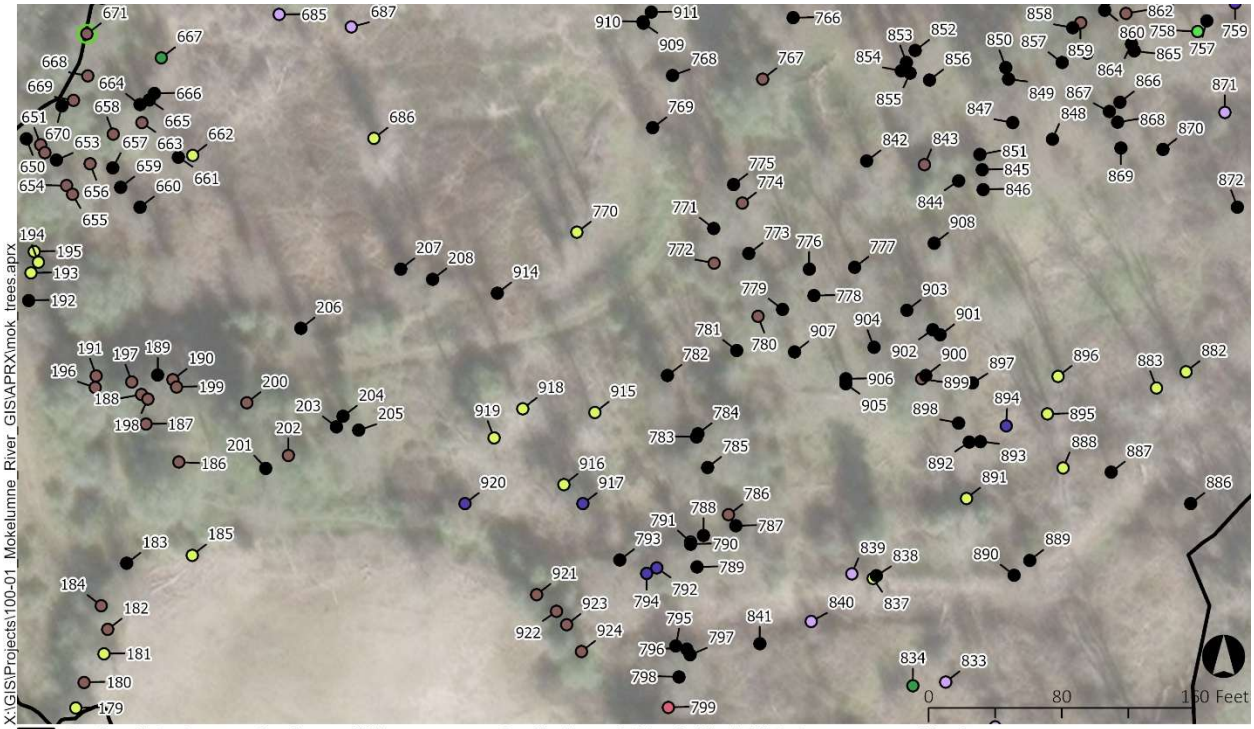

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White Alder
Map Frame
9
FlowWest


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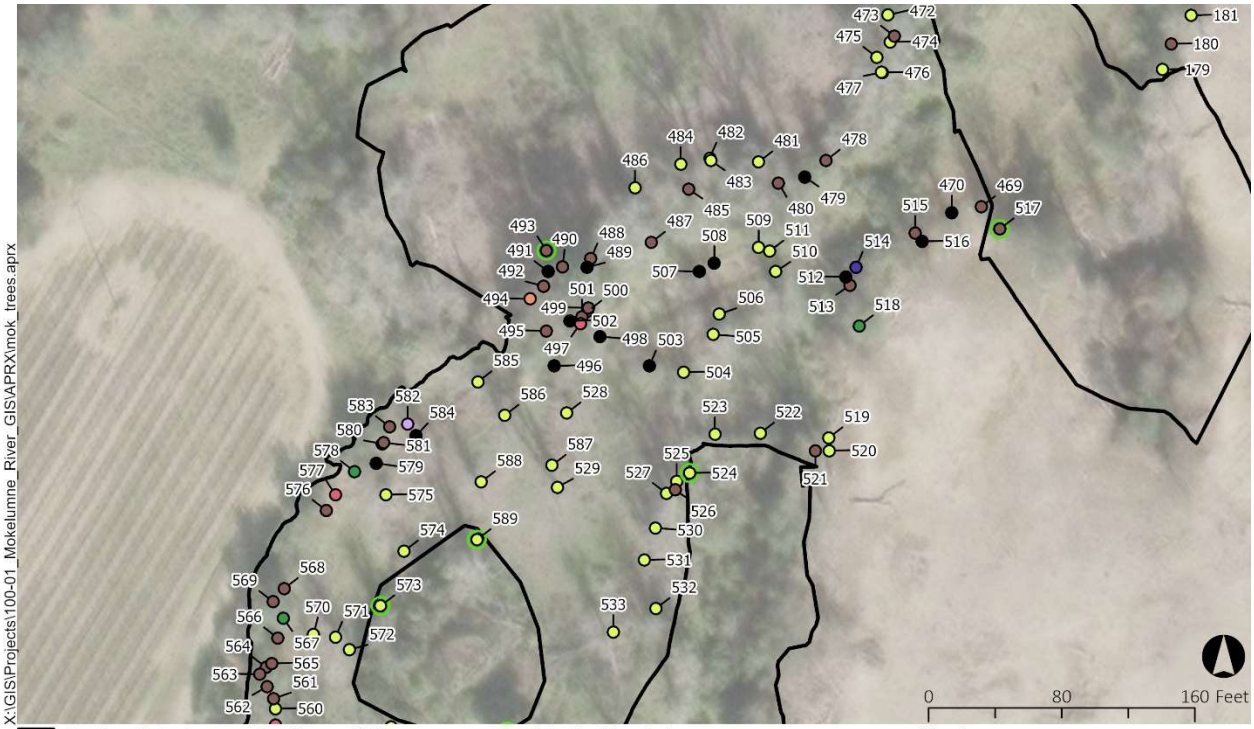

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Valley Oak
Yellow Willow
Map Frame
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Valley Oak
Yellow Willow
Map Frame
12
FlowWest


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Interior Live Oak
Northern California Black Walnut
Valley Oak
Map Frame
13
FlowWest


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FlowWest

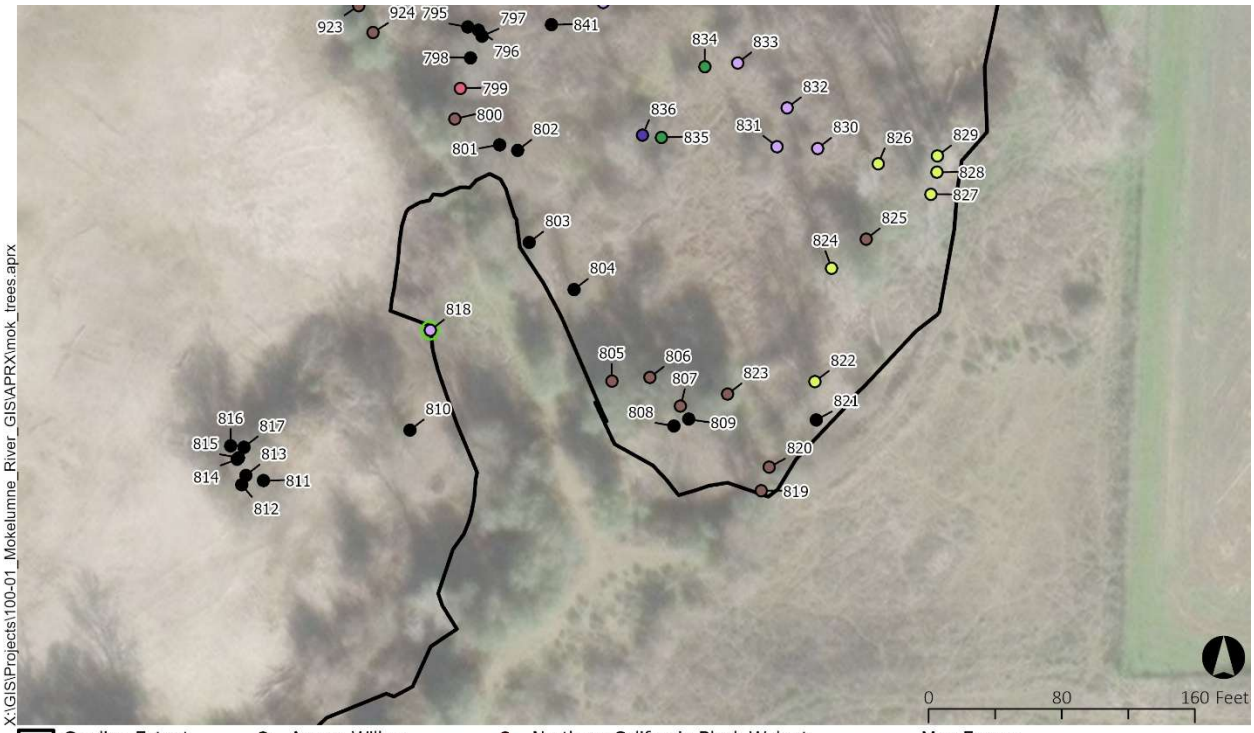

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Fremont Cottonwood
Interior Live Oak
Oregon Ash
Oregon White Oak
Valley Oak
Yellow Willow
Map Frame
15
FlowWest



Grading Extent
Trees not Removed
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Interior Live Oak
Northern California Black Walnut
Valley Oak
Yellow Willow

Map Frame
16

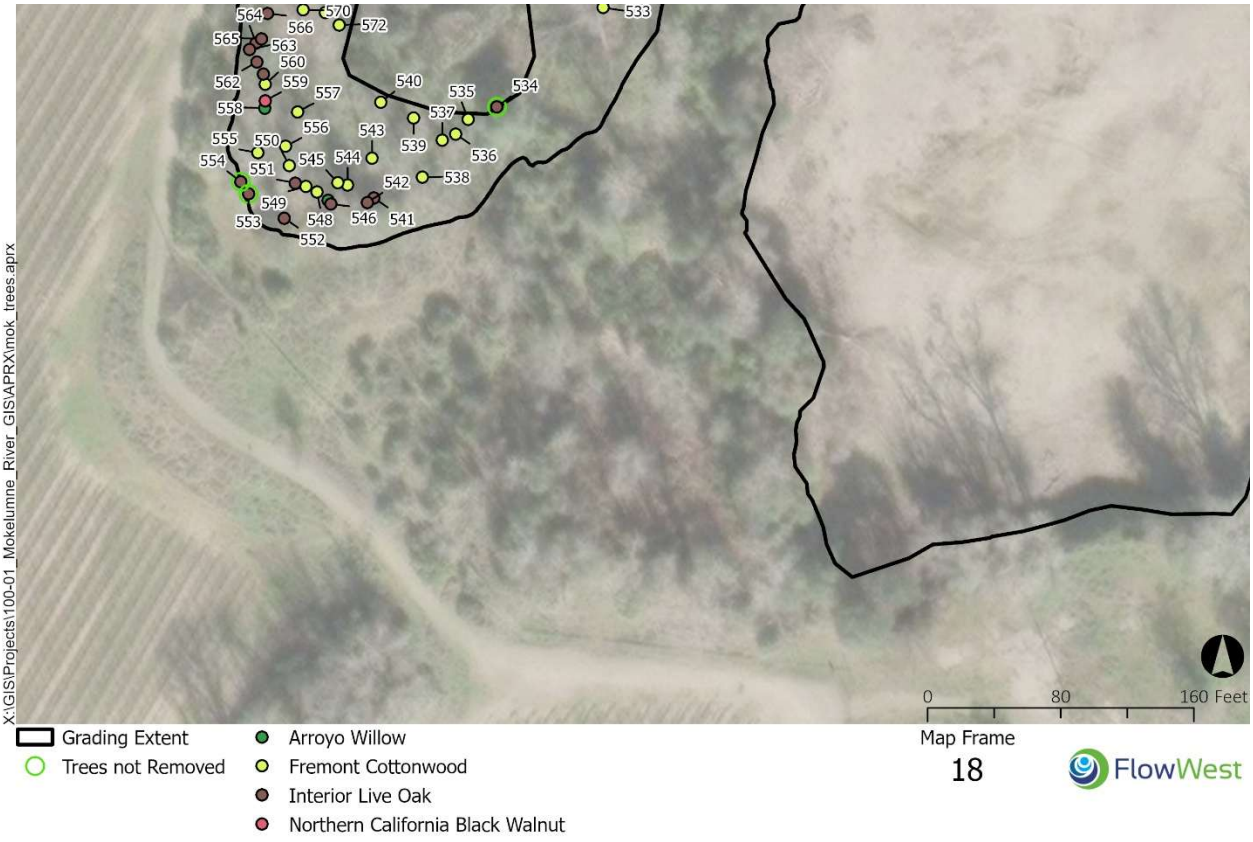
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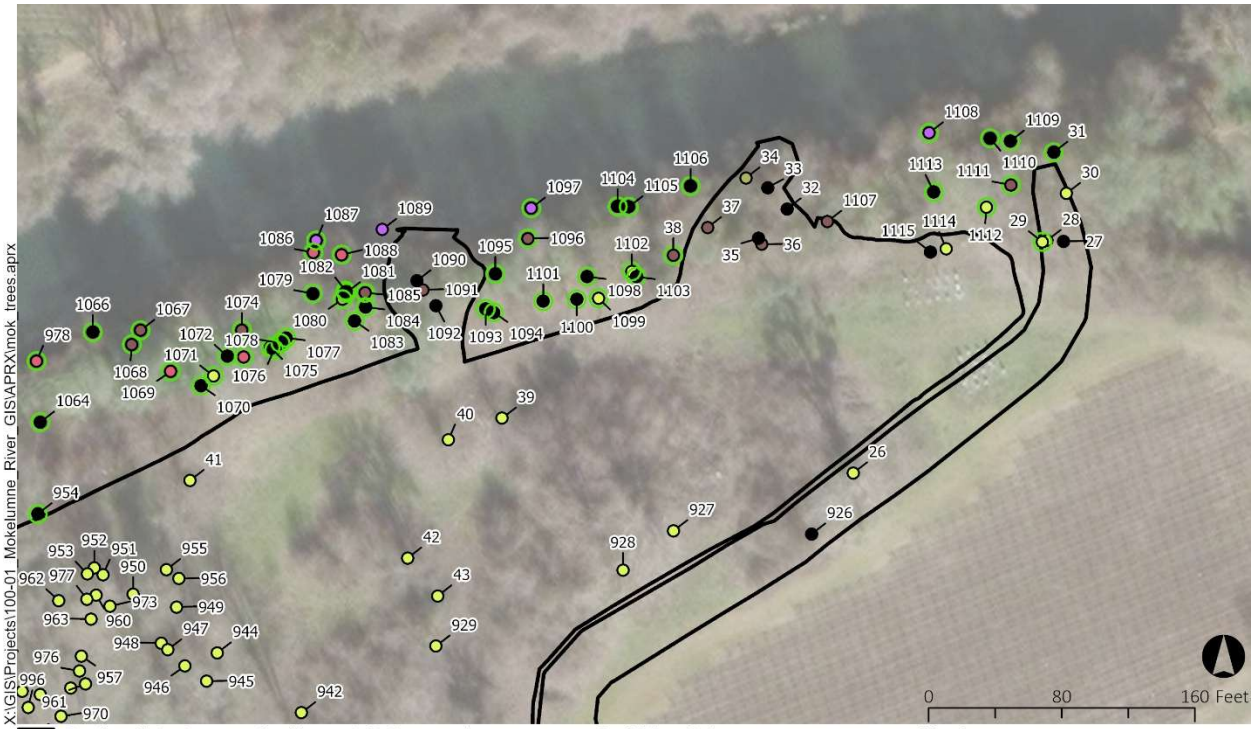


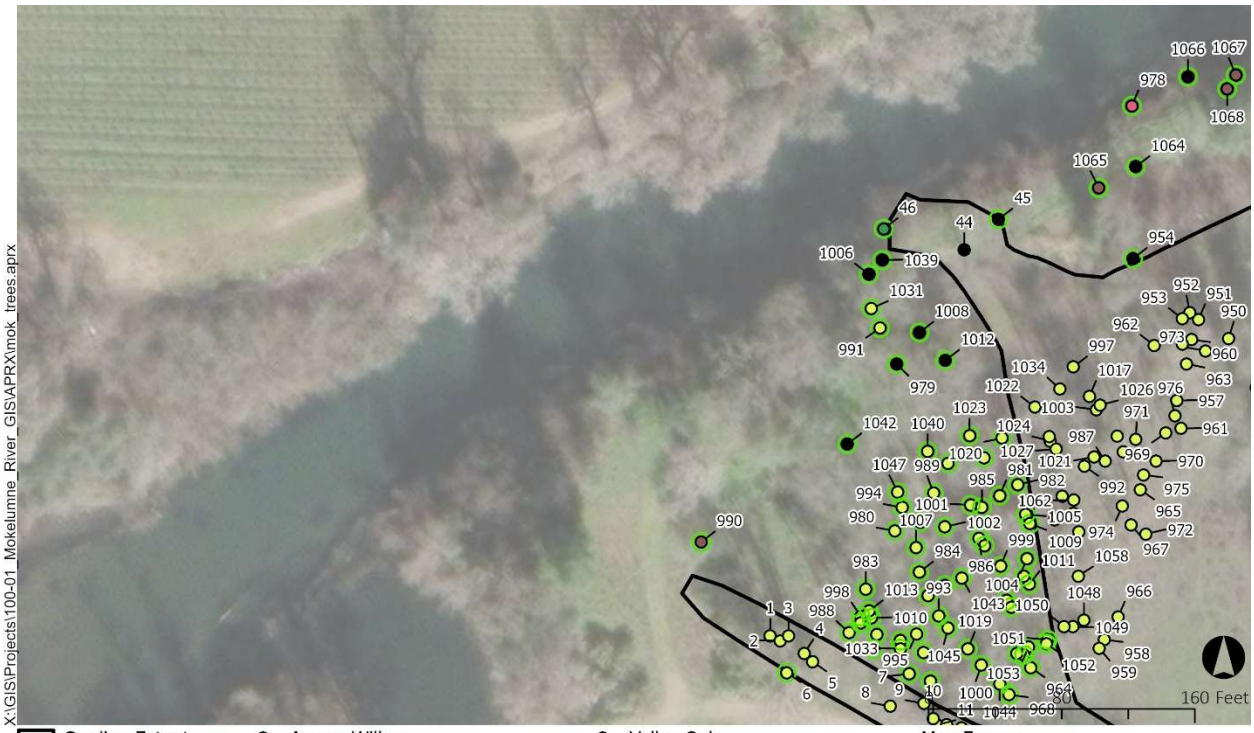
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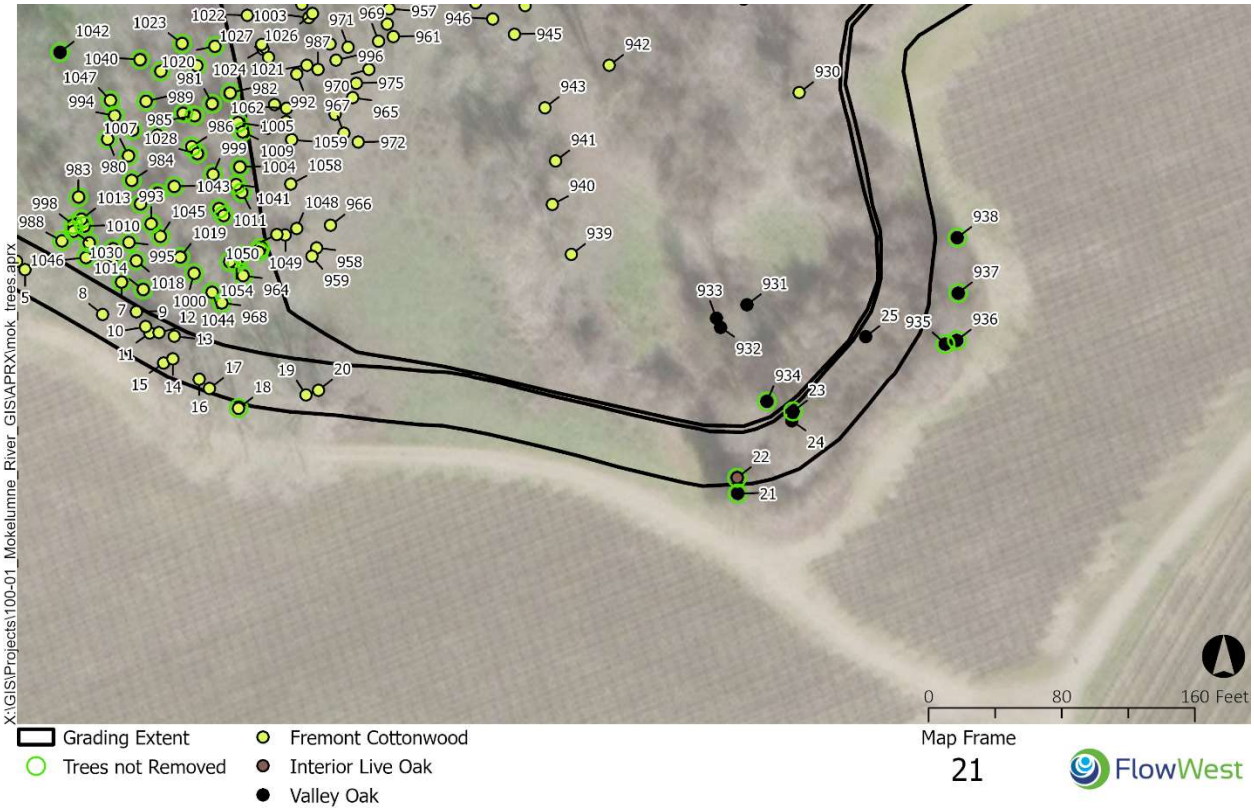
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FlowWest


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Trees not Removed
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Fremont Cottonwood
Interior Live Oak
Northern California Black Walnut
Map Frame
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FlowWest


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FlowWest


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FlowWest

APPENDIX C: HYDROLOGIC ANALYSIS AND HYDRODYNAMIC TECHNICAL MEMORANDUM

HYDROLOGIC ANALYSIS AND HYDRODYNAMIC MODEL

PREPARED FOR: East Bay Municipal Utility District

PREPARED BY: FlowWest

DATE: 2/17/2026

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1 PURPOSE

The purpose of this technical memorandum is to document the hydraulic and hydrological analyses performed as part of the Mokelumne River Floodplain Design and Permitting Project for East Bay Municipal Utility District (EBMUD). The project utilized a 2-D HEC-RAS model to evaluate the ecological and flood characteristics of proposed floodplain and riffle habitat features located along three river miles downstream of the Camanche Dam. The goal of the project is to improve salmonid spawning and rearing habitat in the river reach below the Camanche Dam.

2 HYDRODYNAMIC MODEL

2.1 MODEL PLATFORMS

HEC-RAS (v6.6, U.S. Army Corps of Engineers 2024) was chosen as the modeling platform because it is an industry standard, widely applied, and freely available modeling package that will facilitate ongoing updates without proprietary software. Additionally, HEC-RAS uses a "high resolution subgrid" 2-D model scheme where the geometric and hydraulic properties of each computational cell and cell face are based on the details of the underlying terrain (i.e., each cell face is treated as cross-section that stores continuous underlying topographic details). A high resolution subgrid enables larger cell sizes that can represent fine-scale features—saving valuable computation time relative to other 2-D models. Having been continually supported and updated since the first version was released in 1995, HEC-RAS continues to incorporate features and processing improvements that keep it relevant as an efficient and versatile modeling tool.

RAS 2025 (v0.1, U.S. Army Corp of Engineers 2025) was used to develop the 2D model meshes. RAS 2025 enables variable mesh cell geometry (triangular and quadrilateral), improved tools to orient cells in the direction of flow, as well as streamlined functionality for enforcing mesh breaklines and cell size. These features were utilized to fine-tune the model mesh to improve model accuracy and computation times. Meshes created in RAS 2025 were imported into HEC-RAS for all computations.

2.2 MODEL DOMAIN

The model domain extends along the Mokelumne River between Camanche Dam (RM 64) and the Highway 88 bridge crossing (RM 61). Figure 1 shows the model domain and constituents of the Digital Elevation Model used as the existing conditions terrain. Figure 2 shows the project sites (Day Use Area, Colburn Upstream, and Colburn Downstream) investigated using the model.

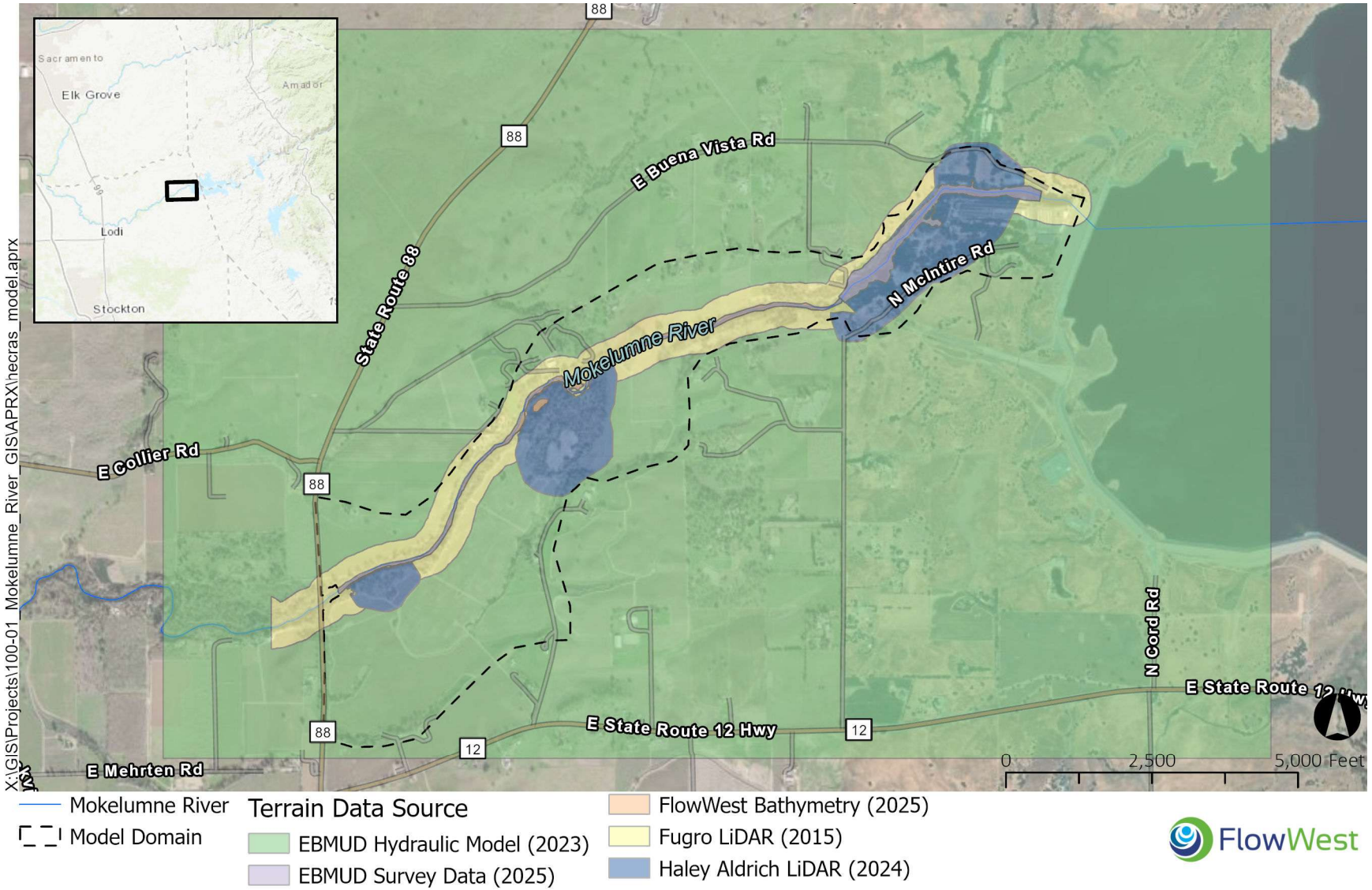


FIGURE 1. 2-D MODEL DOMAIN AND DEM COVERAGE

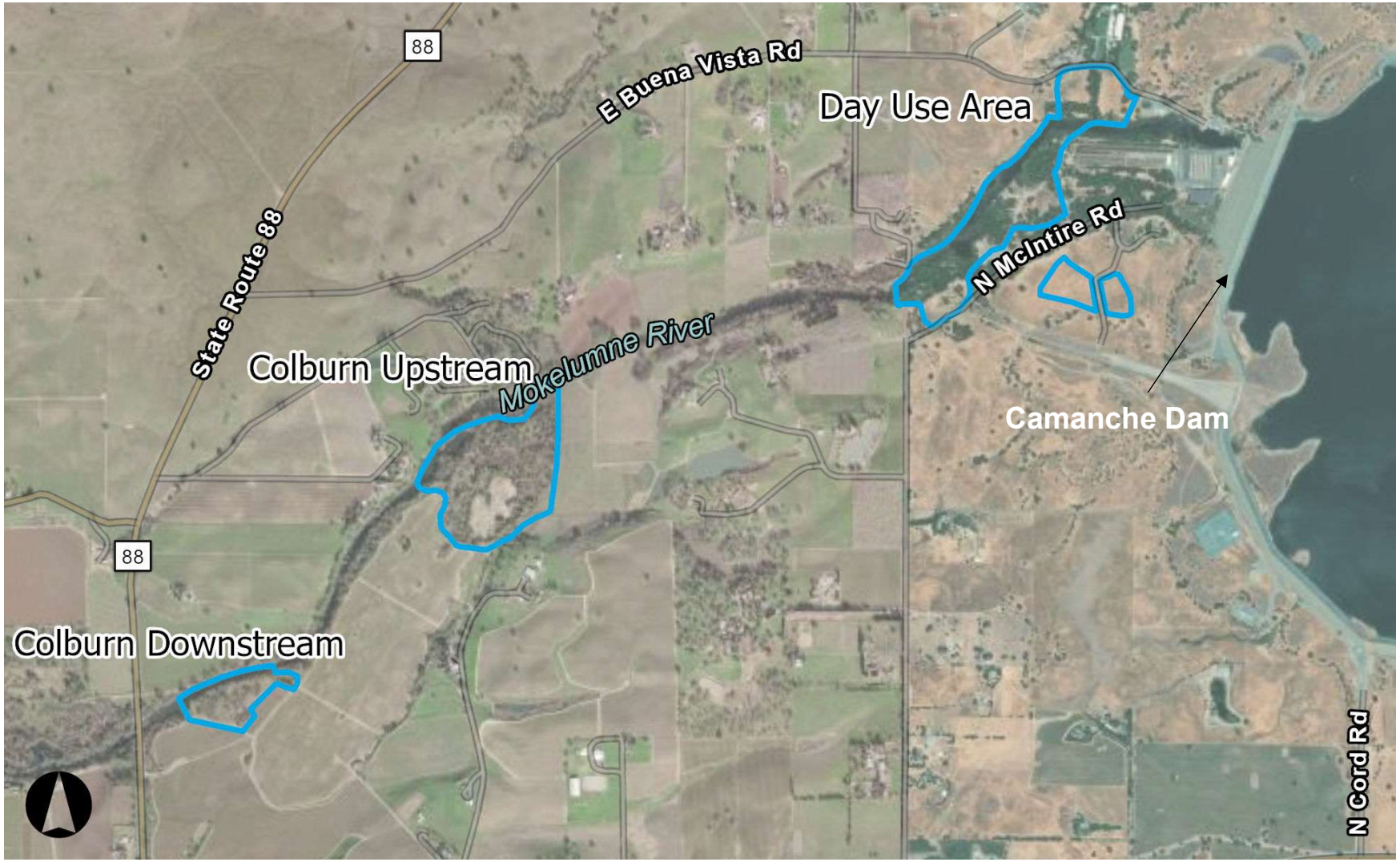


FIGURE 2: PROJECT SITES

2.3 Model Input Data

Data types and sources used in the development of this 2-D hydrodynamic model are summarized in Table 1 and described in the sections that follow.

TABLE 1. INPUT DATA SUMMARY

Input Data	Data Type	Date	Source
EBMUD Hydraulic Model	HEC-RAS Model, DEM	2023	EBMUD
EBMUD Day Use Area Survey	DEM	2025	EBMUD
FlowWest Bathymetric Survey	DEM	2025	FlowWest
Fugro LiDAR Survey	DEM	2015	Fugro
Haley & Aldrich Drone LiDAR Survey	DEM	2024	Haley & Aldrich
Project Design Topography	DEM	2026	FlowWest
Habitat Flows	Hydrology	2024	EBMUD
Historical Flows	Hydrology	1993-2025	EBMUD
Haley & Aldrich Aerial Imagery	Aerial Imagery	2024	Haley & Aldritch
USGS Aerial Imagery	Aerial Imagery	2022	USGS
Calibration WSEs	Water Surface Elevations	2025	EBMUD and FlowWest

2.4 Topography and Channel Bathymetry

Topography and channel bathymetry were derived from several sources (Figure 1). Aerial LiDAR was flown by Fugro Pelagros, Inc in 2015 covering a 200-meter wide corridor of the Mokelumne river (Fugro 2015). This data has been superseded in areas where more recent surveys have been performed. EMBUD carried out regular annual surveys of the Day Use Area near Camanche Dam. Haley & Aldrich flew drone-based aerial lidar of the Day Use Area and two Colburn sites near Highway 88 in December 2024. FlowWest performed a bathymetry survey with single beam sonar of the area downstream of the Day Use Area to just upstream of the Highway 88 Bridge in January 2025. Elevation data from the 2023 EBMUD hydraulic model is used in areas not covered by the other datasets; i.e. in the broader floodplain outside of proposed project work areas.

For more information on the surveys and processing procedures used to develop these datasets, refer to Fugro (2015) and FlowWest (2025).

2.5 Model Geometries

A 2-D model geometry is generally composed of a model mesh, a terrain created from bathymetric and topographic survey data, hydraulic structures, and a land cover layer. The 2-D geometries created for this project are summarized in the subsections below.

2.5.1 Baseline Model Geometry

The baseline model geometry is composed of a 2-D mesh covering the model domain shown in Figure 1. The mesh schema was developed in RAS 2025 with variable mesh size and cell geometry. The main channel is represented by quadrilateral 25-foot cells oriented in the direction of flow. Non-channel areas are represented by 25 to 100-foot triangular cells, with smaller cells in frequently inundated floodplains and larger cells in the overbank areas. Mesh region boundaries (the equivalent of break lines for RAS 2025) were drawn to align with terrain features such as the river thalweg, banks, levees, and floodplain terrain.

The upstream boundary condition line is located in the main channel at the base of Camanche Dam. The downstream boundary line was placed to coincide with the termination of the 2025 bathymetric survey near the Highway 88 bridge. No other boundary conditions are present in the geometry.

2.5.2 Alternatives Model Geometries

The proposed model geometry is based on the baseline geometry, with mesh regions and cell geometries modified to represent the proposed project gradings.

Mesh regions were altered to align break lines with the proposed topography. In addition, proposed side channel regions were revised from triangular cells to quadrilateral cells in the direction of flow.

2.6 Hydraulic Structures

There are no major hydraulic structures present within the model domain. Two 12” drainage pipes in the floodplain of the mid-reach project area were included in the existing conditions model to accurately simulate baseline condition flooding.

2.7 Land Cover and Roughness

Land cover polygons were digitized from USGS and Haley & Aldrich aerial imagery at 1:1000 scale, and selected from the land cover types presented in Table 2. Landcover polygon shapes are shown in Figure 3. Roughness values for each category are based on Chow (1959) and were adjusted during the calibration process.

TABLE 2. LANDCOVER CATEGORIES AND ASSOCIATED ROUGHNESS COEFFICIENTS

Land Cover	Manning's Roughness Coefficient
cobble	0.045
medium riparian	0.05
dense riparian	0.07
light riparian	0.042
woodland	0.06
orchard	0.055
grassland/agriculture	0.03
bare earth/developed	0.03
open water	0.038

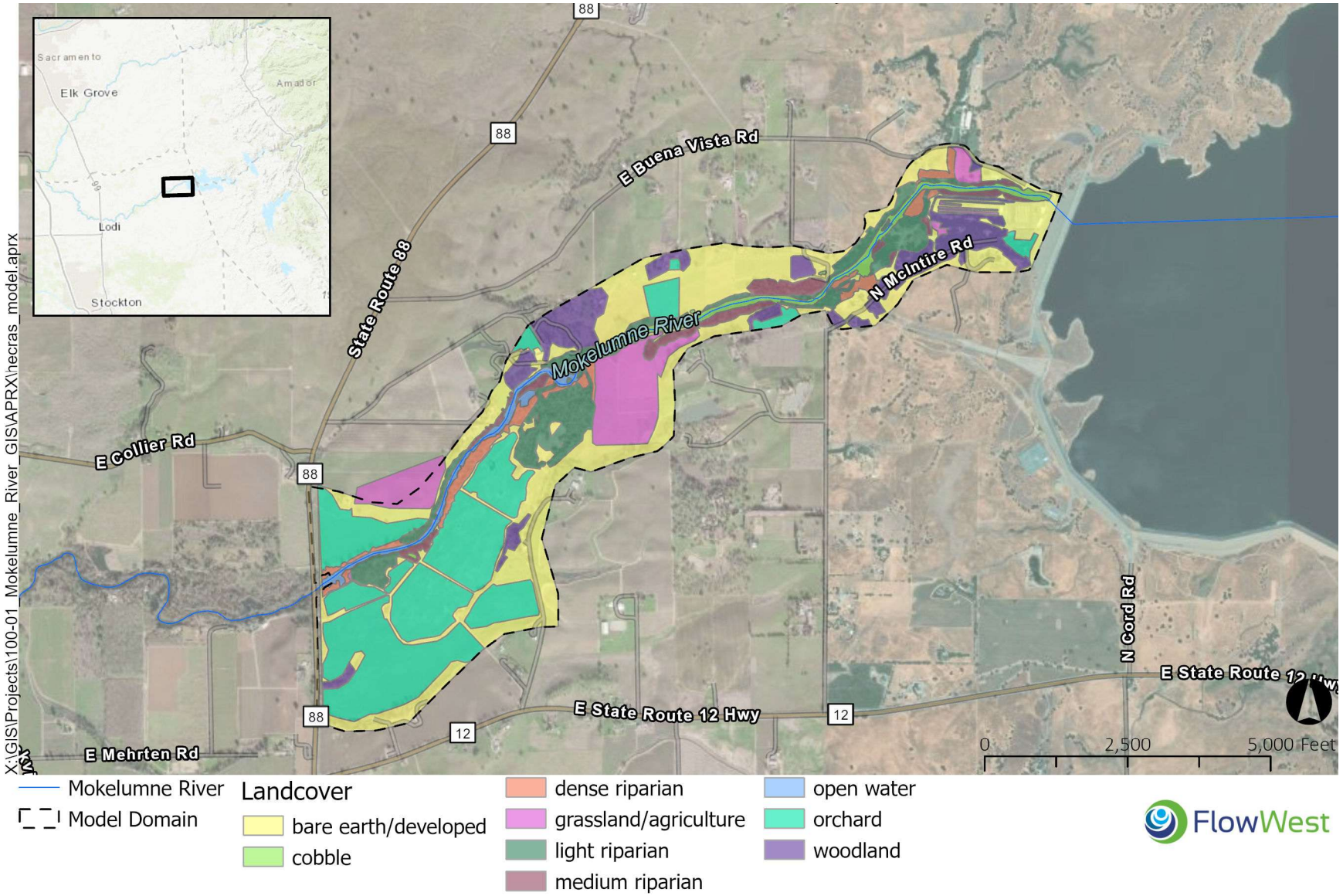


FIGURE 3: LANDCOVER POLYGONS

2.8 Hydrology and Boundary Conditions

Hydrodynamic models require user input of upstream and downstream boundary conditions to perform model runs. In a fluvial system, flow hydrograph boundary conditions (i.e., graphs of flow rate over a period) typically define the upstream and lateral flow input locations along a river or stream. The downstream boundary condition could be a rating curve (i.e., a graph of Water Surface Elevation (WSE) versus flow) or a normal depth (i.e., uniform flow conditions are assumed, and WSE is calculated using the Manning's equation.

The model includes an upstream boundary condition at the Camanche Dam that inputs flow into the model. Flows from Murphy Creek are not included in the model due to its ephemerality. A normal depth boundary is located at the downstream end of the model.

2.8.1 Upstream Flows

All flow inputs are HECRAS Unsteady Flows, as required by 2-D models. To achieve steady state conditions for each flow of interest, flows are structured as stepped hydrographs with each flow held for 4-6 hours to allow WSEs to stabilize across the model domain.

2.8.1.1 Peak Annual Return Interval Flows

Since flows into the study reach are released directly from Camanche Dam, the system's flows are not well represented by standard stochastic methods. The maximum release from Camanche dam during normal operation is 5,000 cfs, which is used as the maximum modeled flow instead of Peak Return Interval flows. This study did not analyze emergency dam operations for flows in excess of 5,000 cfs.

For reference purposes, the Bulletin 17C analysis Peak Annual Return Interval flows from EBMUD Gage "Below Camanche" during Water Years 1995 to 2025 have been tabulated in Table 3.

TABLE 3. BELOW CAMANCHE PEAK ANNUAL RETURN INTERVAL FLOWS

Percent Chance Exceedance	Recurrence Interval (years)	Flow (cfs)
1%	100	9,390
2%	50	7,690
5%	20	5,841
10%	10	4,604
20%	5	3,417
50%	2	1,795
80%	1.25	823

In addition to the stepped hydrograph described above, a hydrograph with both a rising and fall limb was used to analyze drainage characteristics of the floodplain. This hydrograph peaks at 5,600 cfs and recedes to 200 cfs.

2.8.1.2 Fish Habitat Flows

Similarly to peak flows, habitat flows for the study reach are determined primarily by dam releases. Releases from Camanche dam have been programmatically set by the Mokelumne River Tributary Specific Science plan as part of the Healthy Rivers and Landscape agreement (EBMUD, 2025).

TABLE 4: HABITAT FLOWS

Project Flow	Flow (cfs)
Baseflow	325
Low Floodplain Inundation	900
High Floodplain Inundation	1500
Maximum Release	5000

2.8.1.3 Calibration and Validation Flows

Flows for calibration are from two days where releases from Camanche dam were stable and corresponding water surface elevations were sampled at key project locations within the study reach

TABLE 5: CALIBRATION FLOWS

Sample Date	Flow (cfs)
January 30, 2025	325
April 25, 2025	1125

The EBMUD stream gage station "Below Camanche" was used for model validation. The gage is located at latitude 38.2205555, longitude -121.038611, downstream of the Day Use Area project site. Historical flows from 1993 to 2025 were used to create a rating curve fitted to a power function. The fitted curve and 95% prediction interval are shown in Figure 4.

Sections 2.9 and 2.10 detail the calibration and validation procedures.

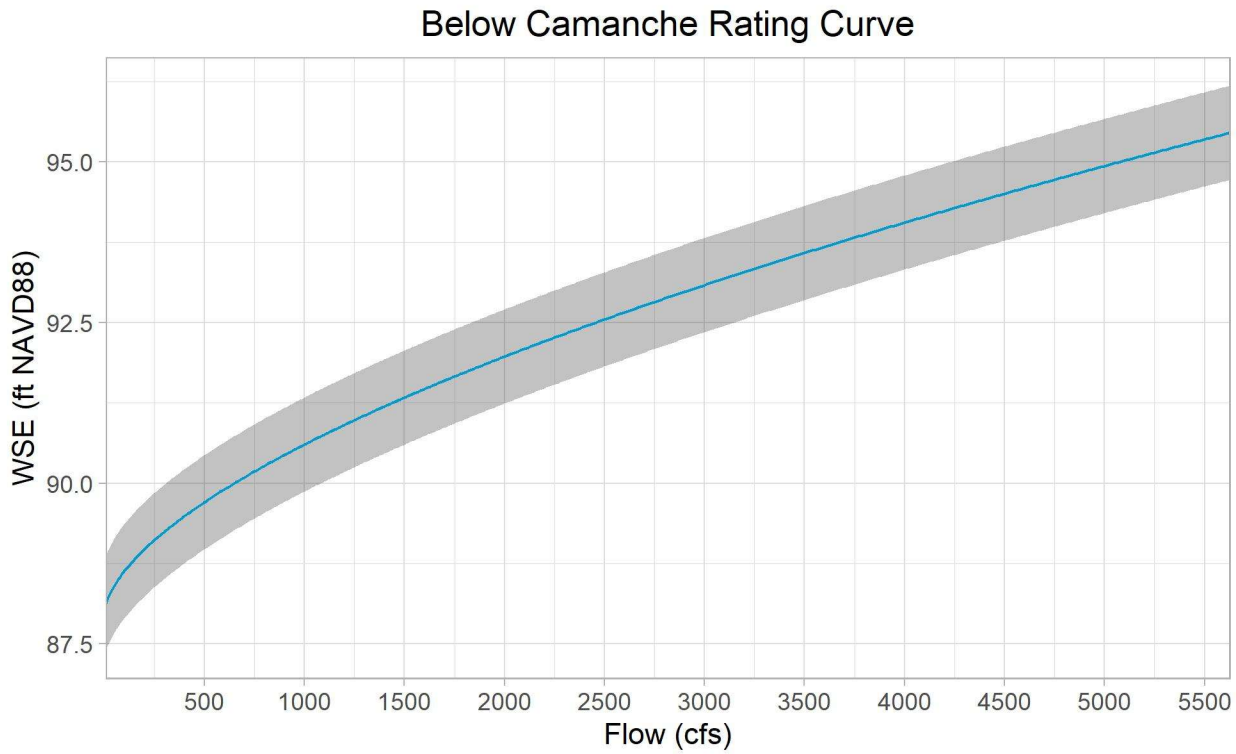


FIGURE 4: BELOW CAMANCHE RATING CURVE

2.8.2 Downstream Boundary

A downstream boundary condition is required to solve the differential equations used by the HEC-RAS model. Ideally, it is defined as known water surface elevations corresponding to the flows of interest. However, continuous stream gage monitoring was not available at the downstream end of the model domain.

Instead of a rating curve, a normal depth boundary was used. The slope of the normal depth boundary was set to the average channel thalweg slope of the next 1000 feet of the channel, or 0.0003 ft/ft. The sensitivity of the model results to the downstream boundary condition is investigated and summarized in the Model Sensitivity section.

2.9 Model Calibration

Observed WSEs paired with flows listed in Table 5 were used to calibrate the model. The 325 cfs flow was used to calibrate baseflow conditions and the 1125 cfs flow for calibrating floodplain inundation. Model roughness values of the central channel (classified as open water or cobble) were adjusted to longitudinally fit modeled WSEs to observed WSEs.

Figure 5 below shows the model results after calibration. Solid lines indicate modeled WSEs and dots represent discrete observed WSEs during the respective flow event. The channel bed is shown in black. Note that calibration data for the 325 cfs flow was only available downstream of the Day Use Area project site, beginning 5,000 ft downstream of Camanche Dam.

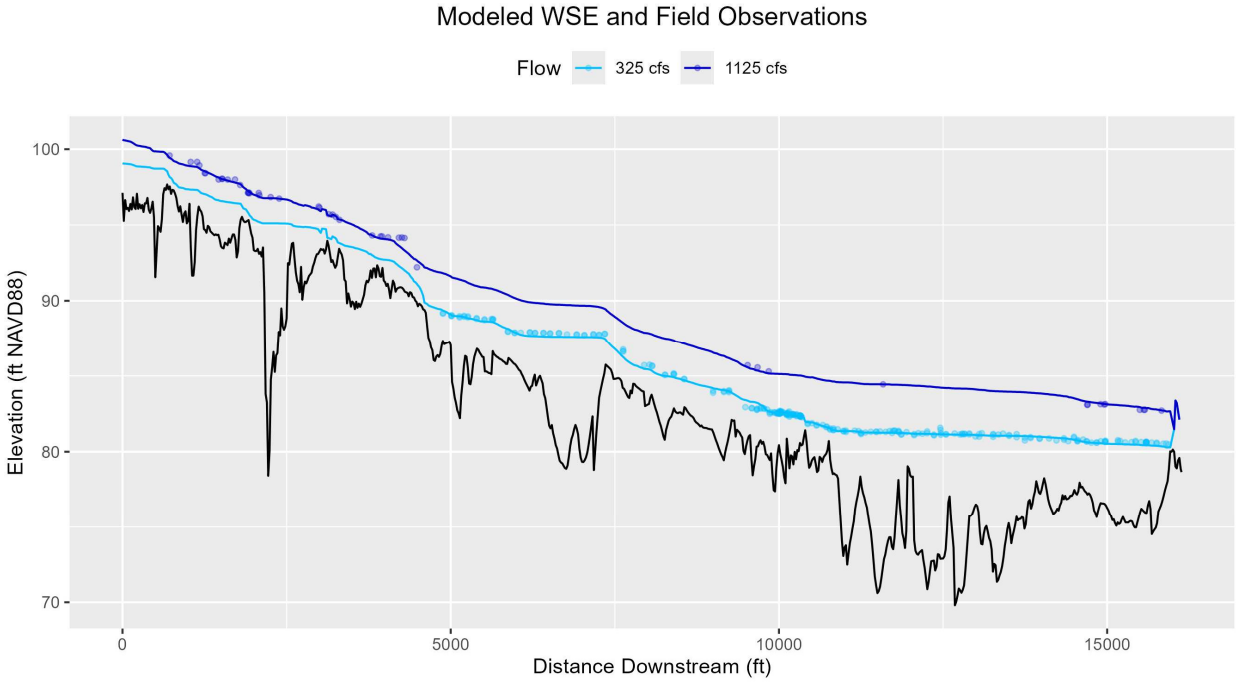


FIGURE 5: CALIBRATION OF MODEL LONGITUDINAL PROFILE

2.10 Model Validation

The model was validated using the rating plot developed for the Below Camanche stream gage. Modeled WSEs are within approximately 0.5 ft of the rating curve values for the flows of interest (325-1500 cfs), and also within the 95% prediction interval. Modeled WSEs skew slightly above the predicted interval values for higher flows. Since the model overpredicts WSEs at higher flows by about 1 foot, it will give a conservative result for flood-related analyses performed.

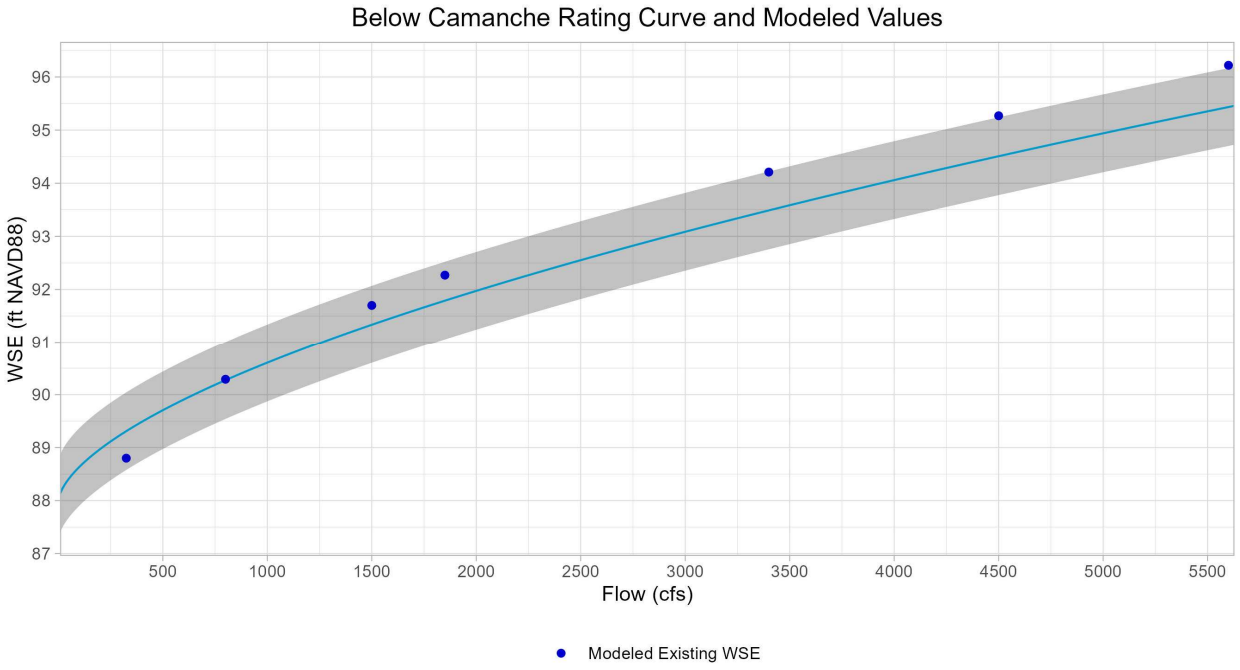


FIGURE 6: RATING CURVE VALIDATION

2.11 Model Sensitivity

Model sensitivity analyses are methods used to investigate how variation in model input parameters influence model results and therefore evaluate model uncertainty. The primary purposes are to identify what input factors have the most influence on model output, the extent over which these influences are significant, and what input factors might be insignificant. This is an important aspect of responsible hydraulic model development because it acknowledges the variable nature of model input parameters and provides a metric by which to identify input parameters that require more study to improve model results.

2.11.1 Manning's Roughness Coefficient

Model sensitivity to Manning's roughness coefficient values for landcover categories was tested by running the two calibration flows (325 and 1125 cfs) with all Manning's roughness coefficients adjusted by ±15% and comparing results to results under baseline roughness values. Figure 7 shows how much WSE varied from baseline along the river thalweg through the entire model domain, for both flows and both varied roughness conditions. At the low calibration flow of 325 cfs, WSE deviated at most 0.25 feet for both the increased and decreased roughness. At the high calibration flow of 1125 cfs, WSE deviated less than 0.5 feet for both increased and decreased roughness. At both flows decreases in roughness led to slightly higher deviations from baseline WSE than increases in roughness.

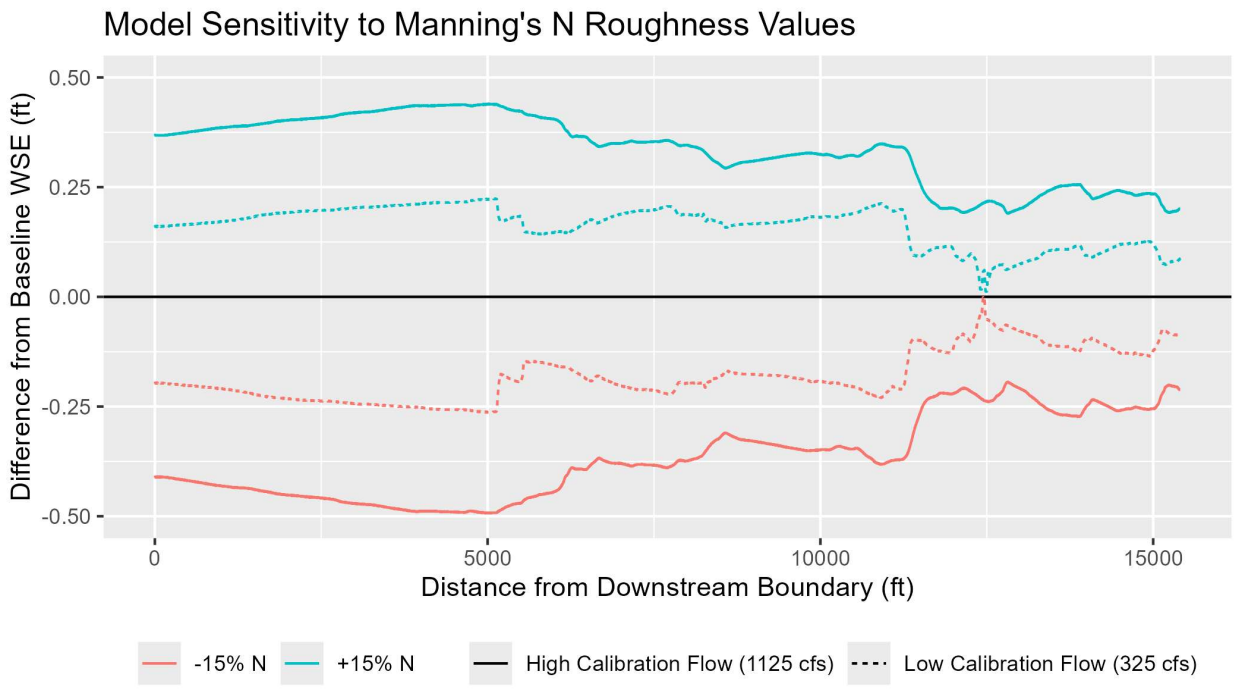


FIGURE 7: MODEL SENSITIVITY TO MANNING'S ROUGHNESS COEFFICIENTS, AS SEEN THROUGH WSE DIFFERENCES FROM STANDARD MODEL, ALONG RIVER THALWEG. 0 FT ON X-AXIS REPRESENTS DOWNSTREAM BOUNDARY OF MODEL, 15,000 FT ON X-AXIS REPRESENTS UPSTREAM BOUNDARY OF MODEL.

2.11.2 Downstream Boundary Friction Slope

The sensitivity of the model to the selected friction slope for the downstream normal depth boundary was tested by varying the friction slope by ±25% and comparing results to results using the baseline friction slope. Figure 8 shows how much WSE varied from baseline along the river thalweg through the entire model domain, for both flows and both varied friction slope conditions. WSE differences converge to zero approximately 6,000 and 8,000 feet upstream of the downstream boundary at the low and high calibration flows, respectively. The maximum difference from baseline WSE is less than 0.2 feet for both conditions at the low calibration flow. The maximum difference from baseline WSE is less than 0.4 feet for both conditions at the high calibration flow. At both flows, increased friction slope led to higher differences from baseline WSE than decreases in friction slope.

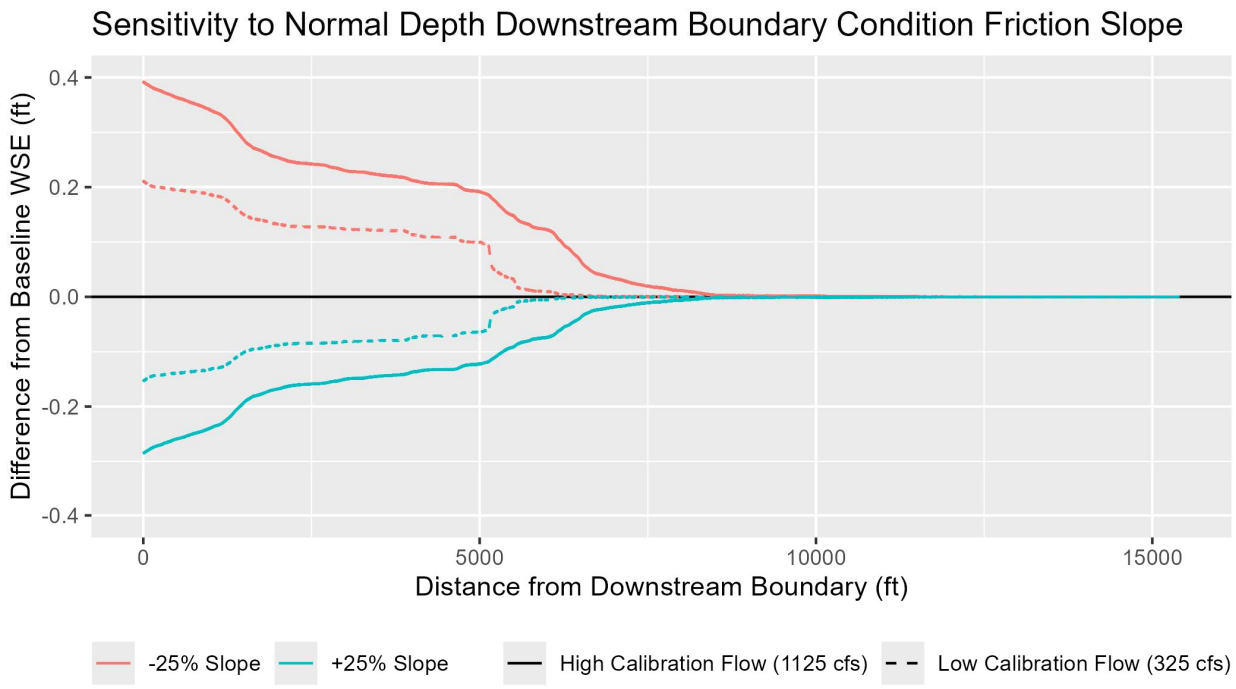


FIGURE 8: MODEL SENSITIVITY TO FRICTION SLOPE VALUE AT NORMAL DEPTH DOWNSTREAM BOUNDARY CONDITION, AS SEEN THROUGH WSE DIFFERENCES FROM STANDARD MODEL, ALONG RIVER THALWEG. 0 FT ON X-AXIS REPRESENTS DOWNSTREAM BOUNDARY OF MODEL, 15,000 FT ON X-AXIS REPRESENTS UPSTREAM BOUNDARY OF MODEL.

2.12 Model Limitations and Data Gaps

As noted in the calibration and validation sections, the model tends to underpredict WSEs at very low flows (less than 325 cfs) and overpredict at higher flows (greater than 1500 cfs). This could impact the height of setback levees designed by the project, but since the error is conservative and within one foot it has been determined to be acceptable. In addition, since 325 cfs flow data was only available downstream of the Day Use Area, model results at baseflows within the Day Use Area contain additional uncertainty.

During calibration, it was observed that WSEs at the downstream end of the study reach were artificially high due to a backwater effect created by the transition between FlowWest's new sonar-based bathymetry the older Fugro LiDAR bathymetry. At this transition, sonar bathymetry produced deeper bathymetry than observed in the old LiDAR dataset. To avoid this artificial backwater effect, we trimmed the model domain to end before the sonar-LiDAR transition.

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APPENDIX D: GEOMORPHIC REPORT

GEOMORPHIC ASSESSMENT AND SURVEY

PREPARED FOR: East Bay Municipal Utility District

PREPARED BY: FlowWest

DATE: 1 June 2026

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1 PURPOSE

The purpose of this technical memorandum is to characterize the geomorphic condition of the project reach of the lower Mokelumne River downstream of Camanche Dam and to evaluate the physical processes that govern its form. This study was performed to support the Mokelumne River Floodplain Habitat Restoration Project.

2 WATERSHED CHARACTERIZATION AND SEDIMENT SUPPLY

This section describes the watershed setting that controls water and sediment delivery to the project reach. It summarizes the flow regime and the degree to which it has been altered by upstream storage, characterizes the supply and grain size of sediment reaching the reach, and reviews the geomorphic consequences of reservoir impoundment.

2.1 HYDROLOGY

Flows in the Mokelumne River below Camanche Dam are impaired. Flows from the upper tributaries, including the North Fork, The Middle Fork, and the South Fork are impounded in reservoirs at the Pardee and Camanche Dams.

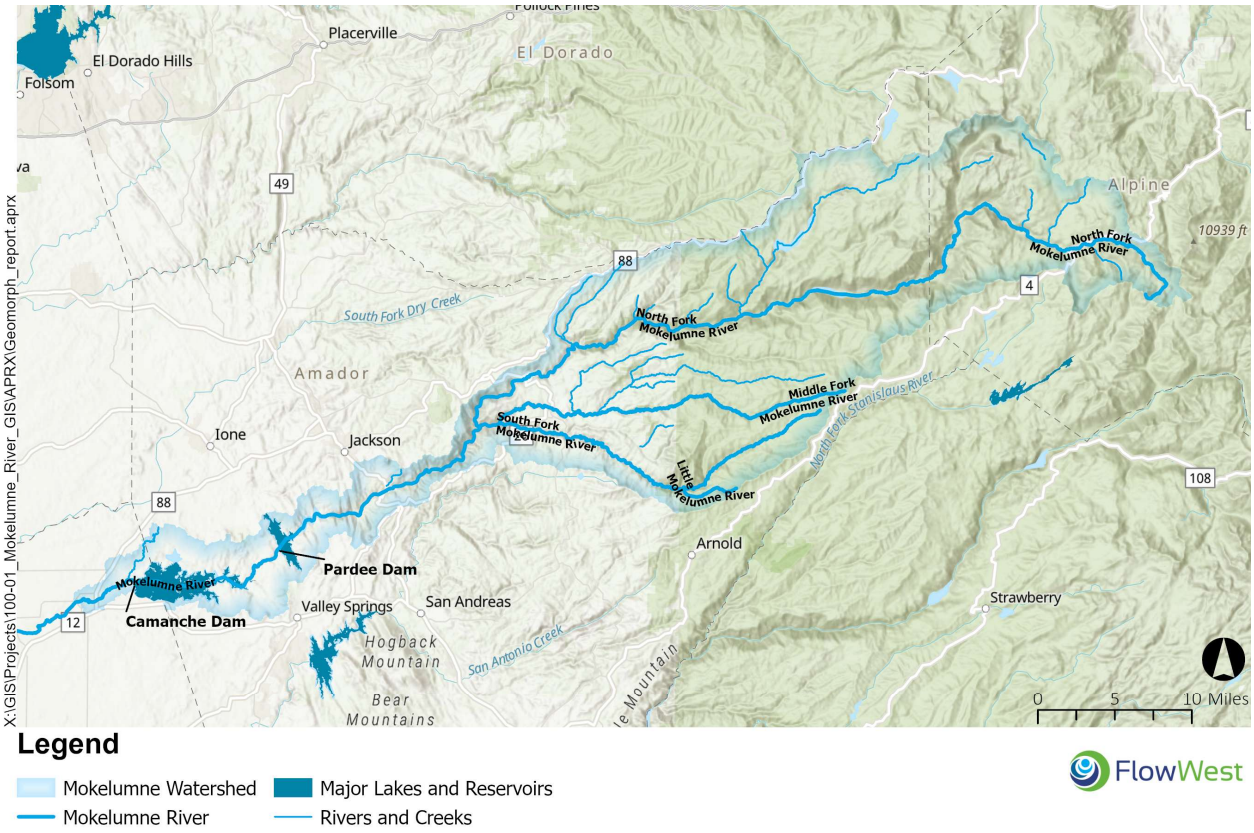


FIGURE 1: MOKELUMNE RIVER WATERSHED

Baseflows downstream of Camanche Dam range from 250-325 cfs. The maximum scheduled release is capped at 5000 cfs, which has not been exceeded in previous 30 years (See Figure 2 below). In comparison, the gage at Mokelumne Hill (USGS Gage 11319500) upstream of the Pardee Reservoir

averages 385 cfs over the same period and has regularly exceeded 10,000 cfs or more. The computed percent exceedance flows below and above the dams are compared below in Table 1.

Pulse flows released from Camanche dam are mandated by the Joint Settlement Agreement depending on Water Year Type and typically range from 1000 to 4000 cfs.

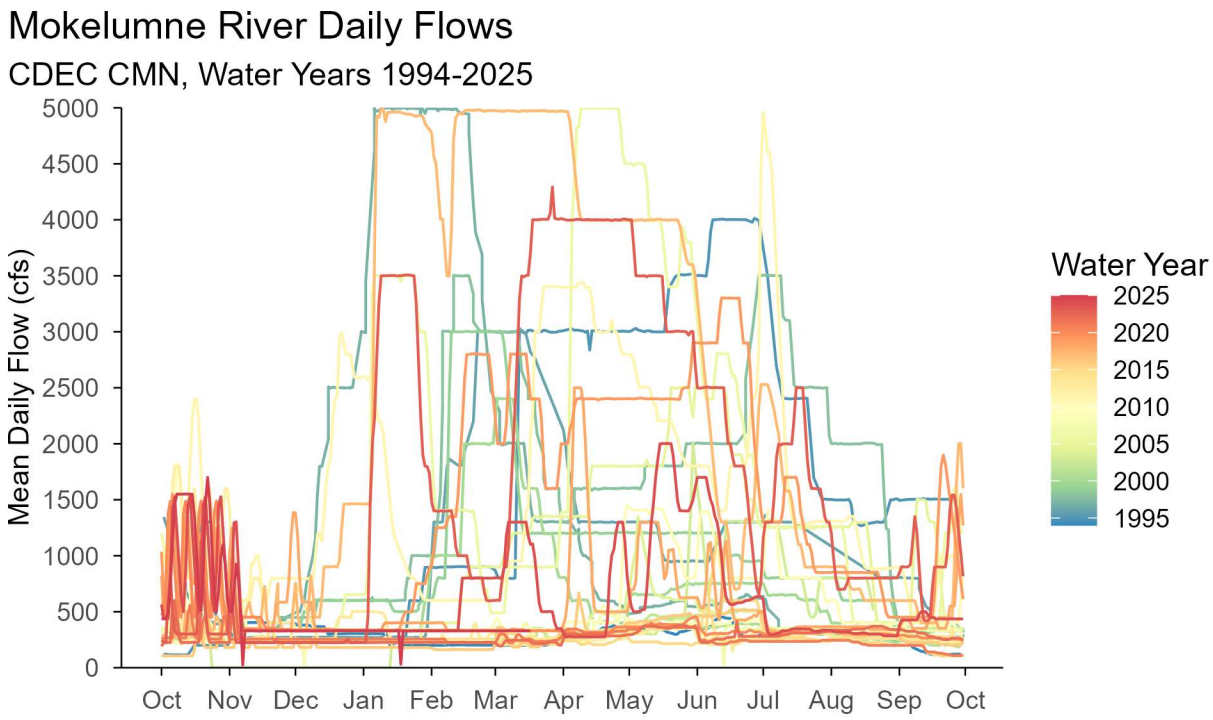


FIGURE 2: MOKELUMNE RIVER FLOWS BELOW CAMANCHE 1994-2025

TABLE 1: MOKELUMNE RIVER PERCENT EXCEEDANCE FLOWS

Percent Chance Exceedance	Recurrence Interval (years)	Below Camanche Flow (cfs)	Mokelumne Hill Flow (cfs)
1%	100	9,390	59,000
2%	50	7,690	45,000
5%	20	5,841	30,000
10%	10	4,604	21,000
20%	5	3,417	13,700
50%	2	1,795	6,000
80%	1.25	823	2,640

2.2 Sediment Supply

The project reach's coarse-sediment supply is fundamentally altered by upstream impoundment. In regulated rivers, dams trap virtually all bedload originating upstream, so sediment-starved flow released downstream tends to erode the channel bed and banks, producing channel incision, bed-material coarsening, and progressive gravel loss (Merz et al., 2006). On the lower Mokelumne River specifically, flow regulation has disconnected the channel from its floodplain, and once-active alluvial deposits below Camanche Dam are now armored by vegetation established under the regulated flow regime (Wheaton et al., 2004, p. 23).

As is discussed further in this section, historical gold and aggregate mining compounded this effect by removing hundreds of thousands of tons of gravel from the reach, and the combination of mining legacy and post-dam sediment trapping has left the reach chronically deficient in spawning-sized substrate (EBMUD, 2014, p. 2-1). This deficit has been quantified at roughly 52,000 to 61,000 cubic yards (CY) of accrued bedload shortfall in the first kilometer below Camanche Dam since Pardee Dam's completion in 1929 (Wheaton et al., 2004, p. 23).

2.3 Impacts of Gold Mining

The Mokelumne River corridor in the Sierra foothills was extensively reworked by placer and dredge mining, beginning in the Gold Rush and continuing well into the twentieth century. The Camanche Reservoir lies within the historical Camanche-Lancha Plana mining district, which extended downstream as far as Clements (Clark, 1970, p.33) and included most of the project reach. River gravels were first worked by in-stream placer mining early in the Gold Rush (from 1849), followed by hydraulic mining of the adjacent terrace gravels later reworking of the tailings, and finally dragline and bucket-line dredging that continued until 1951 (Clark, 1970, p.33).

These operations excavated and re-sorted river and floodplain gravels generally 6 to 50 feet deep, leaving highly permeable dredge tailings substrate still mapped as a distinct geologic unit along the river (California Department of Water Resources, 2003).

Additionally, dredging characteristically leaves a pitted floodplain of excavation ponds and windrowed tailings. The pits present within the project reach may be from a combination of relict dredge workings and/or subsequent aggregate extraction (gravel mining). When inundated during flood flows, there is a risk of the active channel capturing a deep off-channel pit. This could not only reconfigure the alignment of the river channel, but additionally, the lowered base level and trapping of incoming bedload can drive headward and downstream incision (Kondolf, 1997).

2.4 Impacts of Reservoir Impoundment

Pardee Dam was built in 1929 while Camanche Dam, farther downstream from Pardee Dam and immediately upstream of the project site, was built in 1964.

Dams trap the sediment delivered from upstream while continuing to pass water, so releases emerge starved of sediment. This “hungry water” (Kondolf, 1997) carries transport capacity in excess of its sediment load and tends to recover that load by eroding the channel downstream, producing bed degradation (incision) and bank erosion. As the flow preferentially entrains finer material, the surface coarsens into an armor layer, and where the deficit is severe the supply of mobile gravel (including spawning-sized material) declines. These effects are most pronounced immediately below the dam; they attenuate downstream as tributary inflow, bank erosion, and bed erosion reintroduce sediment. The ongoing gravel augmentation program discussed in the next section is designed to counteract these effects.

Flow regulation also complicates the sediment impacts of the reservoir. By truncating flood peaks, dams reduce the transport capacity available to mobilize the bed, which can limit incision but also allows riparian vegetation to encroach and the channel to narrow (Williams & Wolman, 1984; Kondolf, 1997).

2.5 Gravel Augmentation

Augmentation to offset the coarse sediment deficit began in 1990, when EBMUD placed approximately 500 cubic yards (CY) of gravel just below the fish barrier fence downstream of Camanche Dam, followed by roughly 300 CY near Murphy Creek in 1992 (EBMUD, 2014, p. 2-2). Placements continued through the 1990s and early 2000s, including 500 CY at the Mokelumne River Day Use Area (MRDUA) in 1993, approximately 650 CY at three sites in 1996, approximately 1,500 CY (1 to 8 inches diameter) at three sites in 1997, approximately 1,200 CY in 1998, approximately 3,200 CY at MRDUA in 1999, and approximately 1,200 CY (2000), 1,800 CY (2001), 2,100 CY (2002), and 2,300 CY (2003) (EBMUD, 2014, p. 2-2). The 1999 placement of 3,200 CY of washed floodplain gravel was subsequently used as a case study to test 2D hydrodynamic model-based design methods for the reach (Pasternack et al., 2004).

Beginning in 2001, EBMUD and UC Davis formalized placement design under the Spawning Habitat Integrated Rehabilitation Approach (SHIRA), coupling 2D hydrodynamic modeling with sediment-mobility and habitat-suitability criteria (EBMUD, 2014; Pasternack, 2006). This produced a three-phase rehabilitation plan for the reach immediately below the dam. Phases 1 and 2, covering the first 0.55 mi below Camanche Dam (Figure 3), were completed by 2012 with the addition of 23,000 CY of gravel (Bilski, 2013; EBMUD, 2014, p. 2-3). Design work for the 2011-2012 placements identified enough available slope to extend rehabilitation an additional 0.3 river miles through the MRDUA; this Phase 3 extension was completed by 2016 with the addition of 3,300 CY (FlowWest, n.d.).

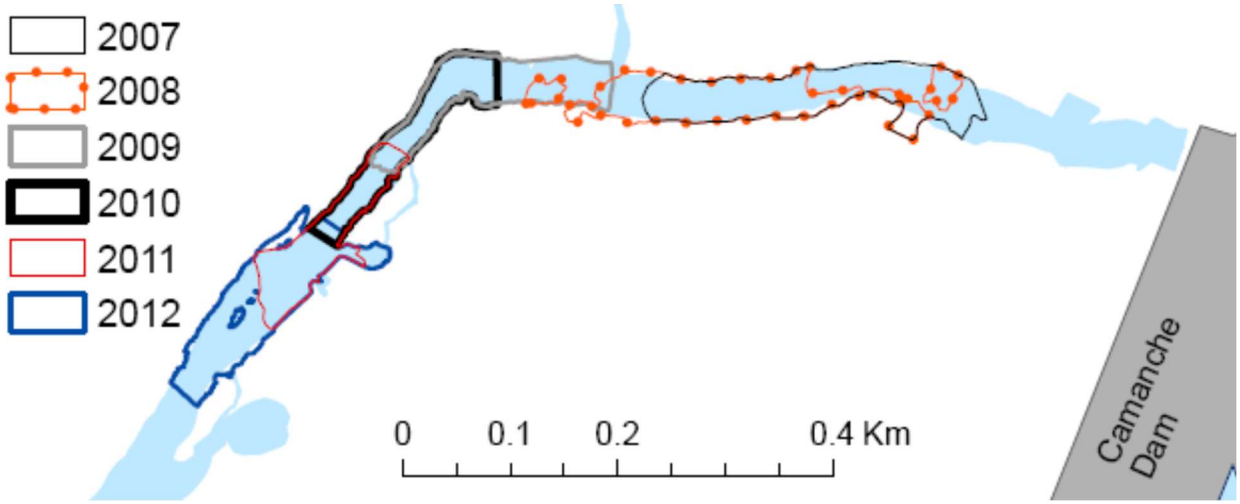


FIGURE 3. MAP OF PHASE 2 GRAVEL PLACEMENT 2007-2012 (SOURCE: BILSKI, 2013)

Since Phase 3 completion, augmentation has shifted to an annual maintenance regime targeting volume losses from scour and deflation rather than new habitat construction. Each phase has required roughly 300-1,000 CY of maintenance gravel per year across the 1-mile reach, guided by annual topographic remapping. A cumulative 5,500 CY has been placed under this maintenance program since 2016, and EBMUD has secured maintenance funding through 2031 (FlowWest, n.d.).

2.5.1 Sediment Size

Gravel size was characterized annually through pebble counts and grouped into three size classes described by Bilski (2013) as “loads of small gravels generally ranging in size from 6.4 to 25.4 mm (0.25 -

1.0 in) in diameter, loads of medium gravels having a median diameter of 38.1 mm (1.5 in), and loads of large gravels generally ranging in size between 50.8 and 101.6 mm (2.0 - 4.0 in) in diameter" (Bilski, 2013, p. 3). The size class delivered varied by year: 2007 and 2012 were dominated by small gravels, 2008 and 2009 by medium gravels, and 2010 almost entirely by large gravels, while 2011 used an intentional blend of all three classes (Bilski, 2013, p. 6, Table 2). These year-to-year changes in sediment size were driven by available sediment supply from quarries.

FlowWest conducted spot pebble counts of spawning gravels in the field in 2026, which are presented later in this report.

2.5.2 Sediment Sources

Sourcing has shifted over the program's history. Early placements used pre-washed, smooth, uncrushed river rock from an onsite floodplain quarry with minimal size variability across placements dating to 1991 (Wheaton et al., 2004, p. 23). That in-basin source is no longer available in sufficient supply, and current gravel is drawn from a mix of in-basin quarries, out-of-basin quarries, and remnant cobble piles on an approximately 3-acre EBMUD parcel in the Camanche Reservoir watershed thought to derive from reservoir construction or historical aggregate mining (EBMUD, 2014, p. 2-6).

2.6 LONGITUDINAL PROFILE

Figure 4 shows the longitudinal profile of the Mokelumne River and its forks. The upper panel presents the drainage network in plan view, with the mainstem and the North, Middle, and South Forks distinguished by color; the lower panel plots channel elevation against distance upstream from the confluence with the San Joaquin River. The profile is characteristic of a regulated foothill river. Downstream of the dams the mainstem (red) is very low gradient, falling from roughly 50 ft to near sea level over approximately 65 river miles, and the project reach lies within this gently sloping segment. The step in the profile at Pardee Dam marks the transition from the impounded reach to the steeper, more confined channel upstream. Above the forks confluence (RM 90), gradient increases sharply, the three forks each climbing several hundred feet over a short distance, with the North Fork extending farthest upstream (to RM 156 and roughly 800 ft). The project reach occupies the low-energy portion of the system, downstream of the two dams that now intercept the coarse sediment supplied from the steep upper watershed.

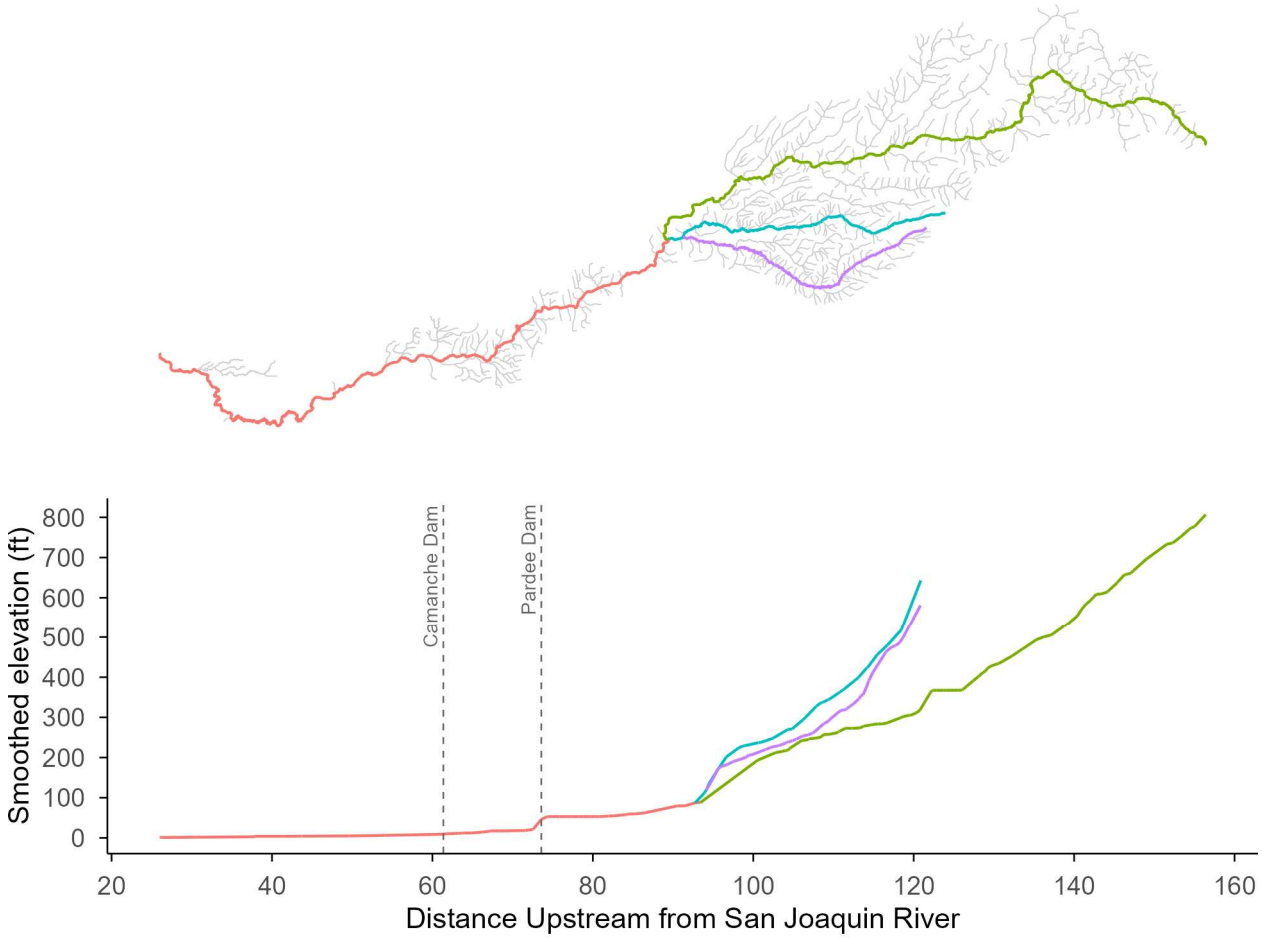


FIGURE 4. LONGITUDINAL PROFILE OF MOKELUMNE RIVER AND TRIBUTARIES

3 GEOMORPHIC ASSESSMENT OF PROJECT REACH

This section characterizes the geomorphic condition of the project reach within the watershed context established above. It begins with the longitudinal profile, which locates the reach within the broader river system, and proceeds through channel geometry and bank condition, planform and morphological unit composition, and evidence of temporal change and active erosion. The characterization draws on a combination of existing survey data, two-dimensional hydraulic model output, remotely sensed imagery, and field observation.

3.1 SITE OBSERVATIONS OF CHANNEL FORM AND PROCESS

FlowWest conducted field reconnaissance of channel condition on 16 June 2026. This section summarizes high-level findings and observations regarding bank condition, channel form and process, and sediment characterization. At the same visit, pebble counts were conducted and 2D morphological unit mapping was field-verified. Reservoir releases at this time were at 450 cfs (138% of baseflow) so field-observed depths, velocities, and inundation areas were slightly higher than those mapped and modeled.

The river mostly follows a single-threaded form with sequences of alternating riffles and runs or glides, punctuated by several locations where the river takes on more complex channel forms. For most of the evaluated reach, the Mokelumne River does not exhibit signs of active channel migration or bank erosion; this is as expected because the Camanche and Pardee Dams upstream are attenuating most of the channel-shaping flows, as discussed in the prior hydrology section. Localized exceptions exist, most notably in the vicinity of the Colburn multi-channel area discussed below.

3.1.1 Day Use Area

As a general trend, the upstream reach in the vicinity of the Day Use Area is dominated by riffles as a result of EBMUD's ongoing gravel augmentation program. This is a high-energy section with relatively steeper channel gradients and fast-moving water through the riffle sections. In portions of the upstream reach, the river runs along a bedrock control on its right bank, which creates a backstop on migration process, governs the locations of bends in the river flow, and creates variable bedforms including deep pool features through scour.

EBMUD gravel augmentation is conducted near the upstream end this reach, including near the Murphy Creek confluence at the location pictured in Figure 5. A close-up of the gravel is shown in Figure 6. According to FlowWest's pebble count survey documented further in Section 3.2.1, the median size class of this gravel is 45-64mm. Figure 5 also shows a barren exposed terrace on the right bank which sits above the level that would be inundated at high flows.



FIGURE 5. SITE PHOTO OF CHANNEL DOWNSTREAM OF MURPHY CREEK CONFLUENCE (LOOKING DOWNSTREAM)



FIGURE 6. SITE PHOTO OF SPAWNING GRAVEL NEAR MURPHY CREEK CONFLUENCE

A similar channel configuration continues farther downstream between Murphy Creek and the boat launch. Where the river turns a corner as shown in Figure 7, there is a typical cross section where the inside of the bend is shallow with coarse gravels and the outside of the bend is a deeper pool. This location has a pronounced drop-off and a sharp, nearly 90-degree bend which is driven by the bedrock on the right bank (visible in Figure 7).



FIGURE 7. SITE PHOTO OF CHANNEL BETWEEN MURPHY CREEK AND BOAT LAUNCH (LOOKING UPSTREAM)

In multiple locations, riffles form a wedge across most of the channel with the thalweg running alongside in a deeper, fast-moving chute. Figure 8 shows a representative example of this configuration downstream of the boat launch: a riffle spans most of the channel with a chute along the right bank, where a bedrock outcrop constrains the channel alignment.

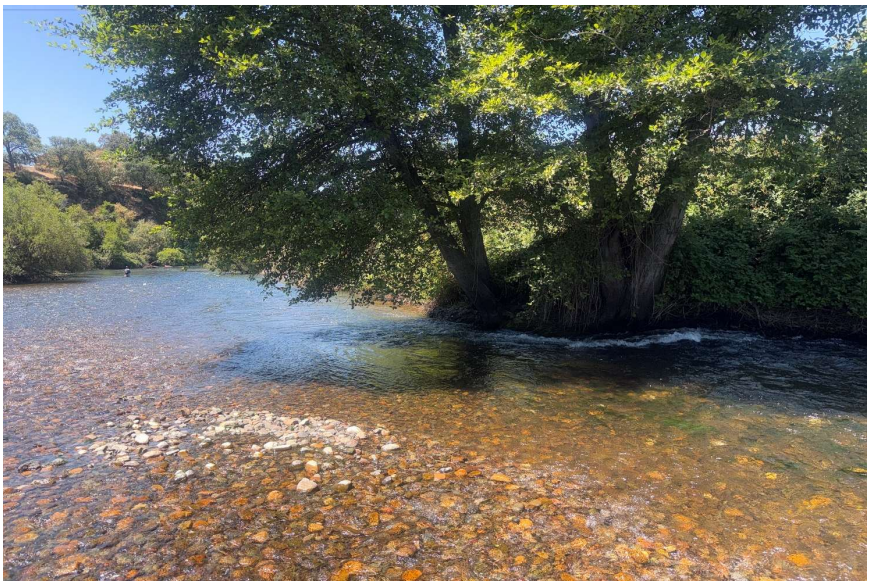


FIGURE 8. SITE PHOTO OF RIFFLE, CHUTE, AND BEDROCK BANK AT BEND

Elsewhere, a vegetation-stabilized island splits the flow: one side is typically higher-capacity and chute- or run-dominated, while the other takes the form of a slow glide or slackwater area. This is visible near the boat launch in Figure 9.



FIGURE 9. SITE PHOTO OF CHANNEL BIFURCATION NEAR THE BOAT LAUNCH (LOOKING DOWNSTREAM)

In places, steep exposed banks rise 4 to 5 feet above the low-flow water surface (Figure 10). This reach immediately downstream of Camanche Dam likely experienced downcutting following dam construction as the sediment supply was cut off. While there is no evidence of ongoing incision, these banks are probably the legacy of past, now-arrested channel lowering.

These banks expose the coarse cobbles that compose much of the floodplain substrate (Figure 11), most likely a relic of the gold dredging that extensively reworked this floodplain. Despite their steepness and lack of vegetation, these banks are unlikely to fail: the coarse clasts armor the face after fines are

winnowed away, and the attenuated flow regime downstream of the dam limits the hydraulic forces available to destabilize them.



FIGURE 10. SITE PHOTO OF STEEP, EXPOSED BANK NEAR THE BOAT LAUNCH (LABRADOR FOR SCALE)



FIGURE 11. DETAIL OF EXPOSED BANK CUT (ONE-FOOT RULER FOR SCALE)

Downstream of the day use area, a straight and single-threaded reach with a classical sequence of pools, riffle, and run follows before arriving at the upstream Colburn site.

3.1.2 Colburn Multi-Channel Reach

The Colburn reach begins with a complex multi-channel area near River Mile 62 (Figure 12), immediately downstream of a cluster of large woody debris in the channel (Figure 13). This is the location of the sharpest meander bend along the evaluated reach. The thalweg runs along the outside bend through a sequence of narrow, fast-moving chutes and deeper runs or pools. In parallel, coarse gravel-cobble riffles (Figure 14) lead to a secondary network of cutoff channels spanning the shorter distance across

the meander bend. These are slower-moving, lower-capacity channels that pass through a broad, deep backwater area.

In a less flow-regulated system, this location would be at high risk for meander bend cutoff, and the channel would be projected to eventually abandon the outer meander and cut a thalweg through what is now the backwater inside the meander bend. Such an event, while part of natural river processes, would jeopardize floodplain reconnection work on the left bank that relies on flows in the meander bend. The attenuation of high flows under the regulated flow regime substantially reduces this risk, as does the large woody debris and vegetation at the upstream end that prevents the flow from following a straight path along the meander bend. Given the importance of the floodplain reconnection work on the left bank, the behavior of this meander bend warrants continued monitoring.



FIGURE 12. SITE PHOTO OF MULTI-CHANNEL AREA VIEWED FROM UPSTREAM COLBURN SITE FLOODPLAIN



FIGURE 13. SITE PHOTO OF LARGE WOODY DEBRIS AT UPSTREAM HEAD OF MULTI-CHANNEL AREA



FIGURE 14. SITE PHOTO OF RIFFLE IN MULTI-CHANNEL AREA AT LOCATION OF PEBBLE COUNT

Substrate in this area is heterogeneous and corresponds to what would be expected in each morphological unit. Glide or run sections along the meander bend were generally gravel-bedded, but exhibited several small, deeper pools (small features at a scale that would not be captured in the bathymetry or the 2D morphological unit delineation). These pools tended to have a fine sand bed and exhibited submerged aquatic vegetation along their upstream inlet. Notably, pool features in this area had clear water and were not silty (Figure 15); fine material was likely being transported through the section or depositing in the adjacent slackwater, which appeared to act as a fine sediment sink.



FIGURE 15. SITE PHOTO OF SMALL POOL FEATURE IN MEANDER BEND (FLOW FROM RIGHT TO LEFT)

3.1.3 Colburn Single-Threaded Reach

Below the meander bend and multi-channel area, gravel coalesces in the farthest-downstream of the significant riffles. Below this point, the character of the river changes significantly. By the downstream end of the Colburn property, the channel transitions to deep, slow-moving pools flanked by slackwater (Figure 16). The substrate is fine silt trapped among submerged aquatic vegetation and woody debris. These pools continue downstream nearly uninterrupted for over a half mile.



FIGURE 16. SITE PHOTO OF POOL NEAR COLBURN UPSTREAM WITH SUBMERGED WOODY DEBRIS

The pools are punctuated by, and eventually give way to, slightly shallower and faster-moving glide sections. By the Colburn Downstream site, this is the dominant channel form (Figure 17). While the water is still several feet deep at baseflow, it moves fast enough to mobilize fine silts so the channel bed is no longer silty. The grain size distribution of the substrate is bimodal: primarily sandy, but with gravel and cobbles mixed in that match the size classes of the riffles farther upstream.



FIGURE 17. SITE PHOTO OF FAST GLIDE AT COLBURN DOWNSTREAM WITH SAND/COBBLE SUBSTRATE

Banks along the Colburn reach tend to be steep and earthen, yet well vegetated and stable, with no active erosion observed during the field reconnaissance.

3.1.4 Colburn Floodplain and Side Channel

The upstream Colburn site floodplain was also evaluated. While the downstream Colburn site is fully bermed off and geomorphically inactive (requiring a levee setback for future activation), the upstream site is an active floodplain that inundates through a combination of surface and subsurface flow.

The existing side channel was traced from its junction with the Mokelumne River just upstream of the multi-channel area into the site (Figure 18, Figure 19). A narrow inundated thread approximately one foot wide tapers to dry land before widening and deepening into a broad, stagnant linear feature. This presents a fish-stranding hazard: the channel connects to the river at higher flows but may become isolated as flows recede. Further reconnaissance is needed to determine if the channel has a surface water connection to the river at its other end, or if it is fully disconnected.



FIGURE 18. SITE PHOTO OF NARROW SIDE CHANNEL UPSTREAM OF MULTI-CHANNEL AREA



FIGURE 19. SITE PHOTO OF DISCONNECTED BACKWATER CHANNEL ON COLBURN UPSTREAM SITE

Another significant feature on the upstream Colburn site is the large backwater pond near its downstream end (Figure 20). On the 2DMU mapping this feature does not appear inundated, because no surface water connection was modeled at the 325 cfs baseflow; however, a surface water connection at its downstream end was observed in the field at 450 cfs. Under the regulated flow regime, this feature is expected to remain fully backwater with negligible flow-through.



FIGURE 20. SITE PHOTO OF BACKWATER POND ON UPSTREAM COLBURN SITE (RIVER IN DISTANCE BEHIND TREES)

Many gravel pits on the site are disconnected from the river except at high flows. During the field reconnaissance, one swale showed evidence of a recent surface water connection between two adjacent pits, including collected woody debris (Figure 21); the downstream pit contained fine sediment substrate that appeared recently deposited (Figure 22). Other pits on site did not exhibit this fresh substrate.



FIGURE 21. SITE PHOTO OF FLOODPLAIN SWALE WITH EVIDENCE OF FLOW



FIGURE 22. SITE PHOTO OF SANDY SUBSTRATE IN ADJACENT PIT

A large inland pond on the southern portion of the upstream Colburn site fills primarily through a subsurface connection with the river rather than surface flow; Figure 23 shows the resulting water body during a field visit on 29 October 2024, when Camanche Dam outflow was 350 cfs.



FIGURE 23. SITE PHOTO OF INLAND POND (LOOKING SOUTH, 29 OCTOBER 2024)

3.2 SUPPORTING ANALYSES

3.2.1 Sediment Grain Size Distribution

Three spot Wolman pebble counts were conducted to characterize riffle grain sizes. At each site, particles were selected by randomly walking through the sampling area and blindly touching the substrate at the tip of a boot. A minimum of 100 particles were measured per site to allow estimation of the D50 (median grain size). The b-axis of each selected particle was measured with a ruler and embedded particles were flagged. Results were tallied by frequency in phi-unit size bins.

The locations of these three pebble counts are shown in the site maps in Figure 29 and Figure 30. Grain size distribution results are shown in Figure 28 and Figure 24. These results supplement the visual interpretations discussed in the site observations section, and illustrate the downstream dispersion of placed spawning gravels.

- The upstream pebble count is at a location of active EBMUD gravel augmentation and is intended to characterize the grain size of placed gravel. This riffle, located at the confluence of Murphy Creek, is extremely well-sorted with a median grain size class of 45-64mm and no surveyed pebbles less than 22.6mm.
- At the Day Use Area, we also surveyed an area near the boat launch. This is a 'riffle transition' zone that is farther from an active gravel augmentation site. There was clearly a mix of the augmented gravel and smaller clasts. The median grain size class was 32-45mm and there were gravels as small as 8mm observed.
- At the Colburn site, we conducted a pebble count at a riffle at the upstream end of the complex multi-channel area. Here, there was a much broader distribution of grain sizes. While large gravels up to 90mm were present, the median size class was 22.6-32mm and these gravels and cobbles were mixed with coarse sands down to 2mm.

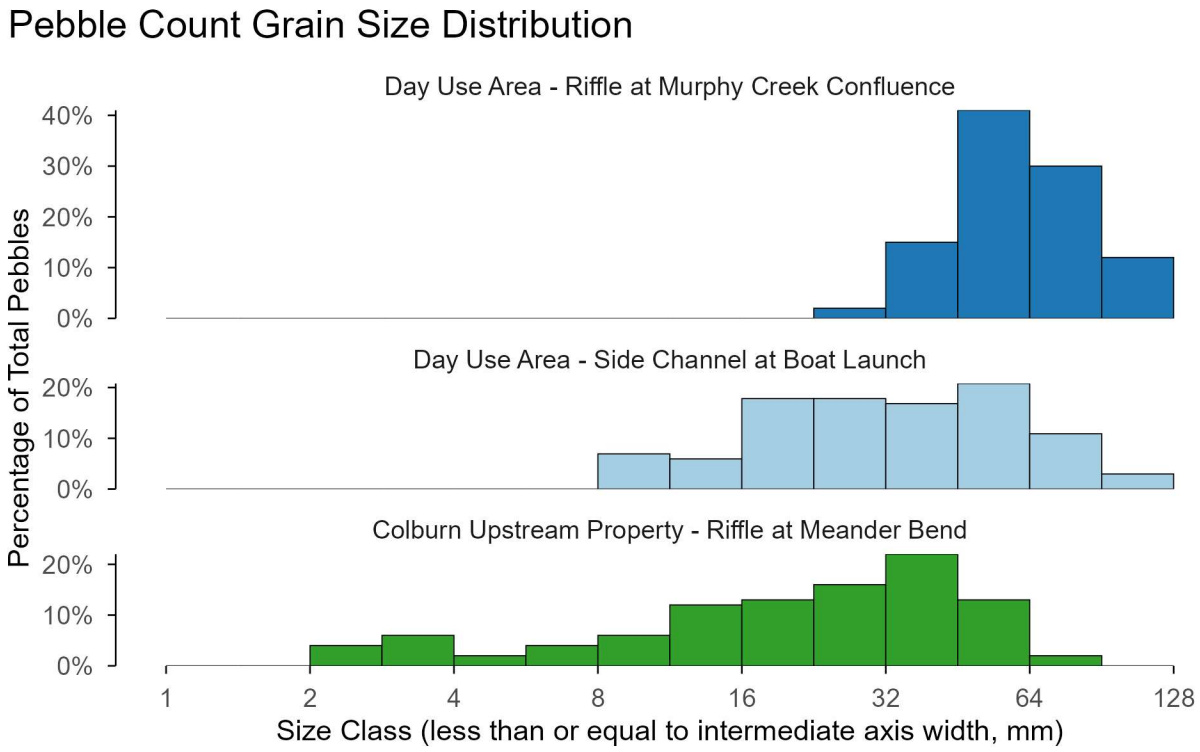


FIGURE 24. PLOT OF PEBBLE COUNT HISTOGRAMS AT THREE SITES

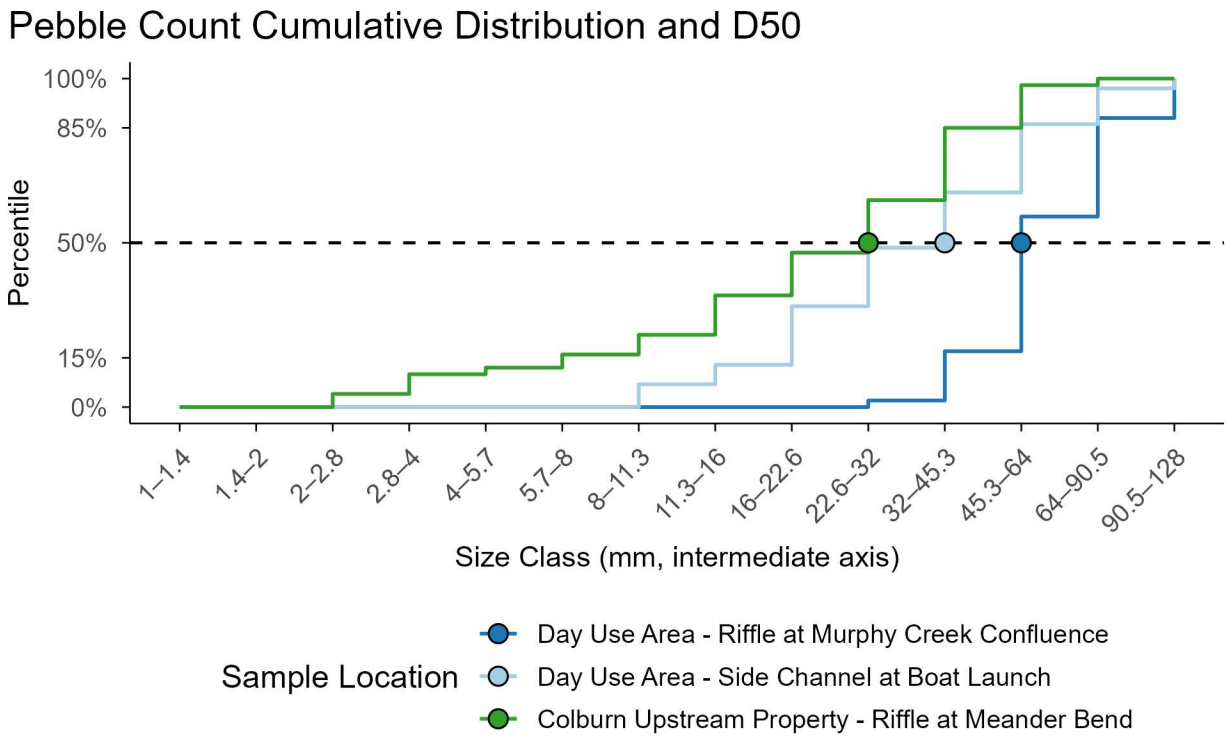


FIGURE 25. PLOT OF CUMULATIVE GRAIN SIZE DISTRIBUTION OF PEBBLE COUNTS

3.2.2 2D Morphological Unit Mapping

Morphological units (MUs) were delineated following the two-dimensional hydraulic approach of Wyrick and Pasternack (2014a), in which spatially continuous depth and velocity fields, rather than field-mapped surface-water patterns, define landform boundaries. Depth and velocity results at a representative baseflow (325 cfs) were exported from the 2D hydrodynamic model developed in HEC-RAS 6.6 by FlowWest and detailed in the H&H Technical Memorandum. At low flow, the depth and velocity patterns most strongly express the underlying bed topography.

Each wetted cell was assigned to one of eight in-channel morphological units: pool, run, chute, fast glide, slow glide, slackwater, riffle, and riffle transition (defined in the Appendix, Table 2), using a decision tree of depth and velocity thresholds. The initial classification scheme used the published thresholds from Wyrick and Pasternack (2014) based on the Lower Yuba River, converted to U.S. customary units. Thresholds were then iteratively refined based on manual inspection and engineering judgment. The resulting scheme was verified in the field.

Figure 26 illustrates the depth and velocity thresholds that define the classification scheme. Figure 27 summarizes the area breakdown of morphological units, and Figure 28 shows a summary map of the output. Detailed maps of the morphological units are shown in the Appendix.

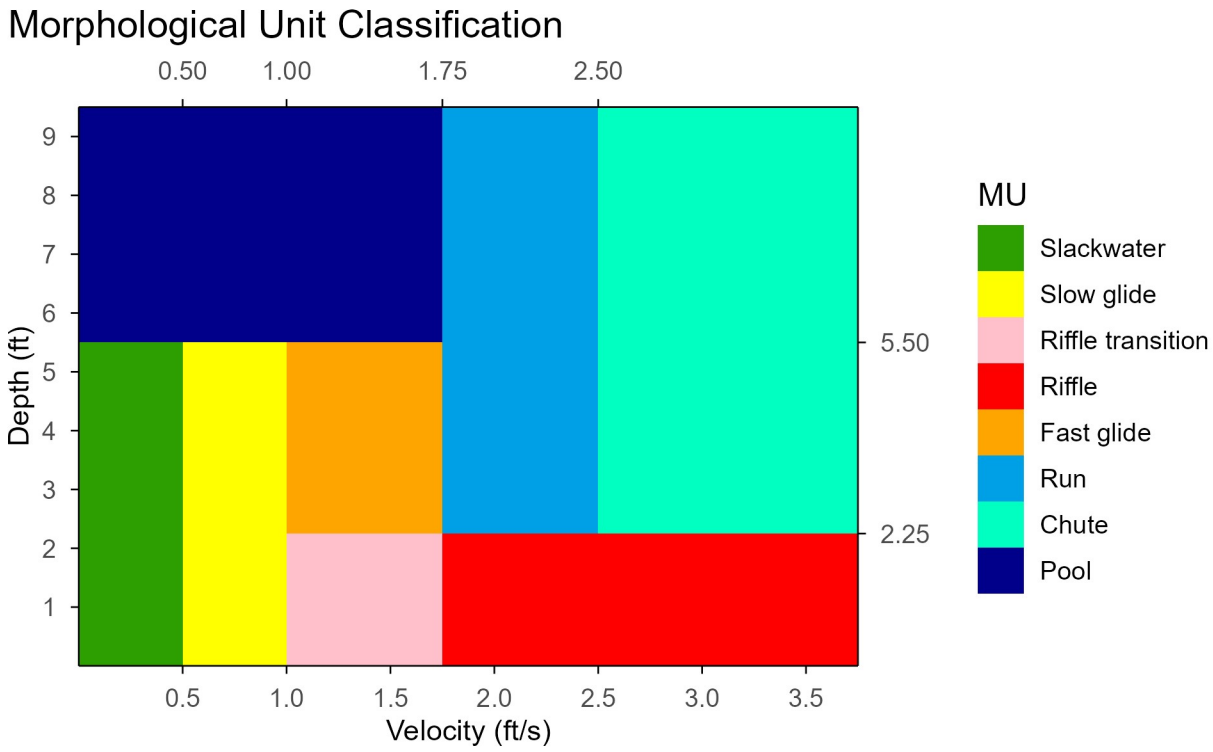


FIGURE 26. MORPHOLOGICAL UNIT CLASSIFICATION

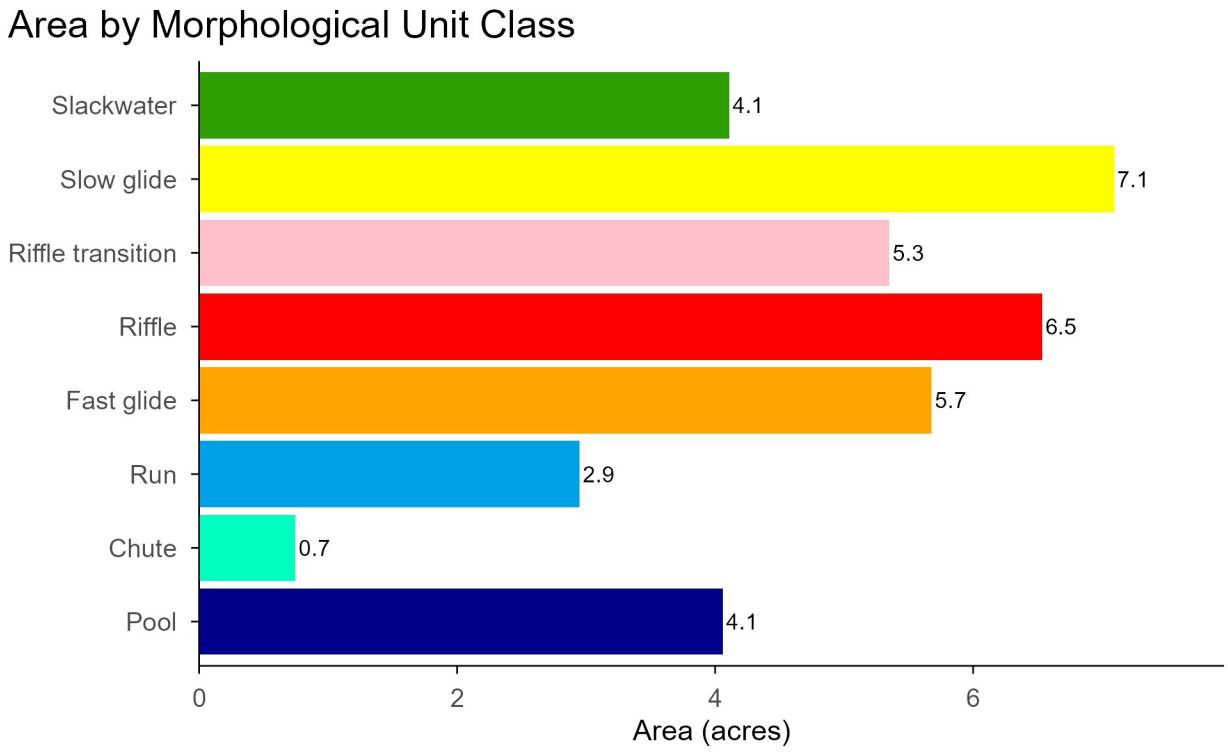


FIGURE 27. AREA BY MORPHOLOGICAL UNIT CLASS

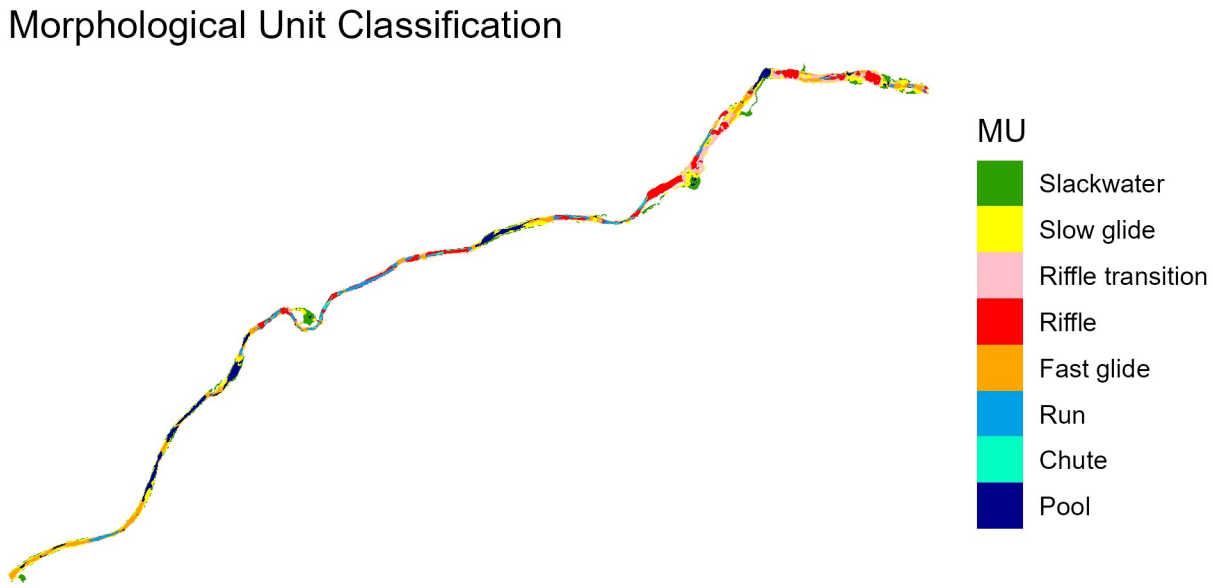


FIGURE 28. SUMMARY MAP OF OUTPUT CLASSIFICATION

Field verification on 16 June 2026 largely confirmed the classification scheme. At most locations, observed channel forms matched their mapped unit; isolated discrepancies (i.e., where a chute or pool was classified as a run, or a riffle appeared as dry land) were expected given that field flows exceeded the modeled baseflow. Observed discrepancies are as follows:

- The small pools in the multi-channel area of the upstream Colburn reach (Figure 15) are mapped as runs because they are too small to be resolved at the available bathymetric resolution, and too shallow to meet the threshold; they would be more accurately classified as shallow pools.
- At the Colburn Upstream site, a few backwater features were not adequately captured in the mapping and are documented in the site observations section. Most notably, the large off-channel pond shown in Figure 20 should be classified as slackwater. The backwater channel shown in Figure 19, if it indeed connects to the river at the downstream end, would classify as backwater as well.

TABLE 2. DESCRIPTIONS OF MORPHOLOGICAL UNIT CLASSIFICATIONS

Color	Morphological unit	**Description at base flow** (from Wyrick & Pasternack, 2014, table 1)
	Slackwater	A shallow, low velocity region of the stream that is typically located within adjacent embayments, side channels, or along channel margins. Velocities are near stagnant during base flow conditions and rise more slowly than in other units as stage increases.
	Slow glide	An area of low velocity, low to moderate depths, and low water surface slope. Slow glides may be located near water's edge as the channel thalweg transitions laterally toward the stream margins.
	Riffle transition	Typically a transitional area between an upstream MU into a riffle or from a riffle into a downstream MU. Water depth is relatively low. Velocity is also relatively low, but increases downstream due to convective acceleration toward a shallow riffle crest that is caused by lateral and vertical flow convergence.
	Riffle	An area with shallow depths, moderate to high velocities, rough water surface texture, and steep water surface slope. Riffles are generally associated with the crest and backslope of a transverse bar.
	Fast glide	An area of moderate velocity and depth and low water surface slope. Fast glides commonly occur along the periphery of channels and flanking pools. Fast glides can also exist in straight sections of low bed slope.
	Run	An area with moderate velocity, high depths, and moderate water surface slope. Runs typically occur in straight sections that exhibit a moderate water surface texture and tend not to be located over transverse bars.
	Chute	An area of high velocity, steep water surface slope, and moderate to high depth located in the channel thalweg. Chutes are often located at an abrupt vertical expansion.
	Pool	Topographic low in the channel that exhibits high depth and low velocity, and low water surface slope. This unit covers 'forced pool' and 'pool'. A forced pool is one that is typically along the periphery of the channel and is 'over-deepened' from local convective acceleration and scour during floods that is often associated with static structures such as wood, boulders, and bedrock outcrops. A pool is not formed by a forcing obstruction.

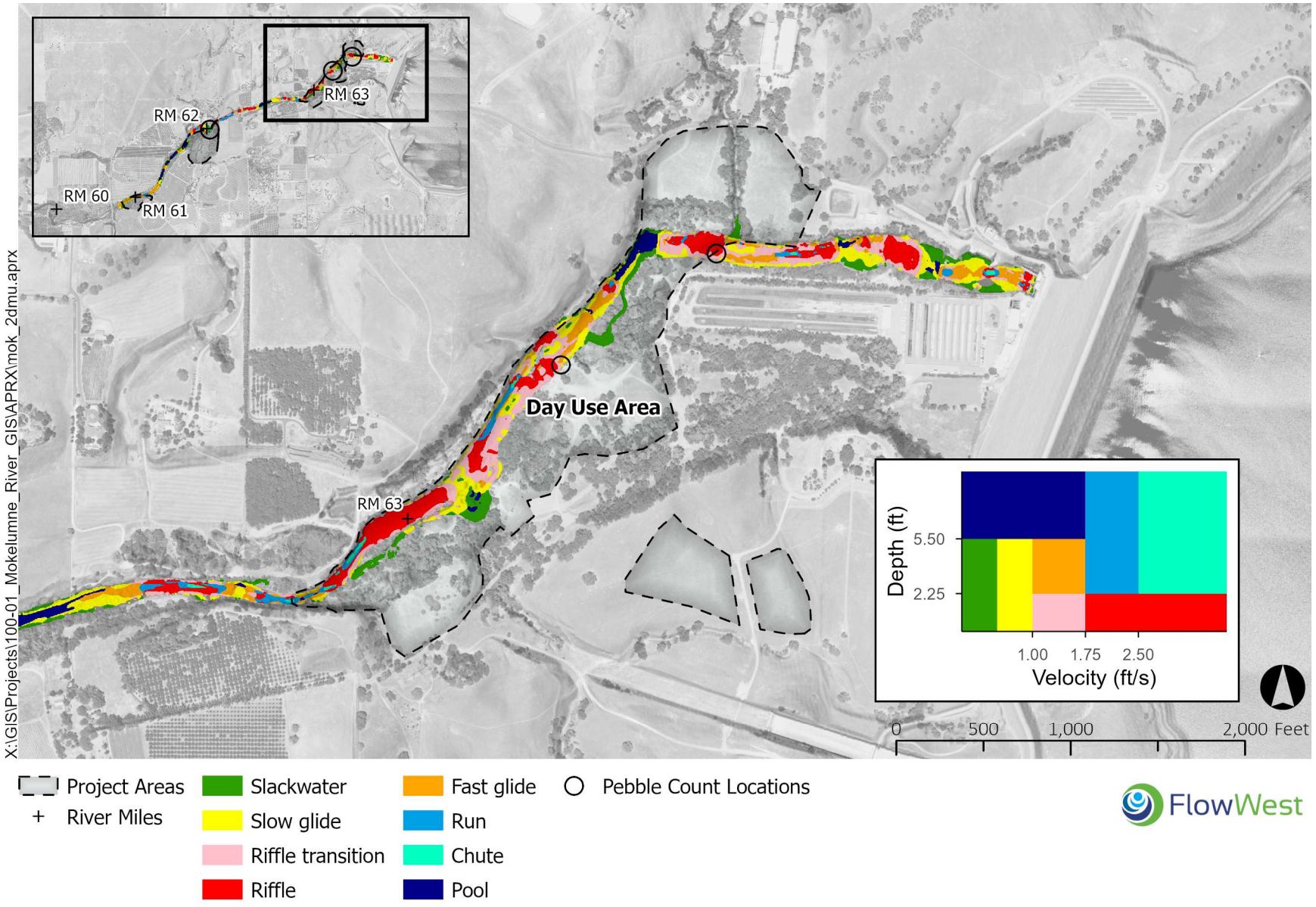


FIGURE 29. 2D MORPHOLOGICAL UNIT CLASSIFICATION FOR DAY USE AREA SITE

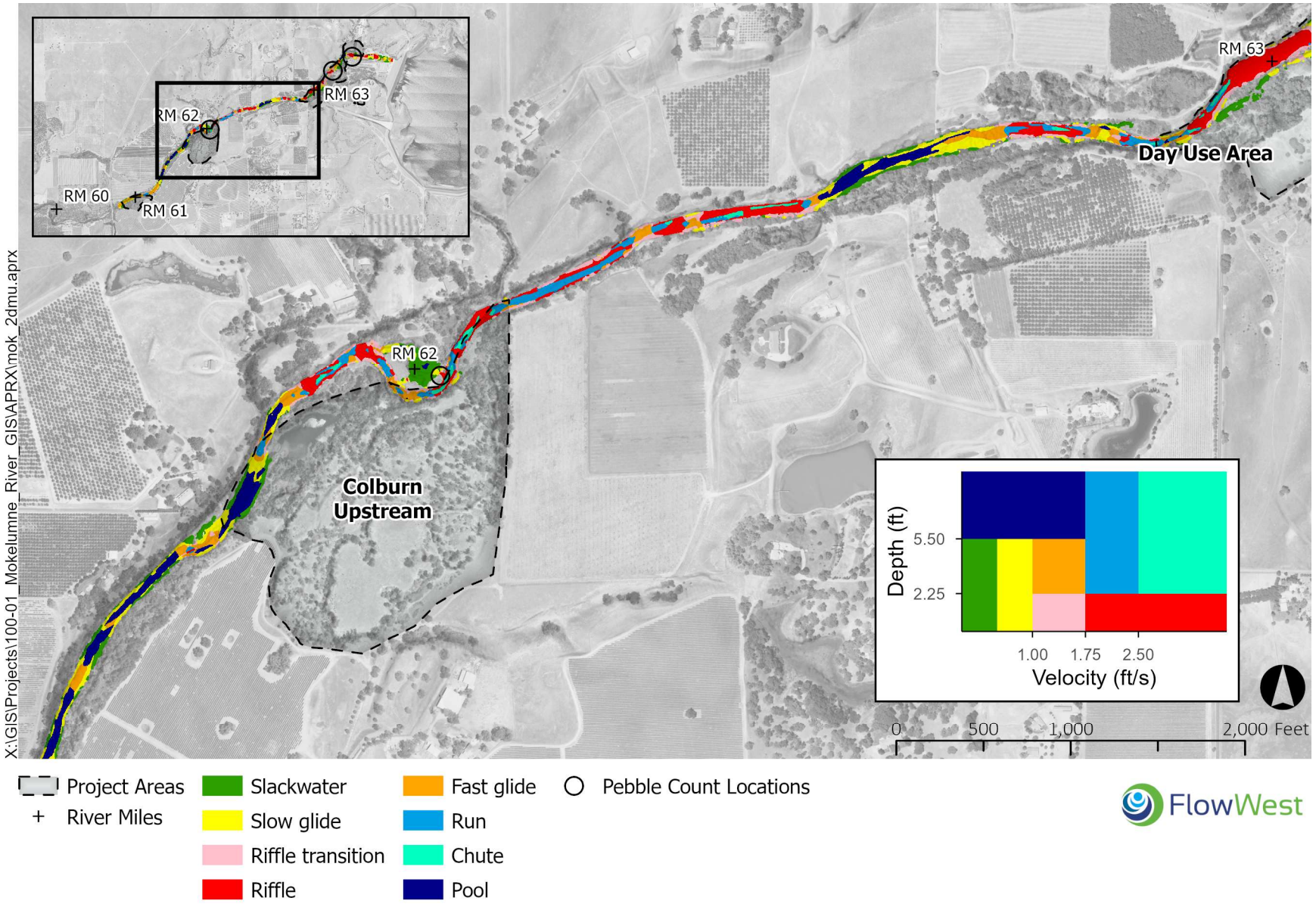


FIGURE 30. 2D MORPHOLOGICAL UNIT CLASSIFICATION FOR COLBURN UPSTREAM SITE

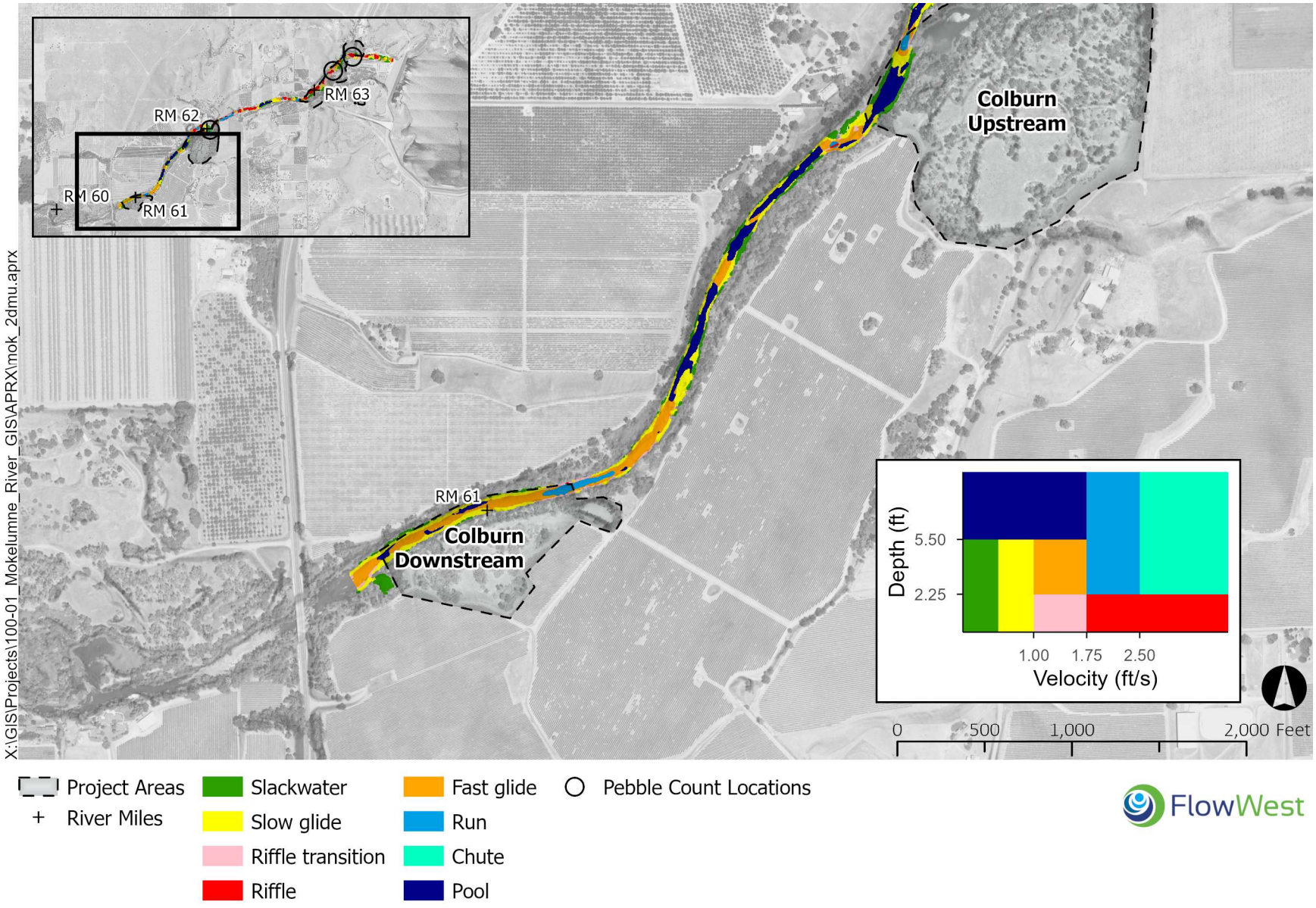


FIGURE 31. 2D MORPHOLOGICAL UNIT CLASSIFICATION FOR COLBURN DOWNSTREAM SITE

3.3 Temporal Change and Active Erosion Sites

3.3.1 Historical Imagery Comparison

Historical imagery and topographic maps were taken from the United States Geological Survey (USGS) database and georeferenced to compare current vs historical geomorphic elements of the project sites. Figures 29 and 30 compare 2024 site conditions to 1937 aerial Imagery and 1909 topographic map site conditions. Using aerial imagery, a historic centerline analysis was conducted to evaluate lateral channel migration of the Mokelumne River over time. Channel centerlines were digitized from historical aerial imagery and maps spanning 1909 to 2024 and overlaid to compare channel position across nine time periods. The results show that after the construction of Pardee and Camanche dams, the river has remained largely stable in planform position throughout the study reach, with centerlines from all periods closely aligned along most of the corridor.

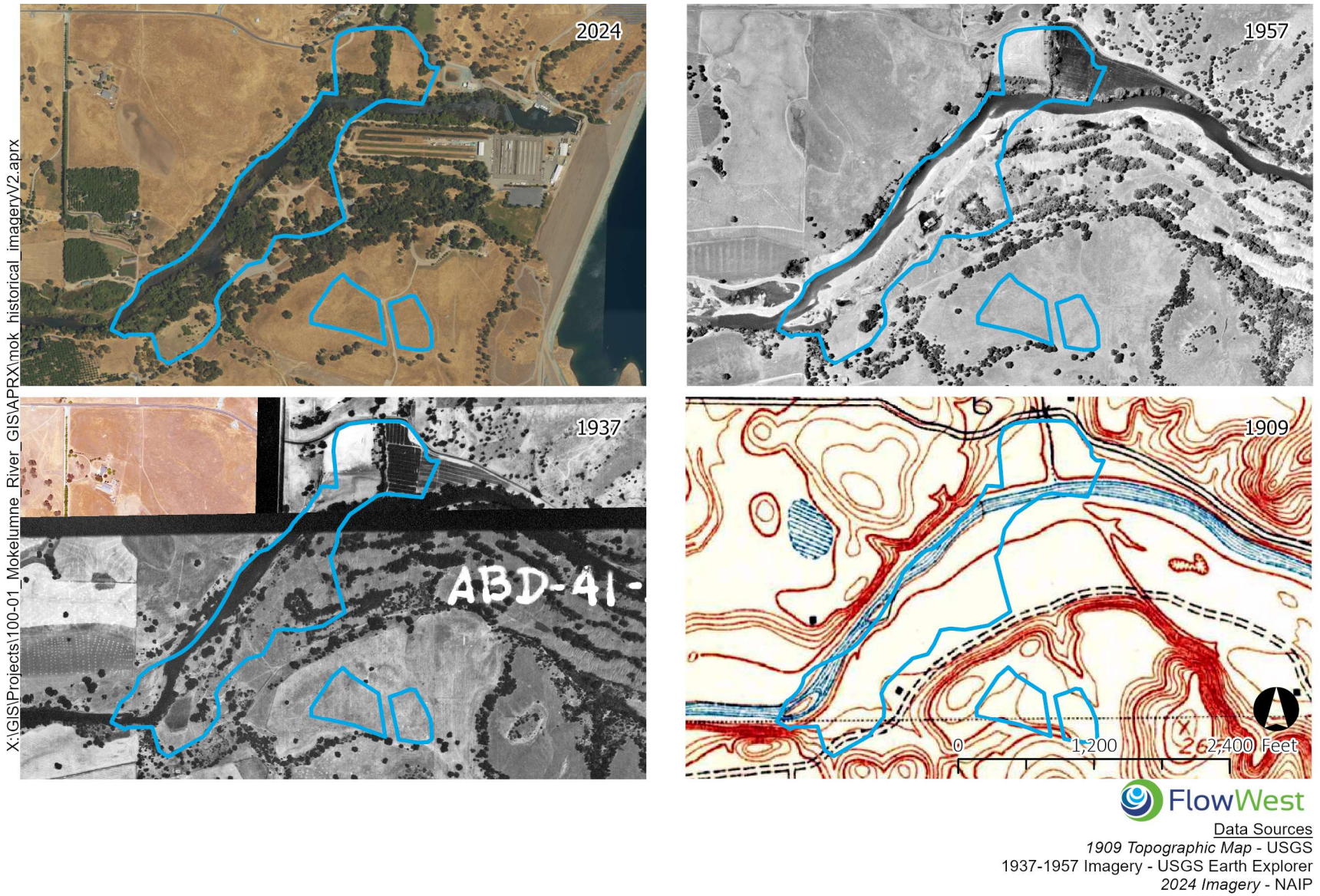


FIGURE 32. HISTORICAL TOPOGRAPHIC MAPS AND AERIAL IMAGERY FOR DAY USE AREA SITE

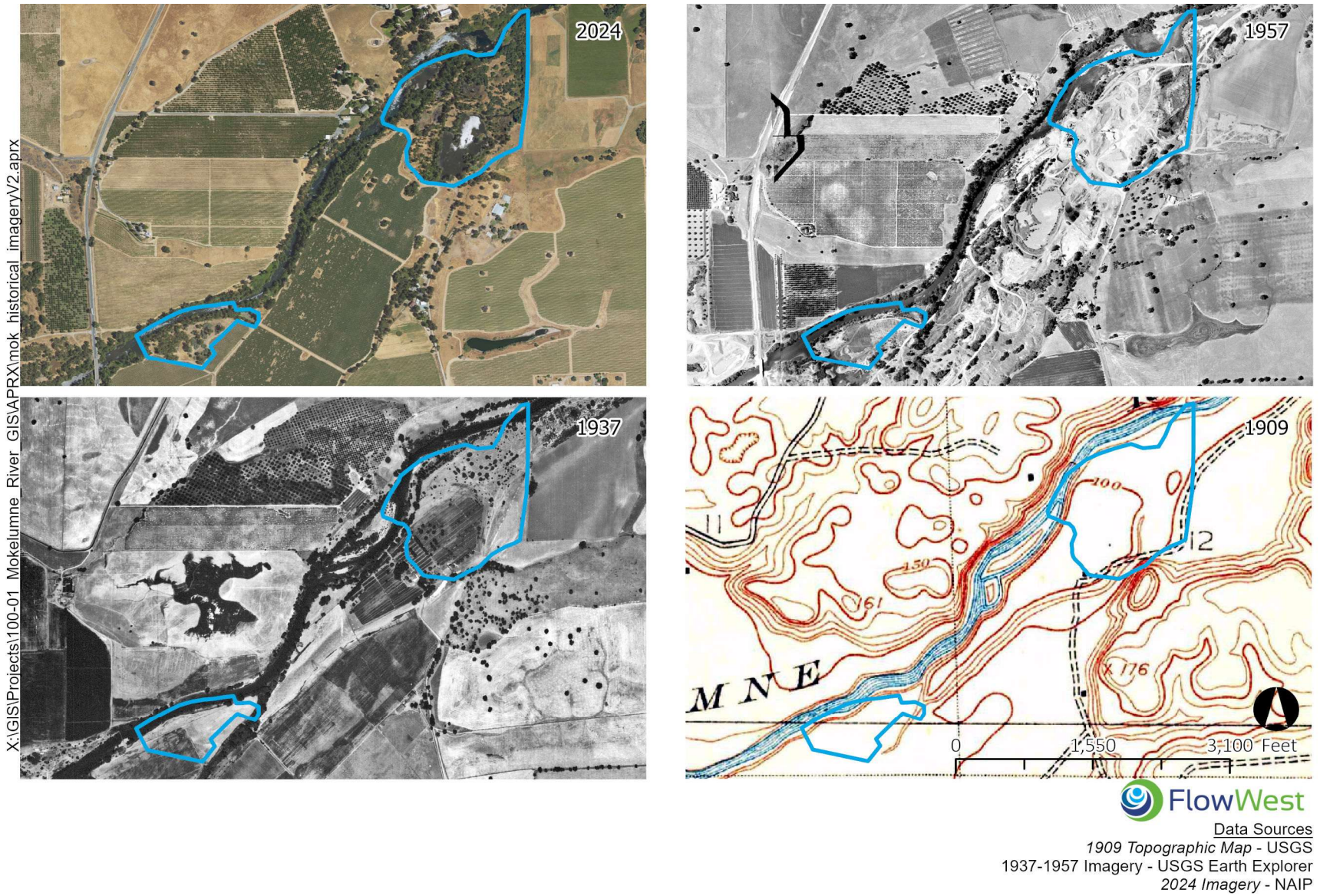


FIGURE 33. HISTORICAL TOPOGRAPHIC MAPS AND AERIAL IMAGERY FOR COLBURN SITE

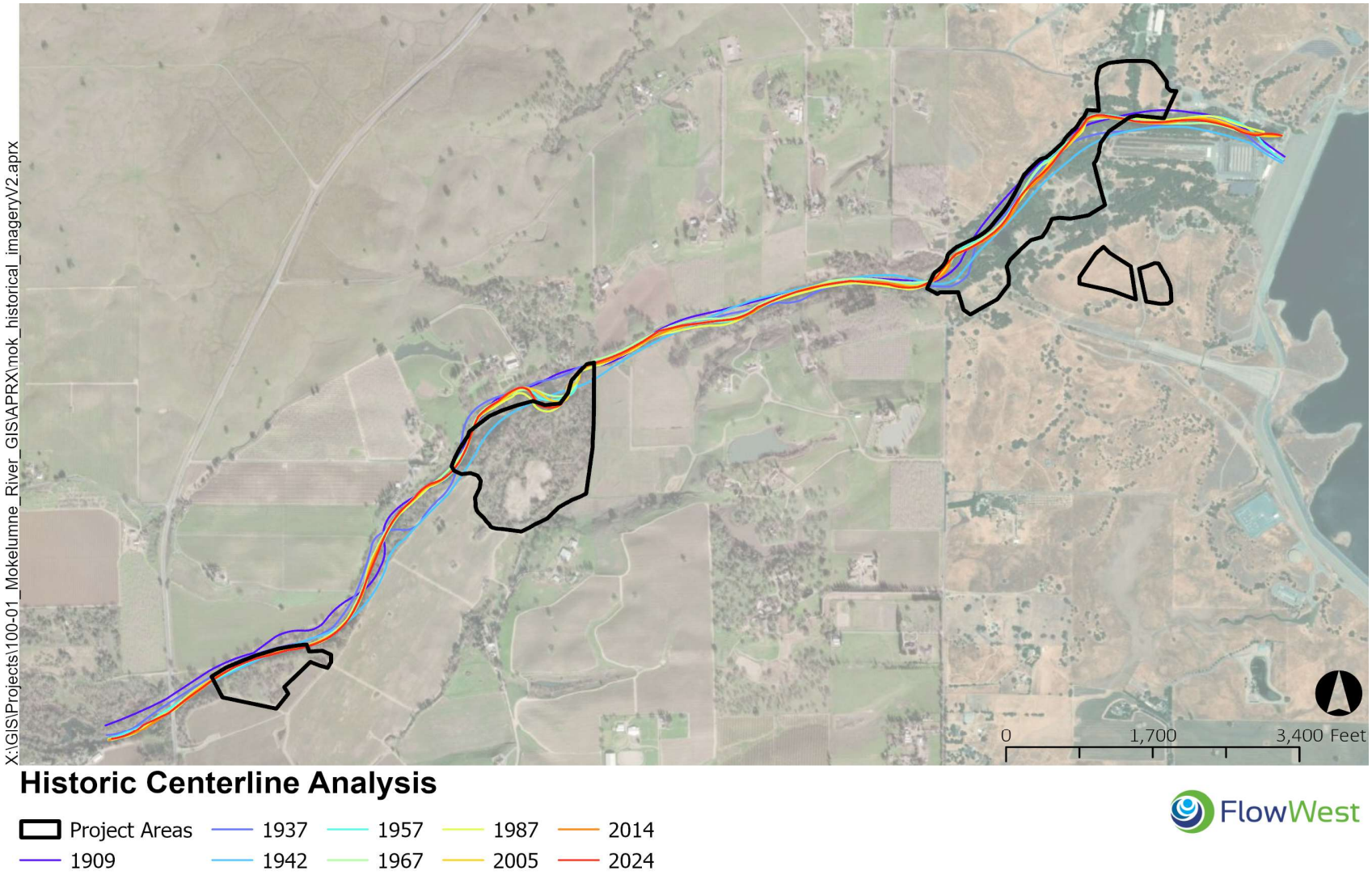


FIGURE 34. HISTORICAL MOKELUMNE RIVER CENTERLINE DELINEATION

3.3.2 Floodplain Topographic Change (LiDAR Differencing)

A DEM of Difference analysis was performed to quantify topographic change at three sites along the Mokelumne River between 2015 and 2025 (Figure 32-34). Digital elevation models derived from lidar collected in 2015 and 2025 were differenced on a cell by cell basis, with negative values (orange to purple) indicating elevation loss (erosion or surface lowering) and positive values (green to blue) indicating elevation gain (deposition or aggradation). Elevation change is displayed in feet, ranging from losses greater than 10 feet to gains greater than 10 feet, and areas of negligible change near zero are shown as transparent.

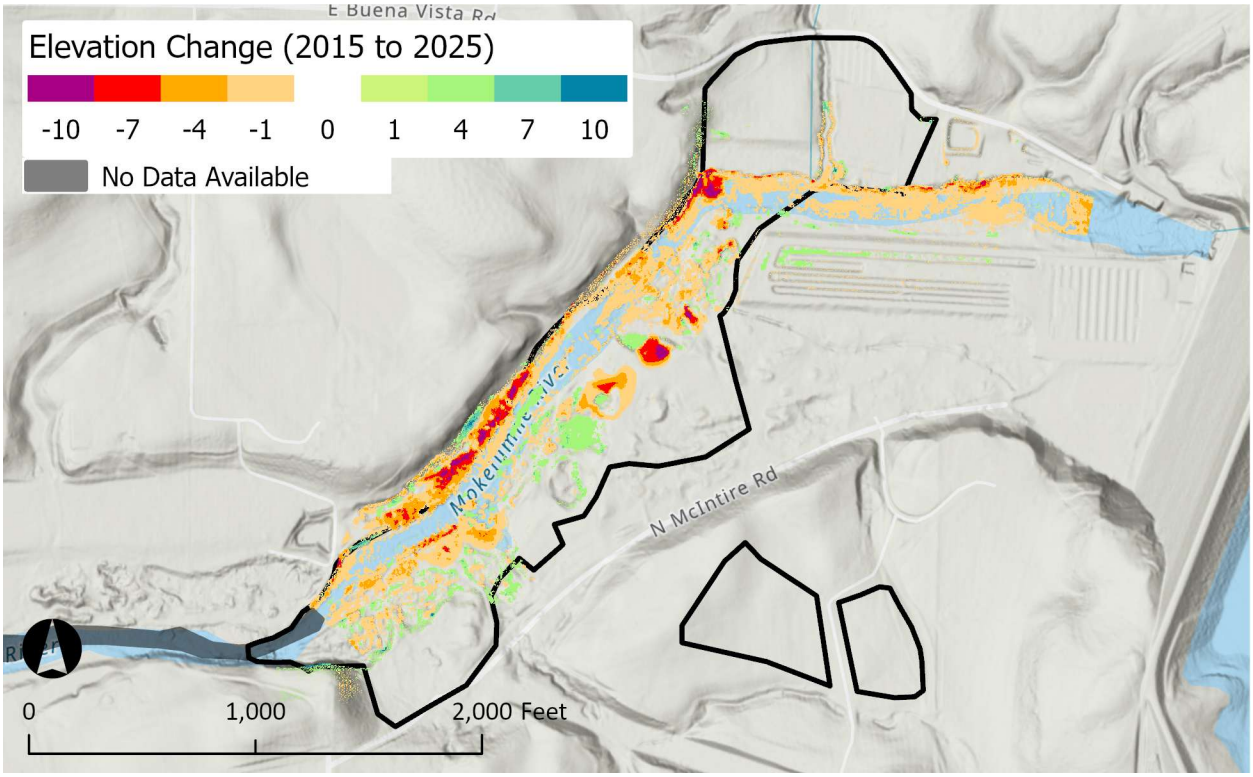


FIGURE 35. TOPOGRAPHIC COMPARISON DAY USE SITE

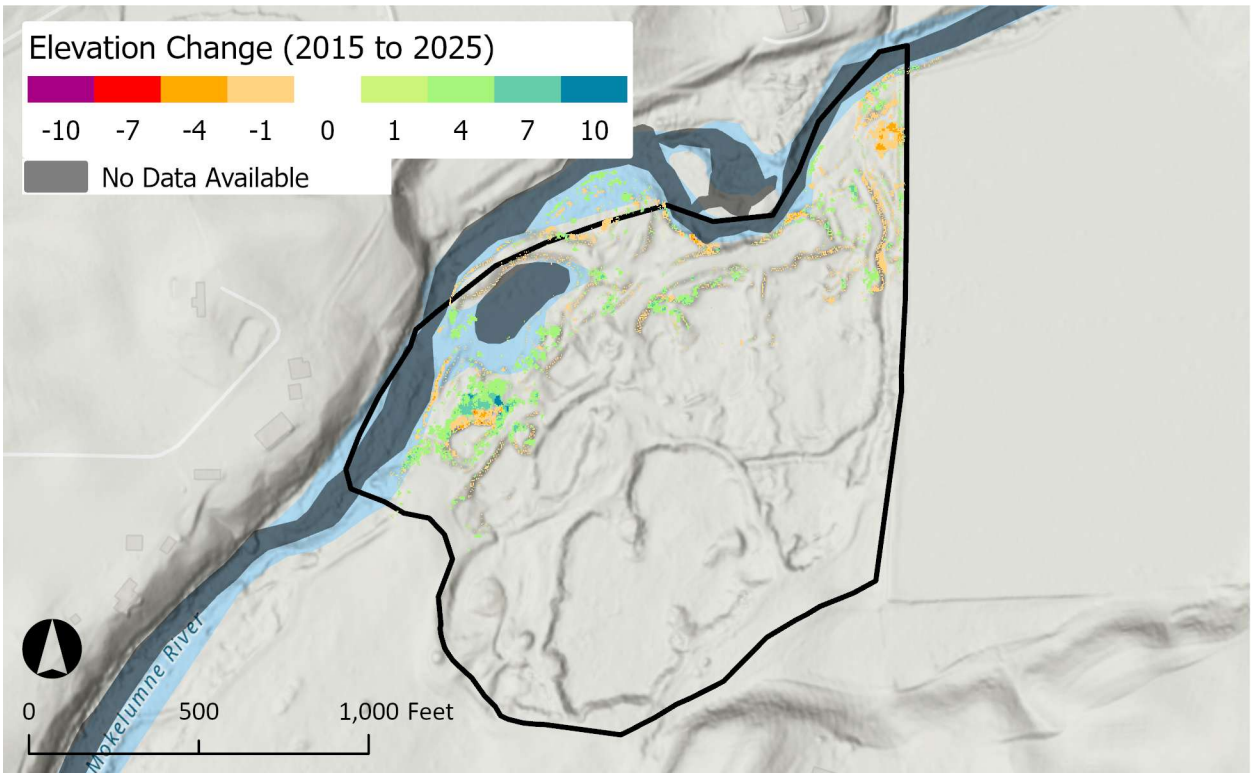


FIGURE 36. TOPOGRAPHIC COMPARISON COLBURN UPSTREAM

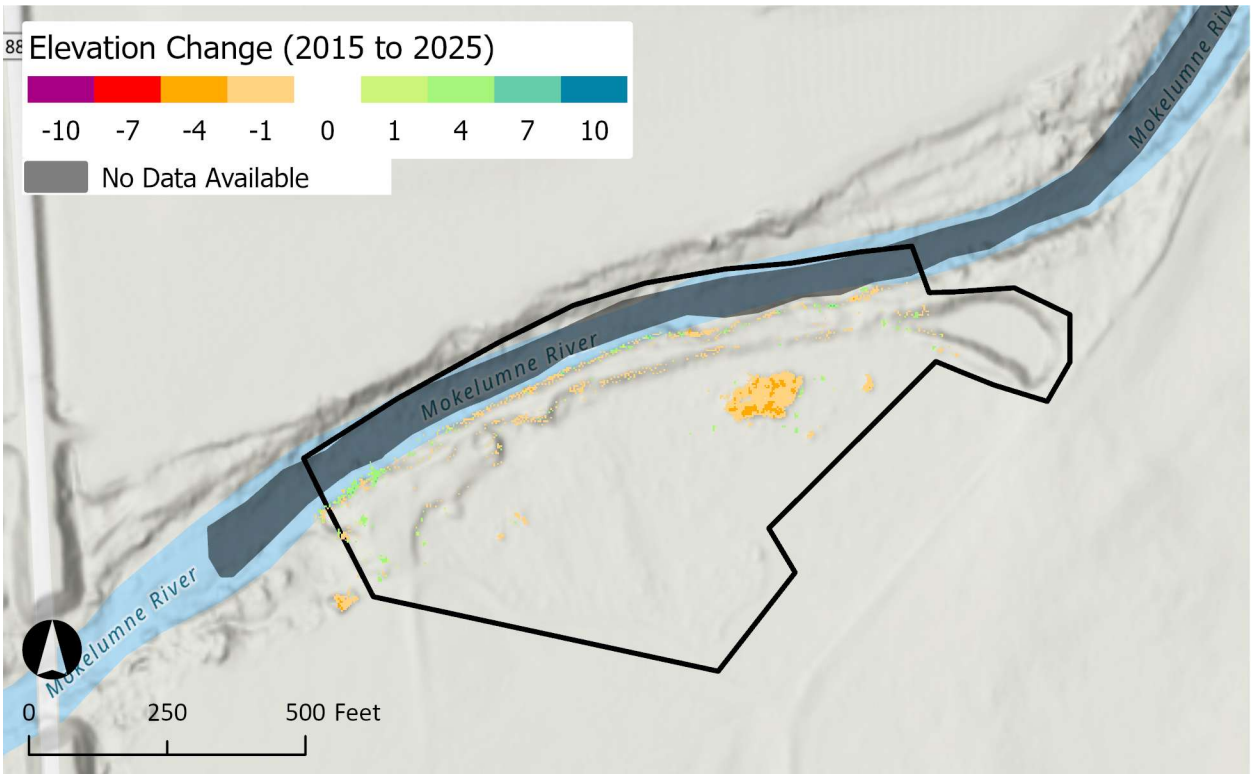


FIGURE 37. TOPOGRAPHIC COMPARISON COLBURN DOWNSTREAM

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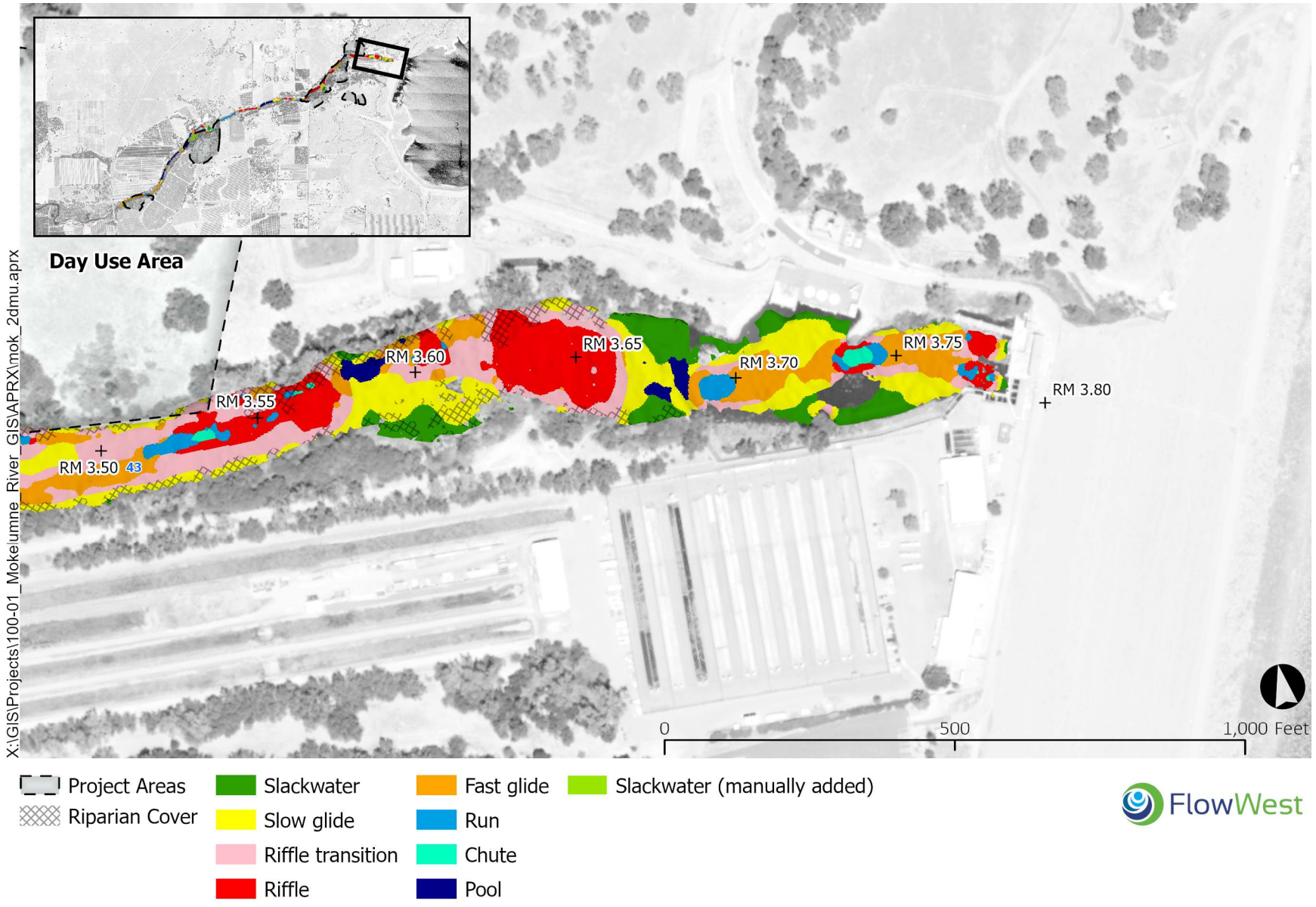
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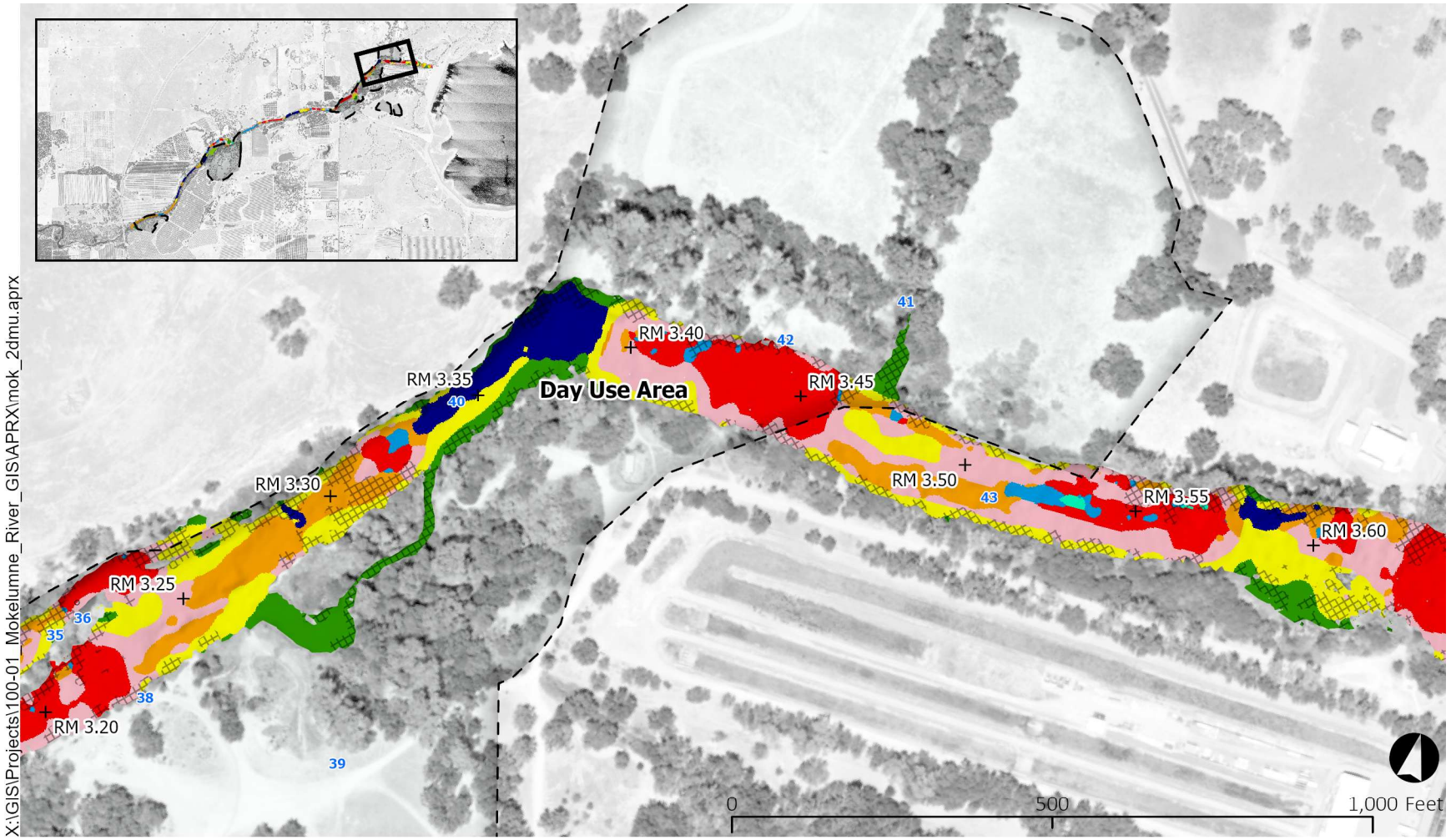
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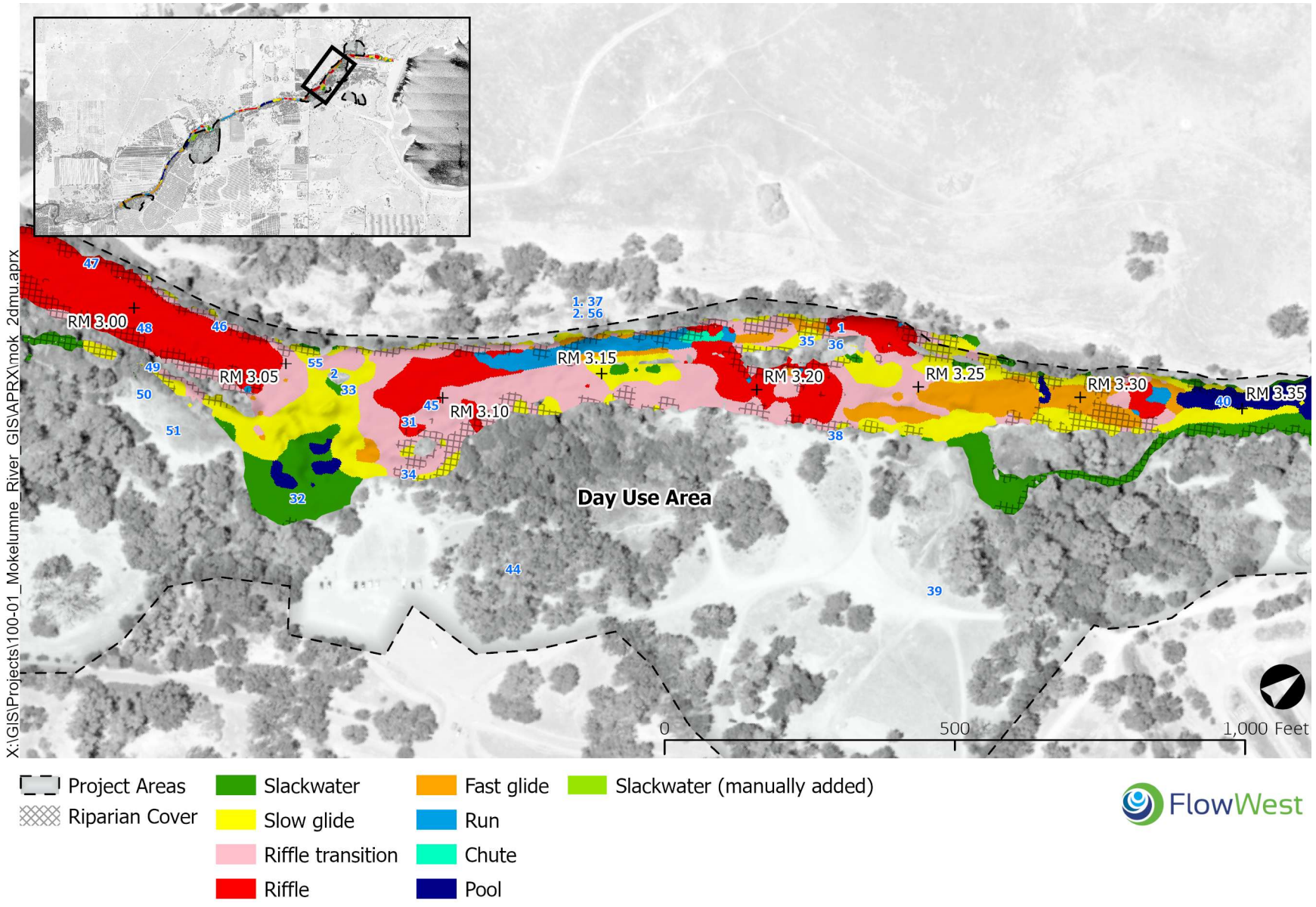
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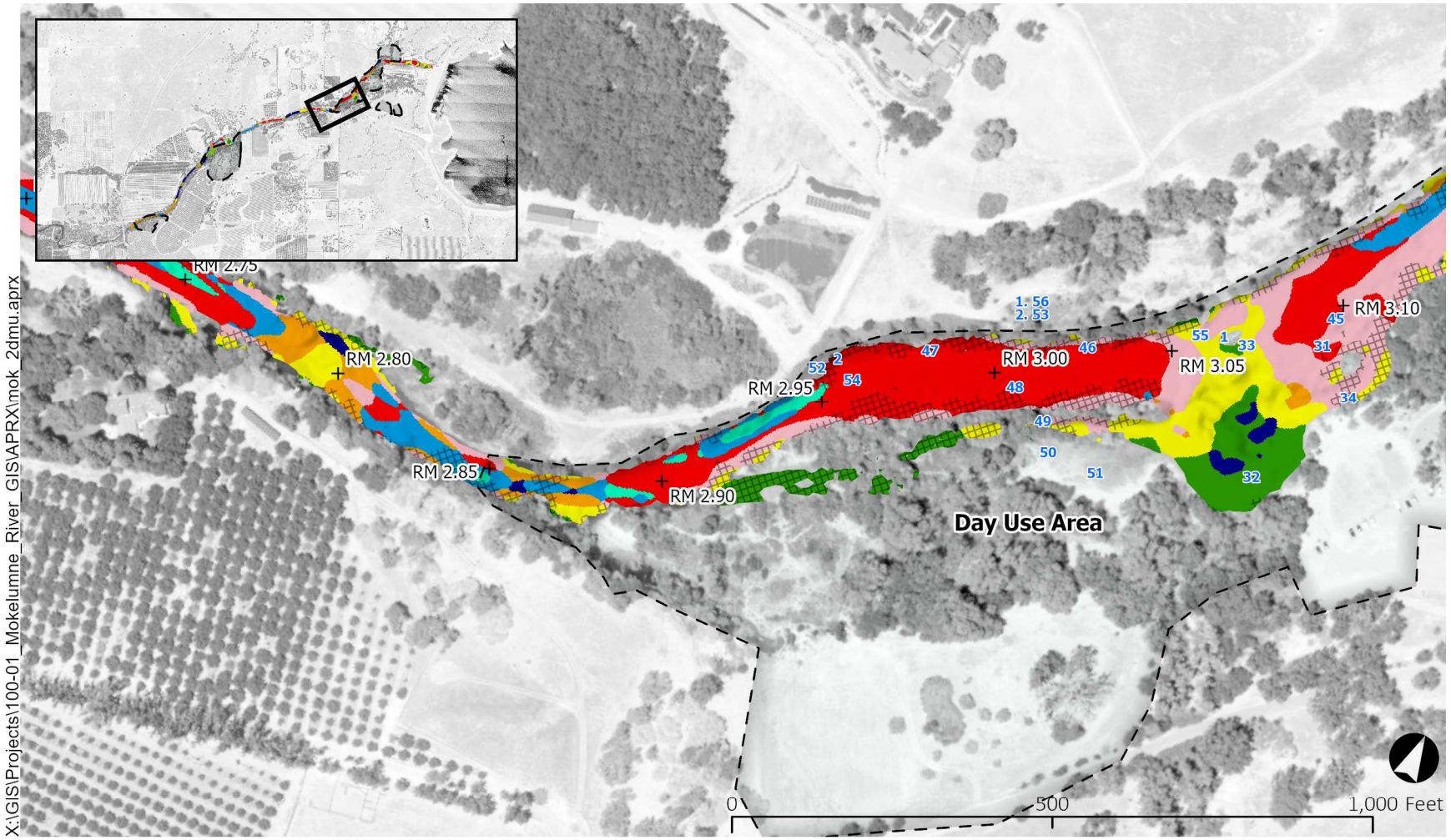
Numbered notes shown on the detailed maps on the following pages:

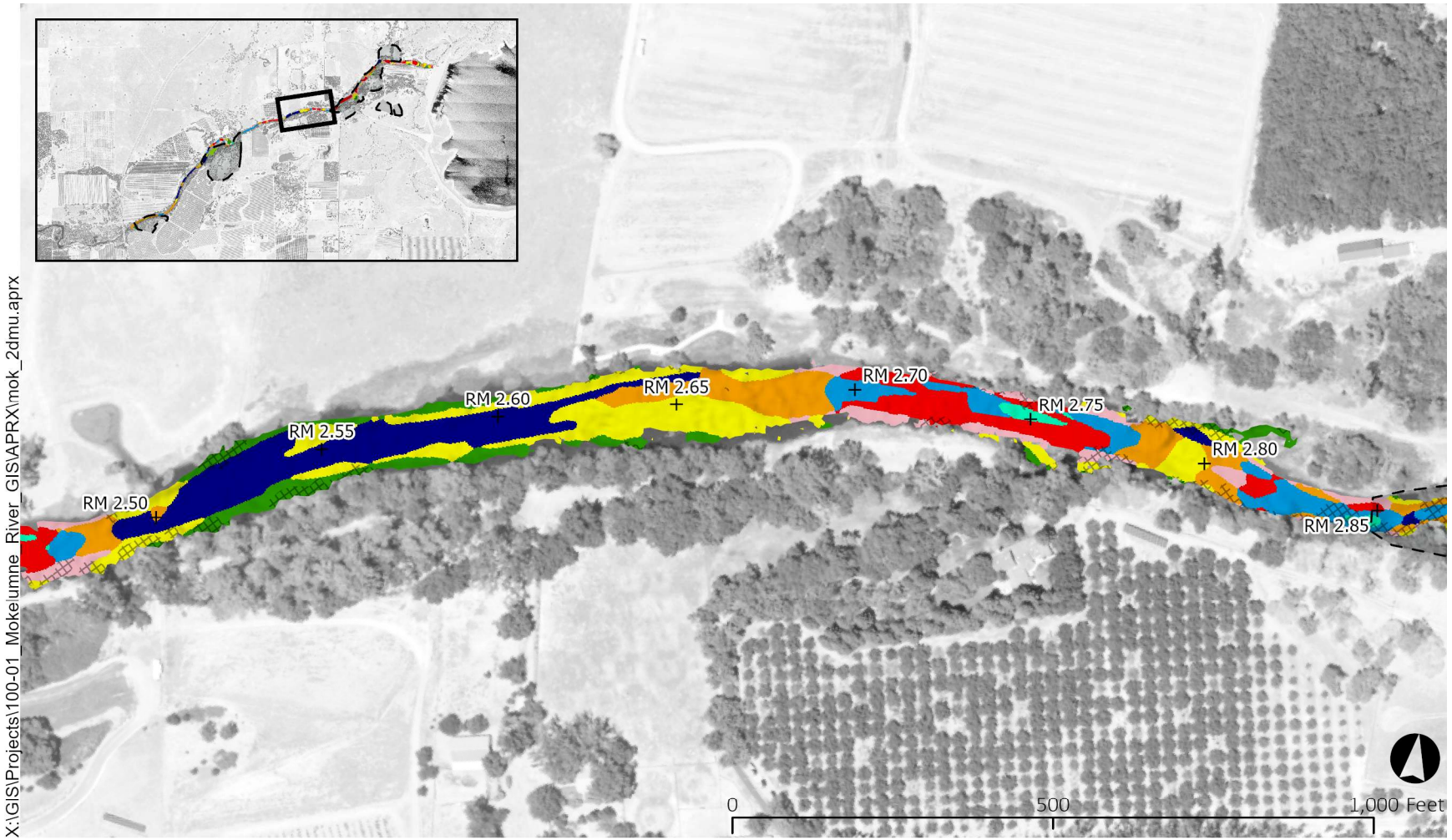
1. Small pool with sand deposition, aquatic veg at crest, riffle behind
2. Slow, deep, large wood
3. Surface connection, a couple feet deep
4. Pool here not shown on map
5. Banks steep and vegetated
6. Less silty, there are visible gravels and cobbles
7. Big backwater area, silty mucky bed
8. Fine sand bed here
9. Riffle-run, coarse gravel
10. Sand in the slackwater and slow glide
11. Pit is dry
12. Side channel 3 feet deep, very murky and stagnant, disconnected
13. Disconnected water, stagnant and tannic, fine silt and mud
14. Wet again
15. Channel continues
16. Low flow channel - edge of water
17. Lots of LWD
18. Deep pool
19. Pebble count- riffle
20. Dense aquatic veg at shore, sand and gravel in middle
21. Slow, deep, aquatic veg
22. Sandy silty and aquatic veg
23. Multi channel branching over island, mix of fast shallow and deep slow
24. LWD
25. Deep sandy bed with aquatic veg
26. Heterogeneous, shallow areas coarser, and more evenly distributed grain size than the upstream riffles
27. 3 ft deep, gravel much smaller than the gravel in the nearby riffle
28. Depression but not exposed sand like the last one
29. Cobble bed overflow swale with collected wood
30. Sand bottom pit
31. Water flowing left, then arcing right
32. Big slackwater aquatic veg with riffle transition and sand boundary
33. Confirmed front wedge of riffle
34. Riffle transition pebble count, at edge of slackwater
35. Dynamic multi channel zone
36. Riffle, mapped as dry island at base flow, see photo
37. Chute
38. Steep cobble bank
39. Erosion in sandy freshly graded areas
40. Confirmed deep pool and slackwater, see photo
41. Trib inflow
42. Steep bank to be terraced
43. Run/chute surrounded by cobble/gravel
44. Wetted currently
45. Wetland veg in slackwater areas
46. Good cover along right bank
47. A riffle drops off to a minor chute
48. Long riffle 1 ft depth, coarse cobble
49. Coarse cobble backwater
50. Waters edge
51. Wetland area saturated at water level
52. High velocity along bank but controlled by roots
53. Bedrock control
54. Crest of riffle wedge. Chute at right, riffle-run at left
55. Downstream end of shallow sloped riffle before it gets much faster
56. Exposed gravel here

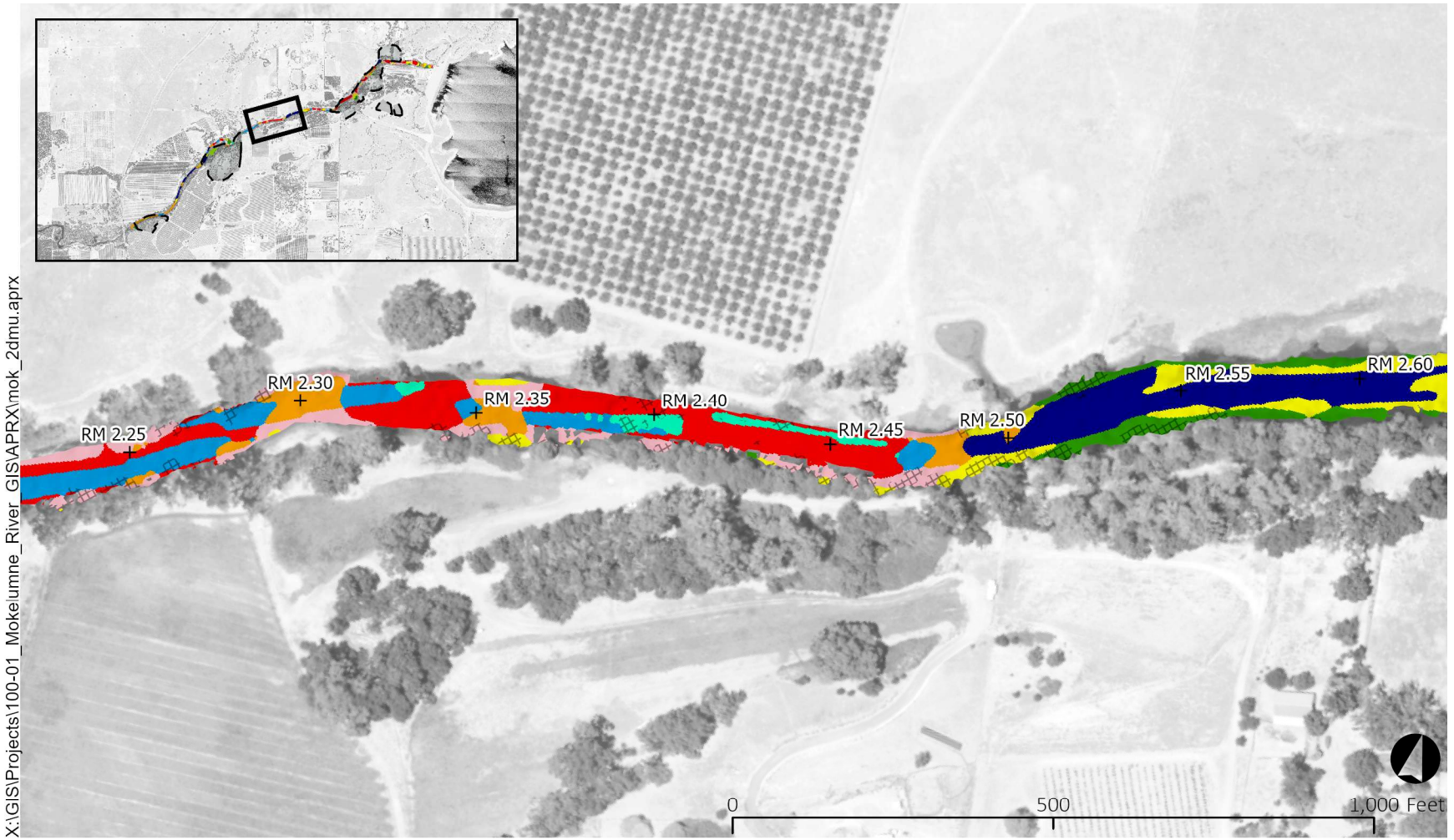

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FlowWest

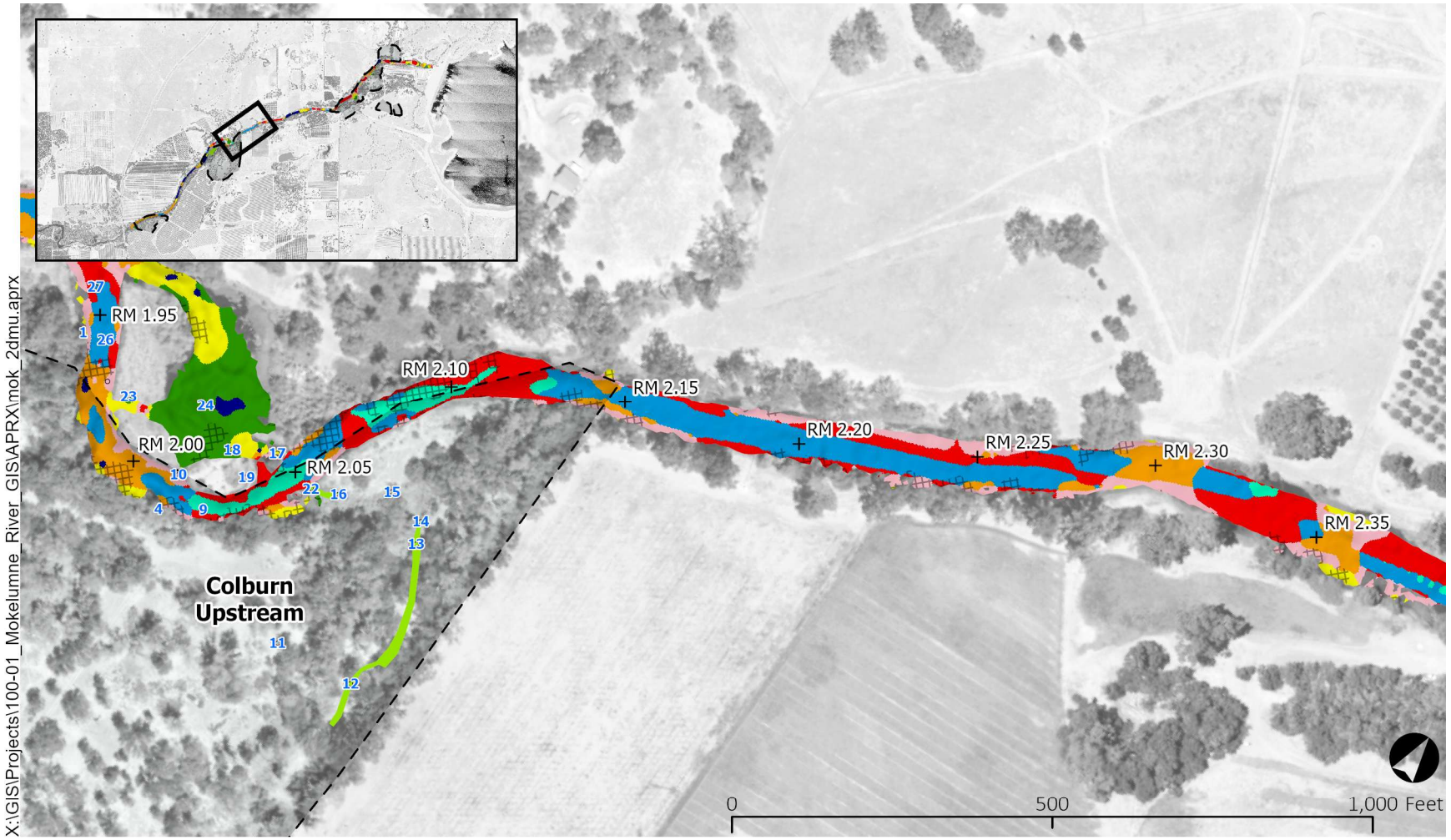

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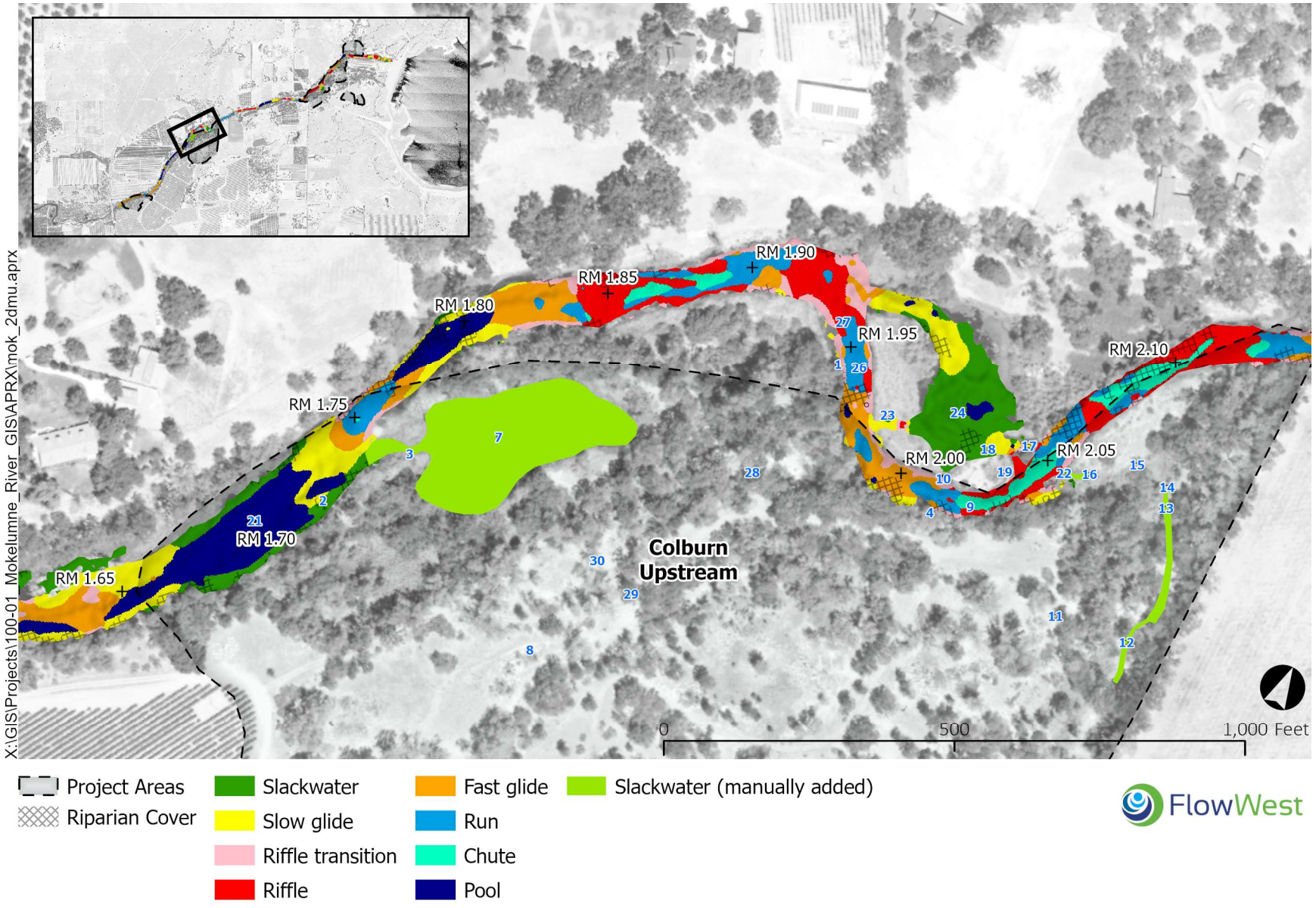

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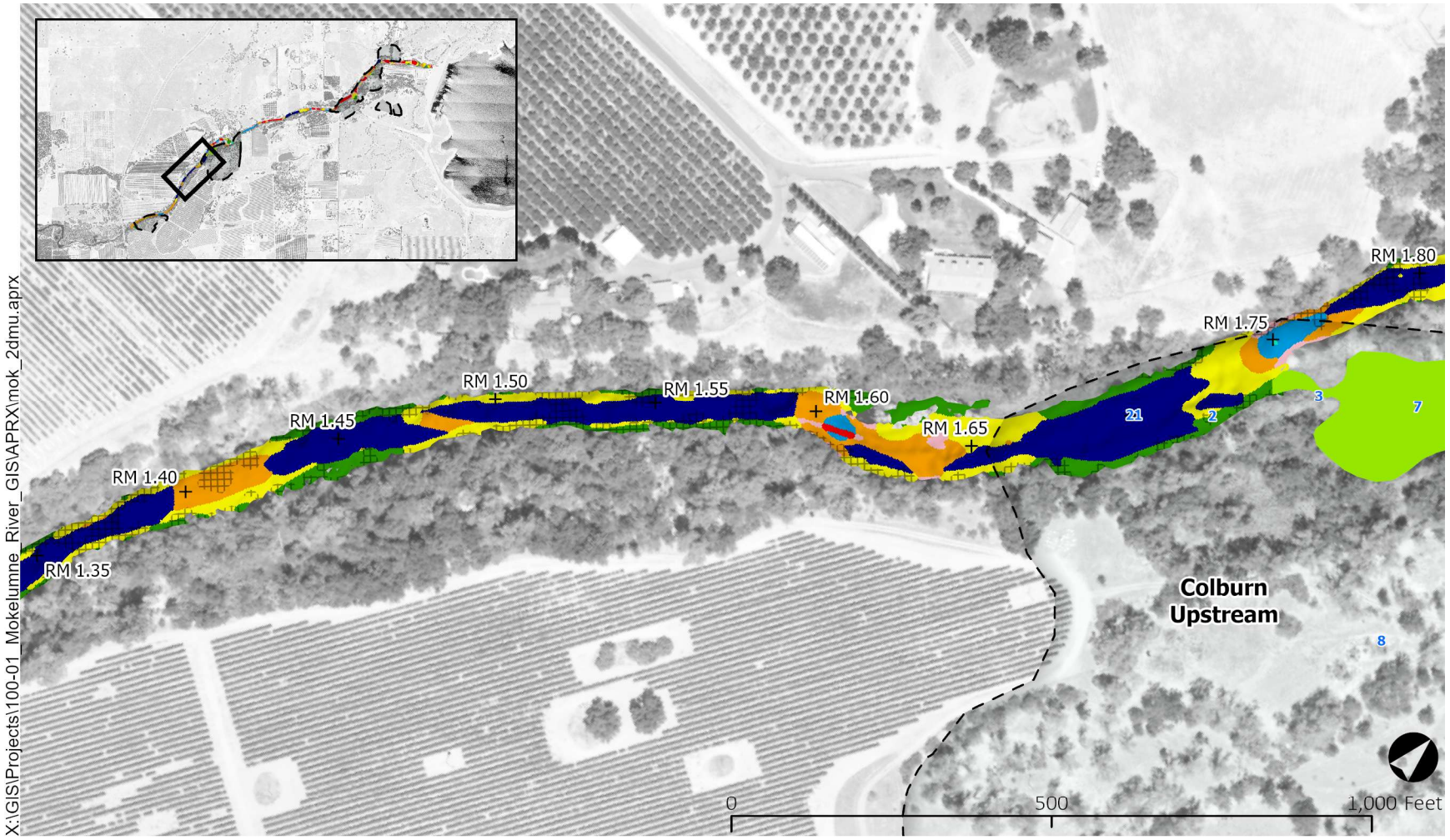

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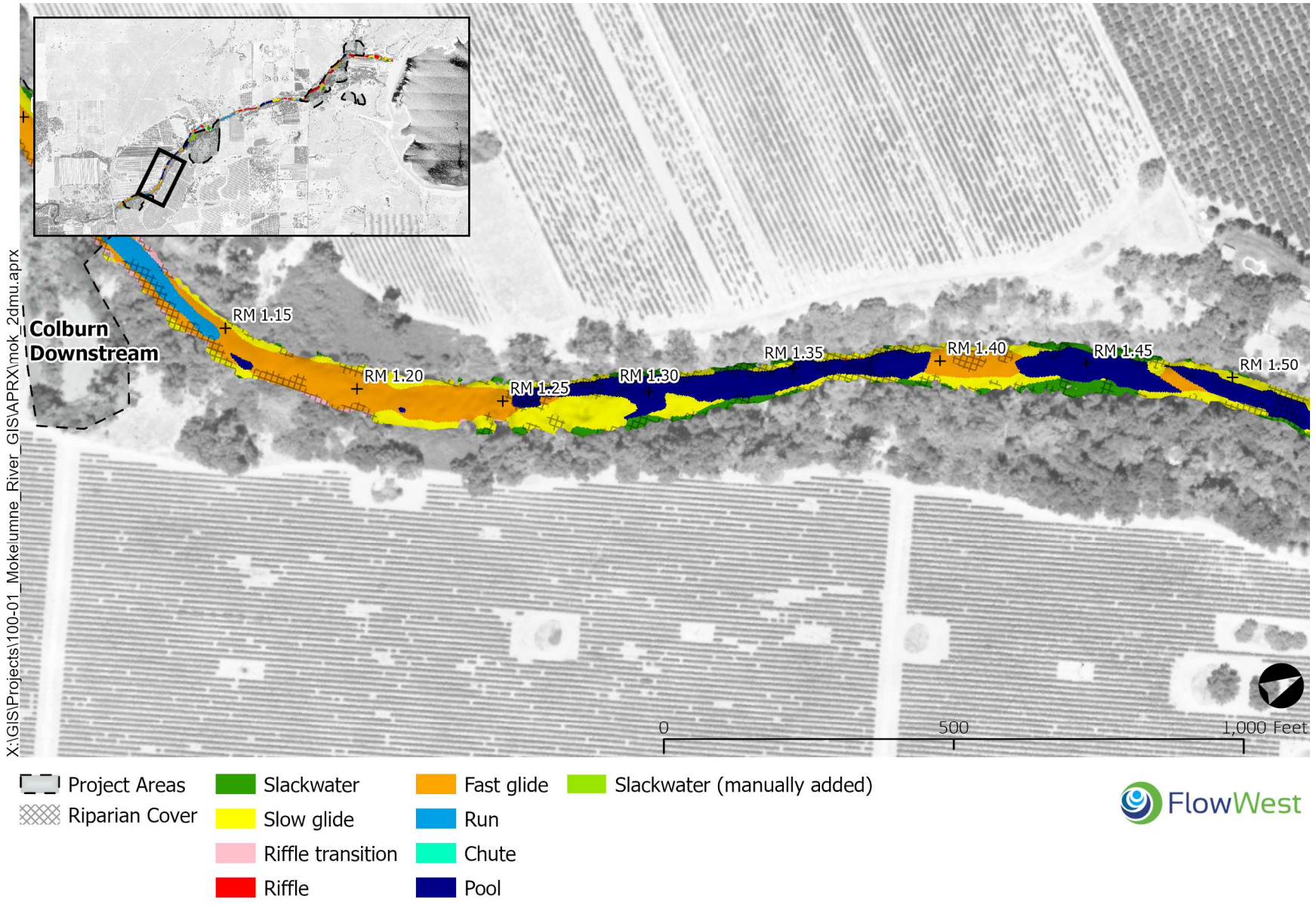

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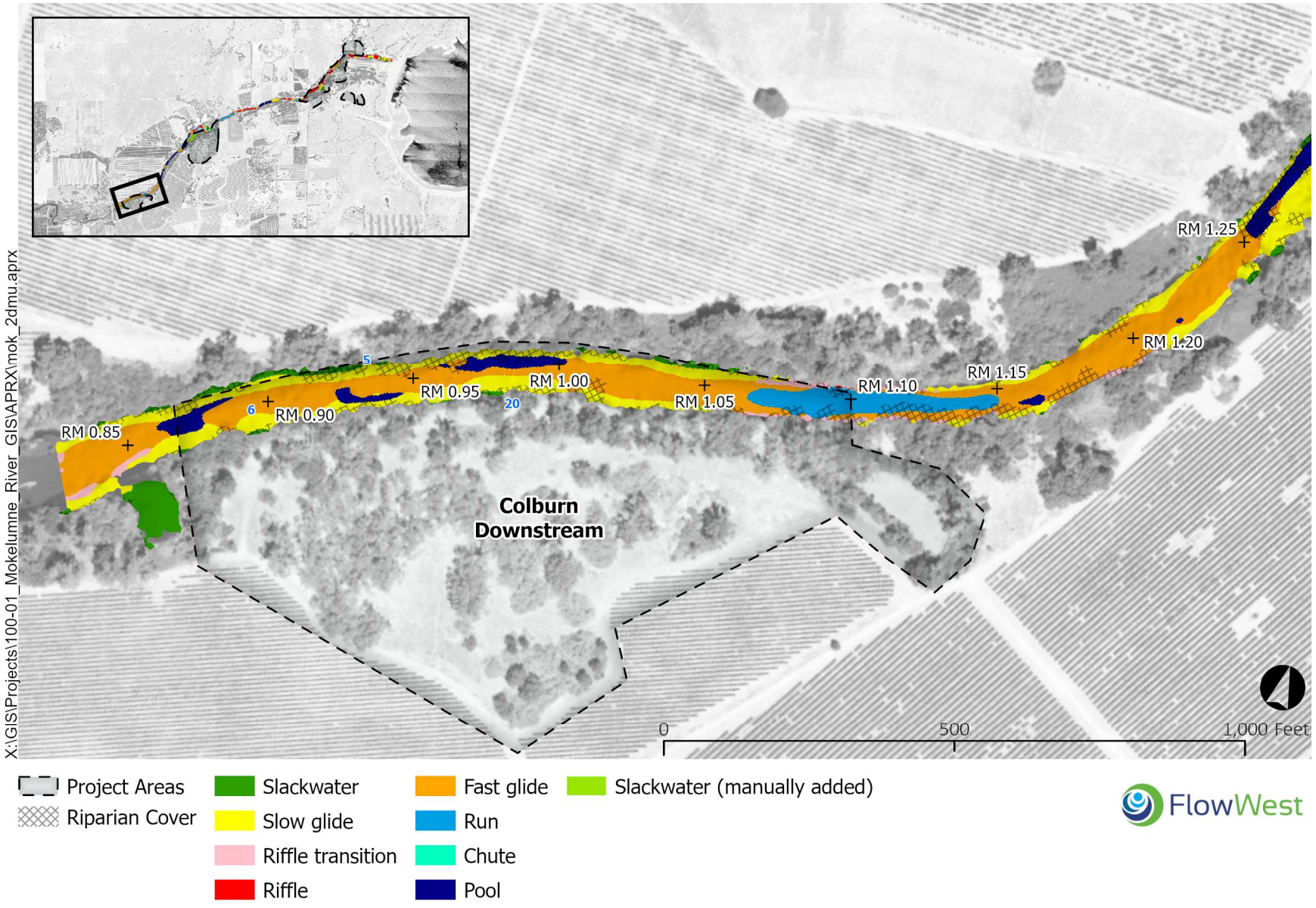

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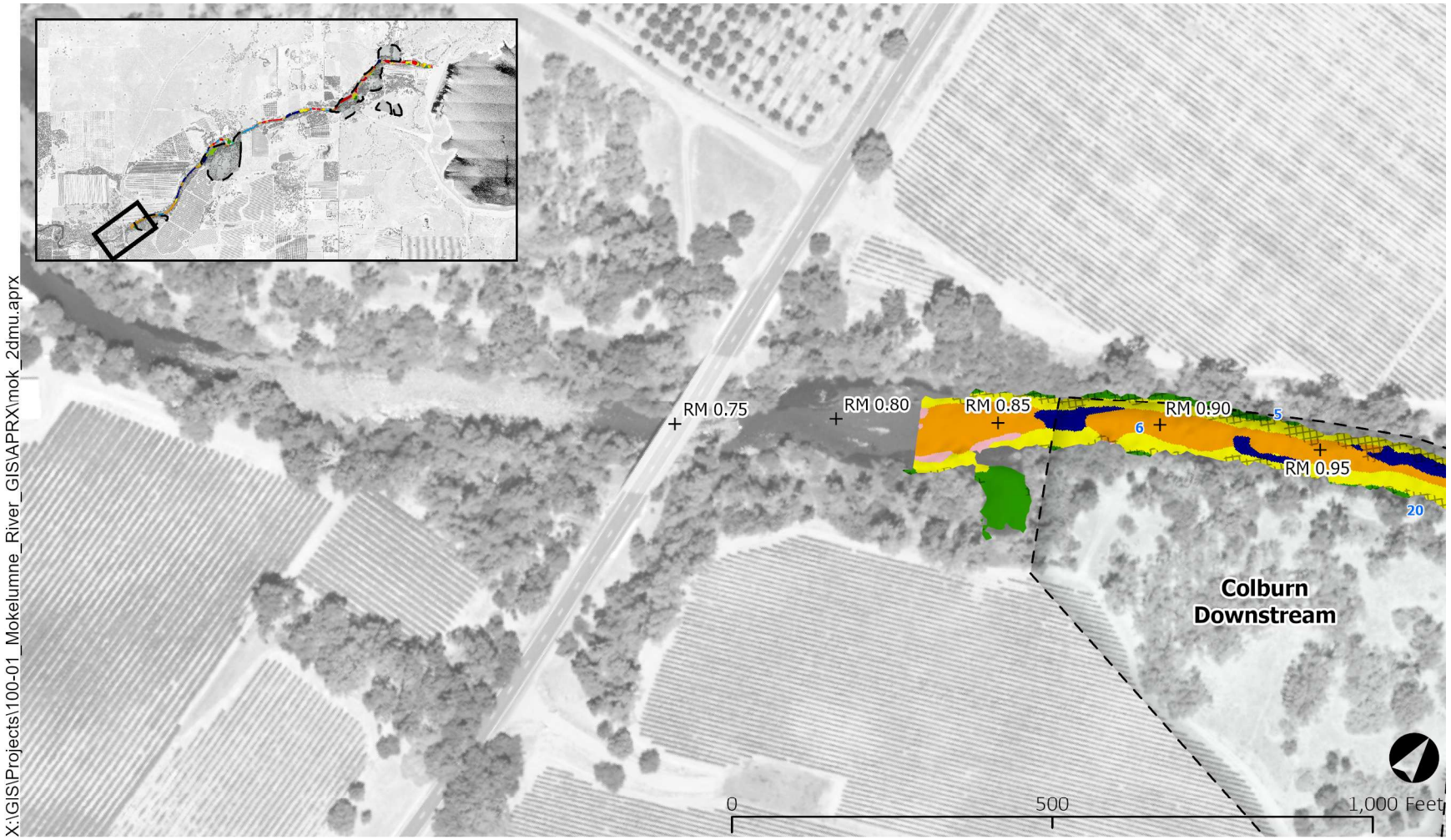

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Pool
Slackwater (manually added)
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Riparian Cover
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Slow glide
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Chute
Pool
Slackwater (manually added)
FlowWest


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Riffle transition
Riffle
Fast glide
Run
Chute
Pool
Slackwater (manually added)
FlowWest

APPENDIX E: BIOLOGICAL RESOURCES EVALUATION

SACRAMENTO OFFICE
2401 Capitol Avenue
Sacramento, CA 95816
Phone: 916/758-6928
www.vollmarconsulting.com

Mokelumne River Floodplain Reconnection and Restoration Project

Biological Resource Evaluation



San Joaquin County, CA

Prepared for:	Prepared by:
East Bay Municipal Utility District	Vollmar Natural Lands Consulting
1 Winemaster Way	1720 Solano Avenue
Lodi, CA 95240	Berkeley, CA 94707
Contact: James Pearson	Contact: John Vollmar
(209) 263-6357	(510) 220-9001
James.pearson@ebmud.com	jvollmar@vollmarconsulting.com

June 2026

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Appendix A. Special-status Species Documented in the Project Vicinity
Appendix B. Representative Photographs of the Study Area

1 INTRODUCTION

This Biological Resource Evaluation report has been prepared to assess the potential impacts to special-status species and jurisdictional habitats from the approximately 142.4-acre Mokelumne River Floodplain Reconnection and Restoration Project (Project). The Project is being completed by East Bay Municipal Utility District (EBMUD) with support from a team led by FlowWest. Vollmar Natural Lands Consulting (VNLC) is assessing biological resource impact and monitoring issues for the Project under subcontract to FlowWest and prepared this report.

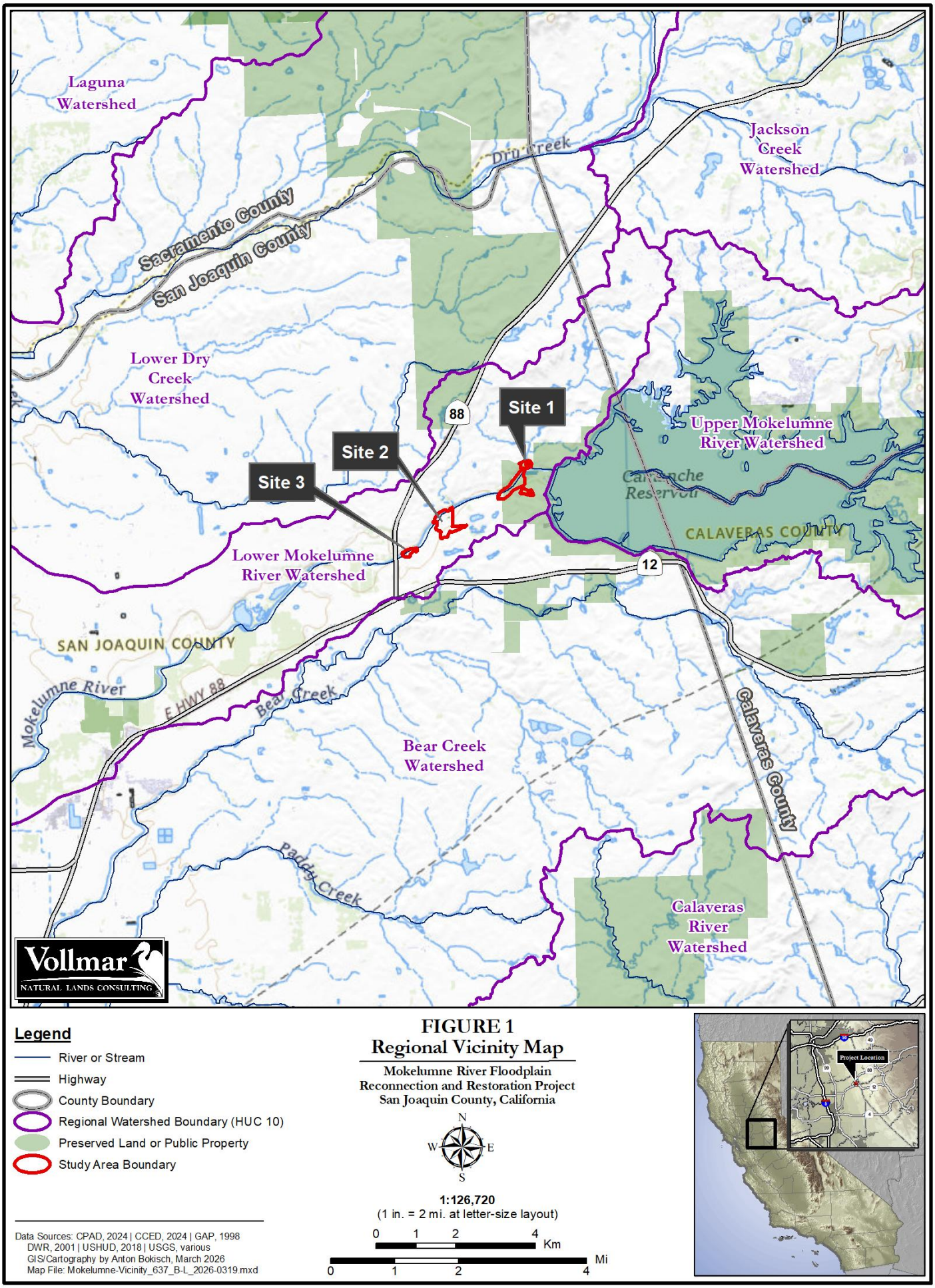
The Project involves design and regrading to improve floodplain salmonid rearing habitat on three sites (Sites) along the river just below Camanche Dam and Reservoir in eastern San Joaquin County, California. Site 1 (63.4 acres) is owned by EBMUD and is located at the Mokelumne River Day Use Area. Site 2 (67.6 acres) and Site 3 (11.4 acres) are both on a privately owned property located along the river about 1.5 miles downstream of Site 1 and just east of the Highway 88 bridge over the Mokelumne River. Together these Sites make up the Study Area (**Figures 1 and 2**).

A total of 32 special-status wildlife species and three special-status plant species known from the region are considered to have potential to occur within the Study Area and are addressed for potential impacts. Other special-status species known from the region are not expected to occur within the Study Area due to a lack of suitable habitat or narrow range located outside of the Study Area.

The primary terrestrial special-species that may be impacted by Project activities include several bird species that may nest in the Study Area, two bat species that may use trees as roosting sites, and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) if found to inhabit any of the host blue elderberry bushes (*Sambucus mexicanus*) that occur in the Study Area. Pre-construction surveys will be conducted for these species and, if documented, mitigation measures will be implemented to avoid or minimize impacts during construction activities.

Aquatic special-status species that inhabit the section of the Mokelumne River in and adjacent to the Study Area and may be impacted by the Project include steelhead - Central Valley DPS (*Oncorhynchus mykiss irideus* pop. 11), Chinook salmon – Central Valley late fall-run ESU (*Oncorhynchus tshawytcha*), Pacific lamprey (*Entosphenus tridentatus*), western river lamprey (*Lampetra ayresii*), and northwestern pond turtle (*Actinemys marmorata*). Mitigation measures for these species will be implemented to avoid or minimize impacts to these species during construction activities, especially performing work when river flows are below 500 cfs and not working nights or weekends to allow fish to pass.

By implementing the proposed mitigation measures, impacts are expected to be less than significant to any special-status species present in the Study Area during Project construction activities. Also, since the Project is intended to improve the extent and quality of floodplain habitats, it will ultimately be beneficial to the special-status species known or with potential to occur.



Legend

- River or Stream
- Highway
- County Boundary
- Regional Watershed Boundary (HUC 10)
- Preserved Land or Public Property
- Study Area Boundary

Data Sources: CPAD, 2024 | CCED, 2024 | GAP, 1998
DWR, 2001 | USHUD, 2018 | USGS, various
GIS/Cartography by Anton Bokisch, March 2026
Map File: Mokelumne-Vicinity_637_B-L_2026-0319.mxd

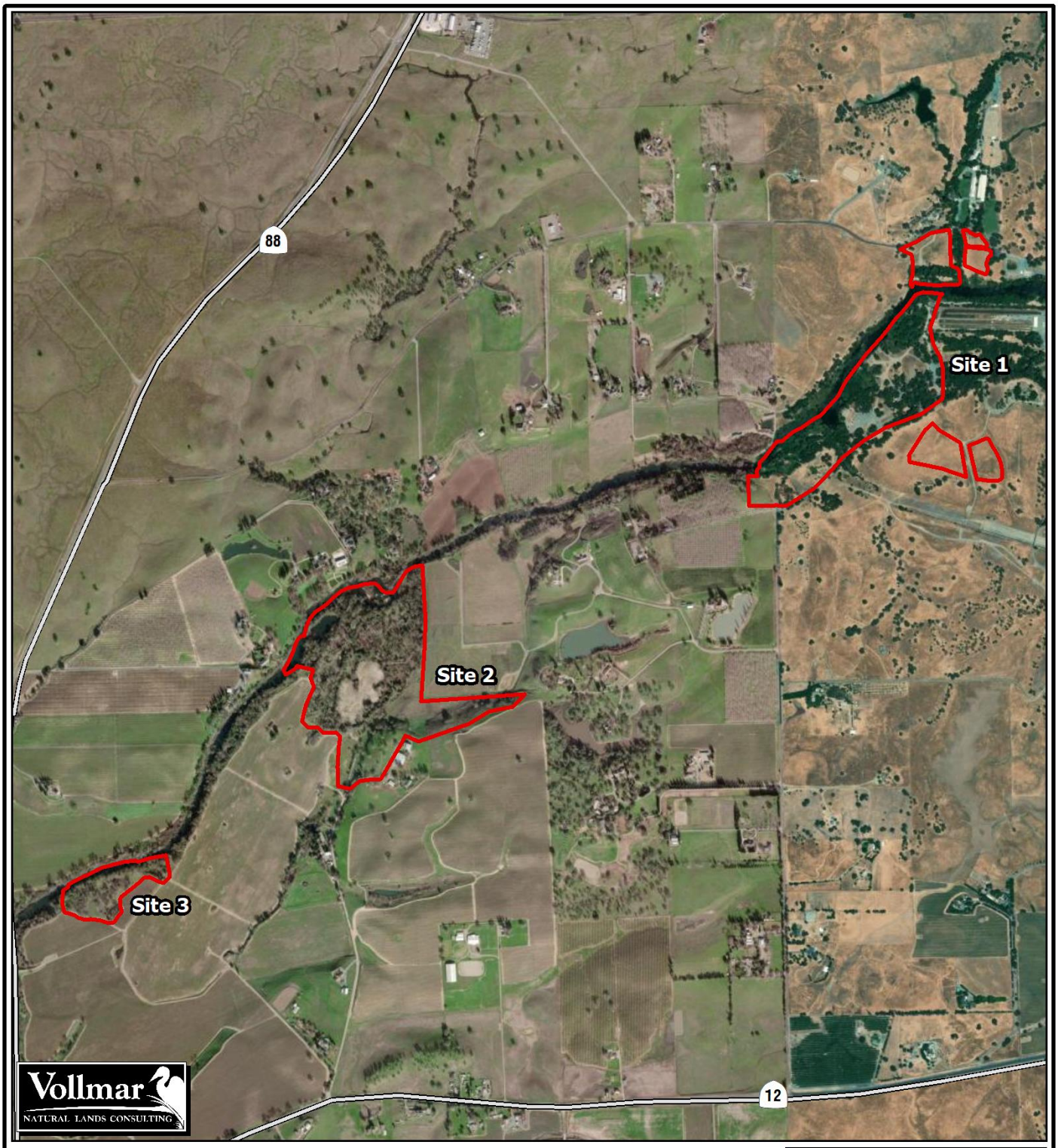
FIGURE 1
Regional Vicinity Map

Mokelumne River Floodplain
Reconnection and Restoration Project
San Joaquin County, California

N
W E
S

1:126,720
(1 in. = 2 mi. at letter-size layout)

0 1 2 4 Km
0 1 2 4 Mi



Legend

Highway

Study Area Boundary

FIGURE 2
Study Area

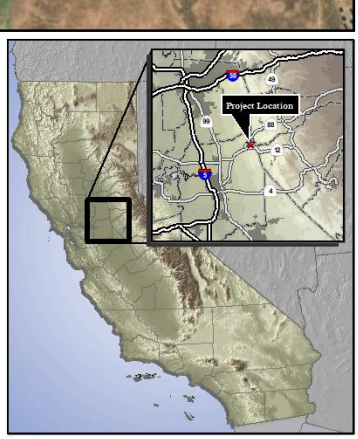
Mokelumne River Floodplain
Reconnection and Restoration Project
San Joaquin County, California

N
W E
S

1:20,000
(1 in. = 1,667 ft. at letter-size layout)

0 150 300 600 Meters

0 750 1,500 3,000 Feet



Data Sources: CPAD, 2024 | CCED, 2024 | GAP, 1998
DWR, 2001 | USHUD, 2018 | USGS, various
GIS/Cartography by Anton Bokisch, March 2026
Map File: Mokelumne-StudyArea_637_B-L_2026-0518.mxd

2 METHODS

Prior to initiating field surveys, VNLC ecologists conducted a review of the California Natural Diversity Data Base (CNDDB) to develop maps and a list of special-status species documented within a 5-mile radius of the Study Area. Plant community mapping data was obtained from VegCAMP (CDFW 2022) and wetland mapping from the National Wetland Inventory (NWI) database (USFWS 2026). VNLC also conducted a wetland delineation of the Study Area as part of the overall Project. All of these data were compiled into a Project geodatabase to develop regional and Study Area maps and to guide field assessments of the occurrence of suitable habitat for special-status species within the Study Area. Maps were installed in iPhone or Android devices and used with Skadi professional GPS units for navigation and data collection during field surveys.

VNLC ecologists conducted wetland delineation and habitat monitoring field surveys from August 25 through August 29, 2025. During these surveys, the special-status species and habitat maps were used to check and refine the plant community mapping and assess habitats for suitability to support special-status species. All wildlife and plant species observed were recorded, but no formal surveys for special-status species were conducted.

Using the combined remote and field survey data, the list of special-status species was trimmed to include only species with potential to occur within the Study Area based on the presence of suitable habitat. These species are addressed in this report.

3 PROPOSED PROJECT

The purpose of the Mokelumne River Floodplain Reconnection and Restoration Project is to design and construct at least 25 acres of new or enhanced floodplain habitat suitable for rearing salmonids, utilizing the three Sites described above to meet this goal. A secondary Project goal is to enhance spawning habitat in the main channel of the Mokelumne River, which will be accomplished through the design and construction of aquatic structures and features that promote suitable depths and velocities for salmonid spawning. The Project will involve grading floodplain areas throughout much of the three Project Sites and installation of materials within the main channel of the Mokelumne River within the footprint of the Study Area. The proposed work will result in temporary impacts to existing habitats within the floodplains, including removal of some trees and other existing wetland and upland vegetation, and temporary disturbance of substrate and aquatic habitats within the Mokelumne River. Ultimately, the proposed Project will result in a net gain in the abundance and quality of both floodplain and river channel habitat for the benefit of rearing salmonids and other wildlife species within the Study Area.

4 EXISTING CONDITIONS

The Study Area consists of three different Sites totaling approximately 142.4 acres (**Table 1**). Site 1 is located upstream on the eastern side of the Study Area and is composed of one large parcel with 63.4 acres within the Study Area. Site 2 is located between Site 1 and Site 3 and is composed of two parcels totaling 60.0 acres within the Study Area. Site 3 is located on the western part of the Study Area on the downstream side of the Mokelumne River. Site 3 is composed of one parcel containing 9.99 acres within the Study Area.

TABLE 1. Assessor's Parcels within the Study Area.

Site Number	Assessor's Parcel Number	Acreage Within Study Area*	Total APN Acreage
1	023-01-001	63.40	1,054.49
2	023-11-036 023-11-030	14.67 45.33	34.80 45.64
3	023-11-028	9.99	45.86

*Parcel acreages do not add up to total Study Area acreage due to parcel boundaries stopping at the bank of the river.

The Study Area is focused on portions of historic floodplains of the Mokelumne River (referred to as "Mokelumne" or "River"). The floodplains within Sites 1 and 2 are still hydrologically connected to the Mokelumne although they have been greatly altered by historic dredging activities that occurred in the early 20th century. Site 3 is hydrologically disconnected from the Mokelumne. This land used to be part of the historic floodplain-river system and, like Sites 1 and 2, was greatly affected by historic dredging activities. Site 3 has a large levee that restricts the Mokelumne from accessing its historic floodplain.

Site 1 allows public access to the Mokelumne River and is largely used for public recreation. This site is mostly composed of riparian woodland habitat that is broken down into multiple habitat categories and contains extensive wetlands, as shown in **Figure 4A.** Site 2 has a large amount of wetlands and a riparian woodland composed of Fremont's cottonwood (*Populus fremontii*), as seen on **Figure 4B**. Site 3 has a riparian woodland composed of a mosaic of habitats, as well as annual grassland and some wetlands, as shown on **Figure 4C**.

4.1 Topography

Elevation within the Study Area ranges from approximately 81 feet to 190 feet above sea level, based on high-resolution digital elevation model (DEM) data (NOAA 2017). The highest elevation occurs along the southwestern edge of Site 1, and the lowest elevation occurs within the Mokelumne River itself (USGS 2023a). The topography of the Study Area is highly variable. Site 1 is relatively flat, as most of it is floodplain to the Mokelumne River. Sites 2 and 3 both contain a levee immediately adjacent to the Mokelumne with undulating terrain on the other side due to deposits left from early 20th century dredging activities.

4.2 Hydrology

The Study Area lies within the Lower Mokelumne River Watershed (Hydrologic Unit Code [HUC] 10) (**Figure 1**) and within the historical floodplain of the Mokelumne River (USGS 2023b). The Mokelumne River flows westward to the Sacramento-San Joaquin River Delta. The lower reaches of the Mokelumne River are highly channelized; levees have been constructed on both sides of the river to prevent flooding and expand farming onto the highly productive historical floodplain. Murphy Creek, which drains directly into the Mokelumne River from the north, is adjacent to Site 1. It is the only tributary present in the Study Area. The Mokelumne River Fish Hatchery and the Camanche Dam and Reservoir are immediately east of Site 1. The Camanche Dam controls the flow of water into the Mokelumne River, which is regulated to provide municipal and agricultural water, generate hydroelectricity, and prevent catastrophic flooding during heavy storms and snowmelt.

The Study Area also contains seasonal wetlands and drainages. There is one seasonal wetland that occurs within the southern area of Site 2 (**Figure 2B**). The seasonal wetland is filled by direct precipitation. There are several drainages present in Site 1 and Site 2 that drain water from the south and east of the Sites into the Mokelumne River. The drainages receive water from various sources. The drainages in the southern part of Site 2 receive water from precipitation that collects along the hillside. The drainages present in Site 1 receive water from a combination of sources including direct precipitation as well as seepage from the Camanche Reservoir.

4.3 Soils

The Study Area contain several different soil map units as shown on **Figure 3A-3C** and summarized in **Table 2**. Over half of the total Study Area is mapped as dumps and tailings (52.6%). Areas with dumps and tailings are restricted to uses such as wildlife habitat, recreation, watershed, or aesthetic purposes as they are not suitable for agriculture. Soils in this map unit are not rated as hydric soils, but water on or in them interferes with proper plant growth. The soil map unit with the second-highest representation in the Study Area (11.5%) is Egbert silty clay loam, partially drained, 0 to 2% slopes. This soil unit consists of mixed alluvium, and is usually hydric and found in floodplains. The remaining soil units consist mostly of moderately- to well-drained sandy loams, which is consistent with a floodplain environment.

TABLE 2. Mapped Soil Units within the Study Area.

Soil Unit	Parent Material	Surface Texture	Hydric	Drainage Class	Percent of Study Area
Columbia fine sandy loam, drained, 0 to 2 percent slopes, MRLA 17	Alluvium derived from igneous, metamorphic and sedimentary rock	Fine sandy loam	Yes	Somewhat poorly drained	5.9% (8.4 ac.)
Dumps, tailings	Unknown	Variable	No	Unknown	52.6% (74.8 ac.)
Egbert silty clay loam, partially drained, 0 to 2 percent slopes, MRLA 16	Alluvium derived from mixed rock sources	Silty clay loam	Yes	Poorly drained	11.5% (16.3 ac.)
Pentz sandy loam, 2 to 15 percent slopes	Residuum weathered from basic tuff	Sandy loam	No	Well drained	0.9% (1.3 ac.)
Ramoth sandy loam, 8 to 15 percent slopes	Alluvium derived from granitic rock sources	Sandy loam	No	Well drained	9.8% (13.8 ac.)
Ramoth sandy loam, 15 to 30 percent slopes	Alluvium derived from granitic rock sources	Sandy loam	No	Well drained	6.3% (9.1 ac.)
Vina fine sandy loam, 0 to 2 percent slopes, MRLA 17	Alluvium derived from igneous, metamorphic and sedimentary rock	Fine sandy loam	No	Well drained	6.1% (8.7 ac.)
Tokay fine sandy loam, 0 to 2 percent slopes	Alluvium derived from granitic rock sources	Fine sandy loam	No	Well drained	2.9% (4.2 ac.)
Water	N/A	N/A	Unranked	N/A	4.0% (5.8 ac.)

Source: U.S. Department of Agriculture Natural Resources Conservation Service, SoilWeb website, 2025 (USDA 2025).

FIGURE 3A
Soils Map

Mokelumne River Floodplain Reconnection and Restoration Project
San Joaquin County, California

Soil Code: Soil Unit Name

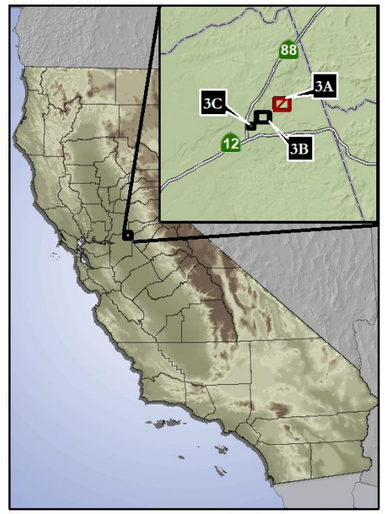
130: Columbia fine sandy loam - drained 0 to 2 percent slopes
151: Dumps - tailings
153: Egbert silty clay loam - partially drained 0 to 2 percent slopes
206: Pentz sandy loam, 2 to 15 percent slopes
217: Ramoth sandy loam, 8 to 15 percent slopes
218: Ramoth sandy loam, 15 to 30 percent slopes
256: Tokay fine sandy loam, 0 to 2 percent slopes
272: Vina fine sandy loam, 0 to 2 percent slopes
W: Water

Elevation (ft)

77 - 85
85 - 90
90 - 95
95 - 100
100 - 105
105 - 110
110 - 115
115 - 120
120 - 125
125 - 130
130 - 135
135 - 140
140 - 145
145 - 150
150 - 155
155 - 160
160 - 165
165 - 170
170 - 175
175 - 180
180 - 185

Legend

Project Boundary
Soil Boundary



N
W E
S

1:4,000
1 in. = 333 ft. at tabloid layout

0 45 90 135 180 Meters
0 165 330 495 660 Feet

Data Sources: ESRI/MAXAR, 2026 | VNLC, 2025 | USGS, various
USDA, 2026
Map Produced by: Vollmar Natural Lands Consulting
GIS/Cartography by T. Hurd, Feb. 2026

Vollmar NATURAL LANDS CONSULTING

FIGURE 3B
Soils Map

Mokelumne River Floodplain Reconnection and Restoration Project
San Joaquin County, California

Soil Code: Soil Unit Name

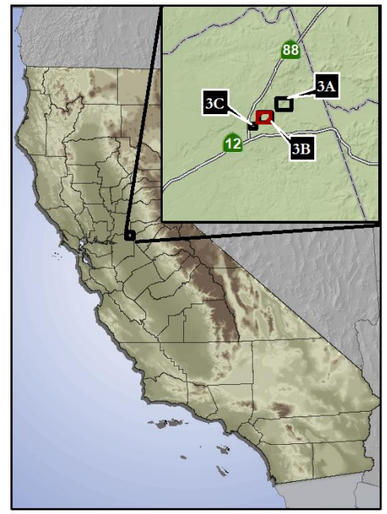
130: Columbia fine sandy loam - drained 0 to 2 percent slopes
151: Dumps - tailings
153: Egbert silty clay loam - partially drained 0 to 2 percent slopes
206: Pentz sandy loam, 2 to 15 percent slopes
217: Ramoth sandy loam, 8 to 15 percent slopes
218: Ramoth sandy loam, 15 to 30 percent slopes
256: Tokay fine sandy loam, 0 to 2 percent slopes
272: Vina fine sandy loam, 0 to 2 percent slopes
W: Water

Elevation (ft)

- 77 - 85
- 85 - 90
- 90 - 95
- 95 - 100
- 100 - 105
- 105 - 110
- 110 - 115
- 115 - 120
- 120 - 125
- 125 - 130
- 130 - 135
- 135 - 140
- 140 - 145
- 145 - 150
- 150 - 155
- 155 - 160
- 160 - 165
- 165 - 170
- 170 - 175
- 175 - 180
- 180 - 185

Legend

- Project Boundary
- Soil Boundary



N
W E
S

1:3,600

1 in. = 300 ft. at tabloid layout

0 40 80 120 160 Meters
0 145 290 435 580 Feet

Data Sources: ESRI/MAXAR, 2026 | VNLC, 2025 | USGS, various
USDA, 2026
Map Produced by: Vollmar Natural Lands Consulting
GIS/Cartography by T. Hurd, Feb. 2026

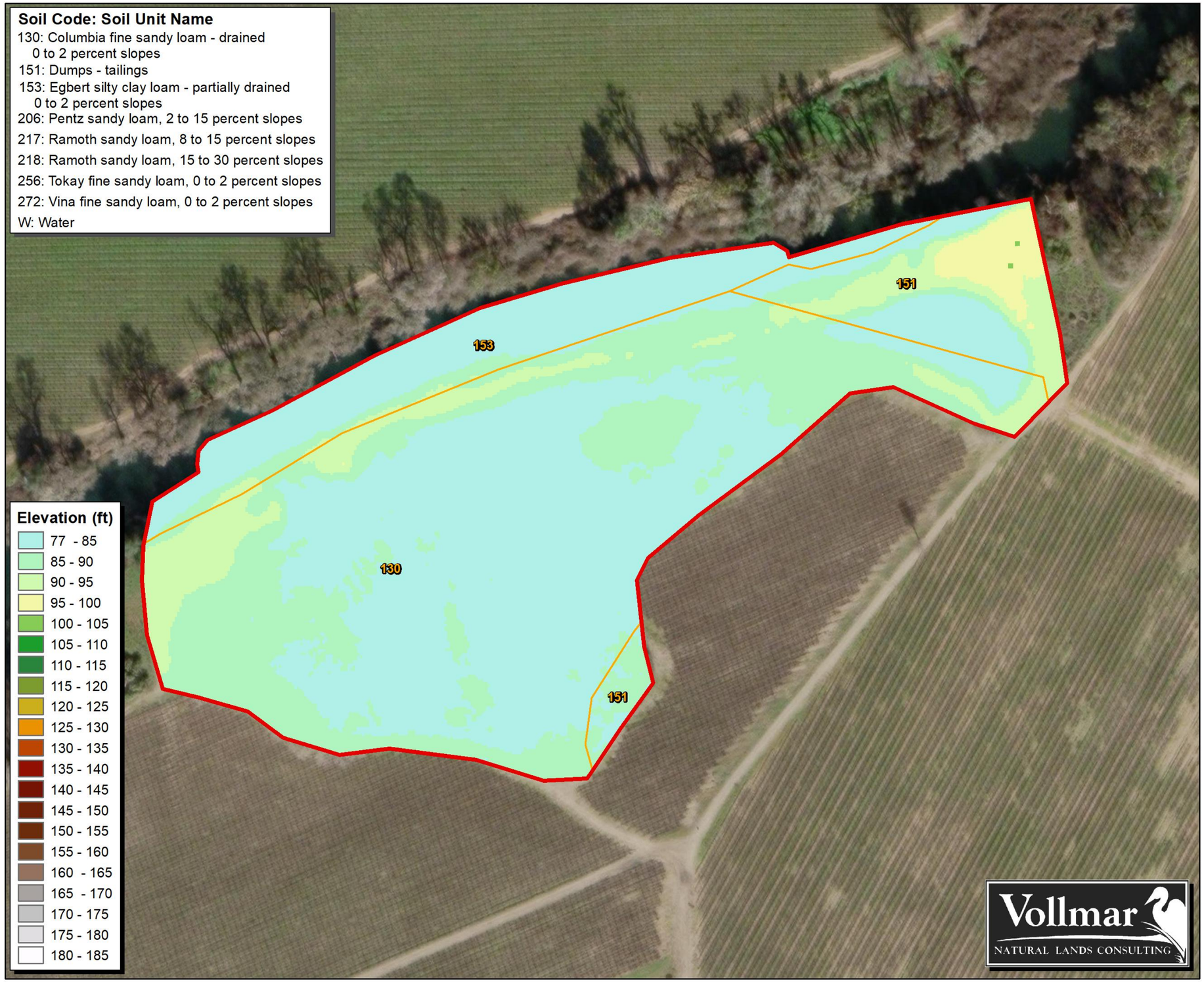
Vollmar NATURAL LANDS CONSULTING

FIGURE 3C
Soils Map

Mokelumne River Floodplain Reconnection and Restoration Project
San Joaquin County, California

Soil Code: Soil Unit Name

130: Columbia fine sandy loam - drained 0 to 2 percent slopes
151: Dumps - tailings
153: Egbert silty clay loam - partially drained 0 to 2 percent slopes
206: Pentz sandy loam, 2 to 15 percent slopes
217: Ramoth sandy loam, 8 to 15 percent slopes
218: Ramoth sandy loam, 15 to 30 percent slopes
256: Tokay fine sandy loam, 0 to 2 percent slopes
272: Vina fine sandy loam, 0 to 2 percent slopes
W: Water



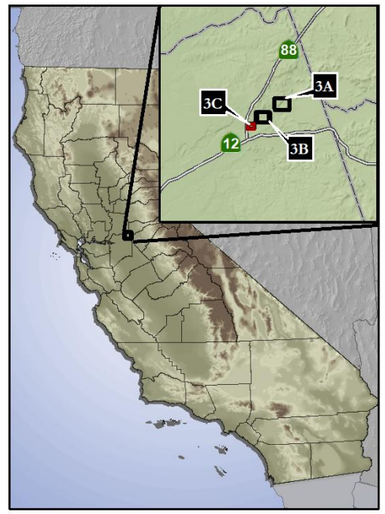
Elevation (ft)

- 77 - 85
- 85 - 90
- 90 - 95
- 95 - 100
- 100 - 105
- 105 - 110
- 110 - 115
- 115 - 120
- 120 - 125
- 125 - 130
- 130 - 135
- 135 - 140
- 140 - 145
- 145 - 150
- 150 - 155
- 155 - 160
- 160 - 165
- 165 - 170
- 170 - 175
- 175 - 180
- 180 - 185

Vollmar NATURAL LANDS CONSULTING

Legend

- Project Boundary
- Soil Boundary



N
W E
S

1:1,600

1 in. = 133 ft. at tabloid layout

0 15 30 45 60 Meters
0 65 130 195 260 Feet

Data Sources: ESRI/MAXAR, 2026 | VNLC, 2025 | USGS, various USDA, 2026
Map Produced by: Vollmar Natural Lands Consulting
GIS/Cartography by T. Hurd, Feb. 2026

4.4 Climate

The climate in the region is characterized as Mediterranean, with cool, wet winters and warm, dry summers as well as high inter-annual and intra-annual variability in precipitation. Mean annual precipitation and temperature at the Study Area are 18.6 inches and 61.2 degrees Fahrenheit, respectively. Normally, over 98 percent of annual precipitation occurs during the wet season, which extends from October to May. December is generally the coldest month of the year, averaging 46.8 degrees Fahrenheit, while the summer temperature maximums occur in July, reaching an average of 75.7 degrees Fahrenheit (PRISM 2025).

4.5 Vegetation

Vegetation communities within the Study Area are broken into seven different types: white alder forest, Fremont's cottonwood forest, Fremont's cottonwood – white alder forest, blue oak woodland, interior live oak woodland, valley oak woodland, valley oak – interior live oak woodland, arroyo willow forest, California annual and perennial grassland, seasonal wetlands, and perennial wetlands. **Figure 4A-4C** shows the distribution of these communities in the Study Area.

4.5.1 White Alder Forest

White alder (*Alnus rhombifolia*) forest represents a small amount of riparian canopy which occurs between the main stem of the Mokelumne River and a small side channel within Site 1. The overstory is dominated by white alder and some scattered Fremont's cottonwood. The understory is entirely dominated by a dense thicket of Himalayan blackberry (*Rubus armeniacus*), with some herbaceous wetland species including Dallis grass (*Paspalum dilatatum*) and water pepper (*Persicaria hydropoperoides*) present on the water's edge.

4.5.2 Fremont's Cottonwood Forest

Fremont's cottonwood forest is classified by a woody overstory dominated by this species. This habitat type is present within all three Sites. The overstory is primarily dominated by Fremont's cottonwood while in certain areas other woody overstory species were present such as white alder, valley oak (*Quercus lobata*), interior live oak (*Quercus wislizeni*), and northern California walnut (*Juglans hindsii*). Species commonly found within the understory were Himalayan blackberry, slender wild oat (*Avena barbata*), ripgut brome (*Bromus diandrus*), Italian rye grass (*Festuca perennis*), summer mustard (*Hirschfeldia incana*), spreading hedgeparsley (*Torillis arvensis*), and seashore vervain (*Verbena littoralis*).

4.5.3 Blue Oak Woodland

Blue oak (*Quercus douglasii*) woodland is present along a hillslope in the southern area of Site 2. This habitat type is classified by a scattered overstory dominated by blue oaks. The understory is composed of non-native annual grasses commonly found in the central valley such as Italian rye grass, ripgut brome, soft chess (*Bromus hordeaceous*), and slender wild oat.

4.5.4 Interior Live Oak Woodland

Interior live oak woodland occurs along slopes both on the northern and southern sides of Site 1. This habitat type is classified by a canopy dominated by interior live oaks. This habitat type is present within larger complexes of the California annual and perennial grassland community. Understory of the interior

live oak habitat is composed of non-native annual grasses such as Italian rye grass, ripgut brome, soft chess, and slender wild oat.

4.5.5 Blue Oak – Interior Live Oak Woodland

Blue oak – Interior live oak woodland occurs within all three Project Sites. This habitat type is classified by a co-dominant tree canopy consisting of blue oak and interior live oak. Understory of the interior live oak habitat is composed of non-native annual grasses such as Italian rye grass, ripgut brome, soft chess, and slender wild oat.

4.5.6 Arroyo Willow Forest

Arroyo willow (*Salix lasiolepis*) forest occurs in only one area within Site 1. A dense thicket of arroyo willow formed around a side channel of the Mokelumne River. The overstory is composed entirely of arroyo willow and the understory was sparse but contained few scatterings of Dallis grass, Baltic rush (*Juncus balticus*), and tall flatsedge (*Cyperus eragrostis*).

4.5.7 Perennial Wetland

Perennial wetlands occur within all three Sites. This community encompasses a mosaic of habitats such as woody riparian mixed with herbaceous wetlands. The woody vegetation of the perennial wetlands include sandbar willow (*Salix exigua*), arroyo willow, white alder, and Fremont cottonwood. Dominant herbaceous plant species recorded within perennial wetlands included pale spikerush (*Eleocharis macrostachya*), tall flatsedge, rice cutgrass (*Leersia oryzoides*), rabbitsfoot grass (*Polypogon monspeliensis*), water pepper, Mexican rush (*Juncus mexicanus*), soft rush (*Juncus effusus*), curly dock (*Rumex crispus*), and duckweed (*Lemna minor*).

4.5.8 Seasonal Wetland

A seasonal wetland occurs in the southern corner of Site 2. This feature is seasonally inundated strictly by rainfall. Plants recorded in this feature are entirely herbaceous and included stalked popcornflower (*Plagiobothrys stipitatus*), Bermuda grass (*Cynodon dactylon*), seaside barley (*Hordeum marinum*), and red stemmed filaree (*Erodium cicutarium*).

4.5.9 Other Waters

For the purposes of this report, this habitat includes the active channel of the Mokelumne River below the Ordinary High Water Mark (OHWM). It occurs within all three Project Sites in the main stem of the Mokelumne and in some seasonal side channels at Sites 1 and 2.

4.5.10 California Annual and Perennial Grassland

The remaining portions of the Study Area are mostly dominated by California annual and perennial grassland community. It primarily consists of non-native annual grasses and ruderal weeds. These are likely related to the history of disturbance and agriculture within the Study Area. Dominant plant species in this community include slender wild oat, ripgut brome, soft chess, Mediterranean barley (*Hordeum murinum*), seashore vervain, and rose clover (*Trifolium hirtum*). Other non-dominant plants species in this community include yellow star thistle (*Centaurea solstitialis*) and summer mustard.

4.6 Wildlife

The Study Area provides suitable habitat for a large number of common and special-status wildlife species. The majority of the common wildlife species observed during the field surveys were birds, and they were mostly concentrated around the riparian and grassland habitats. These habitats provide important foraging and nesting areas for many species of migratory and resident birds. In total, 12 bird species were incidentally documented during 2025 surveys, with no formal or focused bird surveys conducted. These included: Bewick's wren (*Thryomanes bewickii*), acorn woodpecker (*Melanerpes formicivorus*), California scrub jay (*Aphelocoma californica*), and lesser goldfinch (*Spinus psaltria*). Other wildlife species documented in the Study Area (by EBMUD biologists) include steelhead (*Oncorhynchus mykiss irideus*), Chinook salmon (*Oncorhynchus tshawytscha*), and three-spined stickleback (*Gasterosteus aculeatus*). The potential for special-status wildlife species to occur within the Study Area is addressed below in **Section 4**.

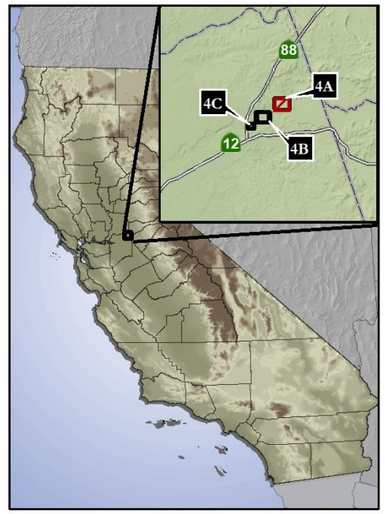
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FIGURE 4A
Habitats Map

Mokelumne River Floodplain Reconnection and Restoration Project
San Joaquin County, California

Habitat Alliance

- Alnus rhombifolia
- California Annual and Perennial Grassland
- Other Waters
- Perennial Wetland
- Populus fremontii
- Quercus lobata
- Quercus lobata - Quercus wislizeni
- Quercus wislizeni
- Salix lasiolepis
- Urban



N
W E
S

1:4,000

1 in. = 333 ft. at tabloid layout

0 45 90 135 180 Meters

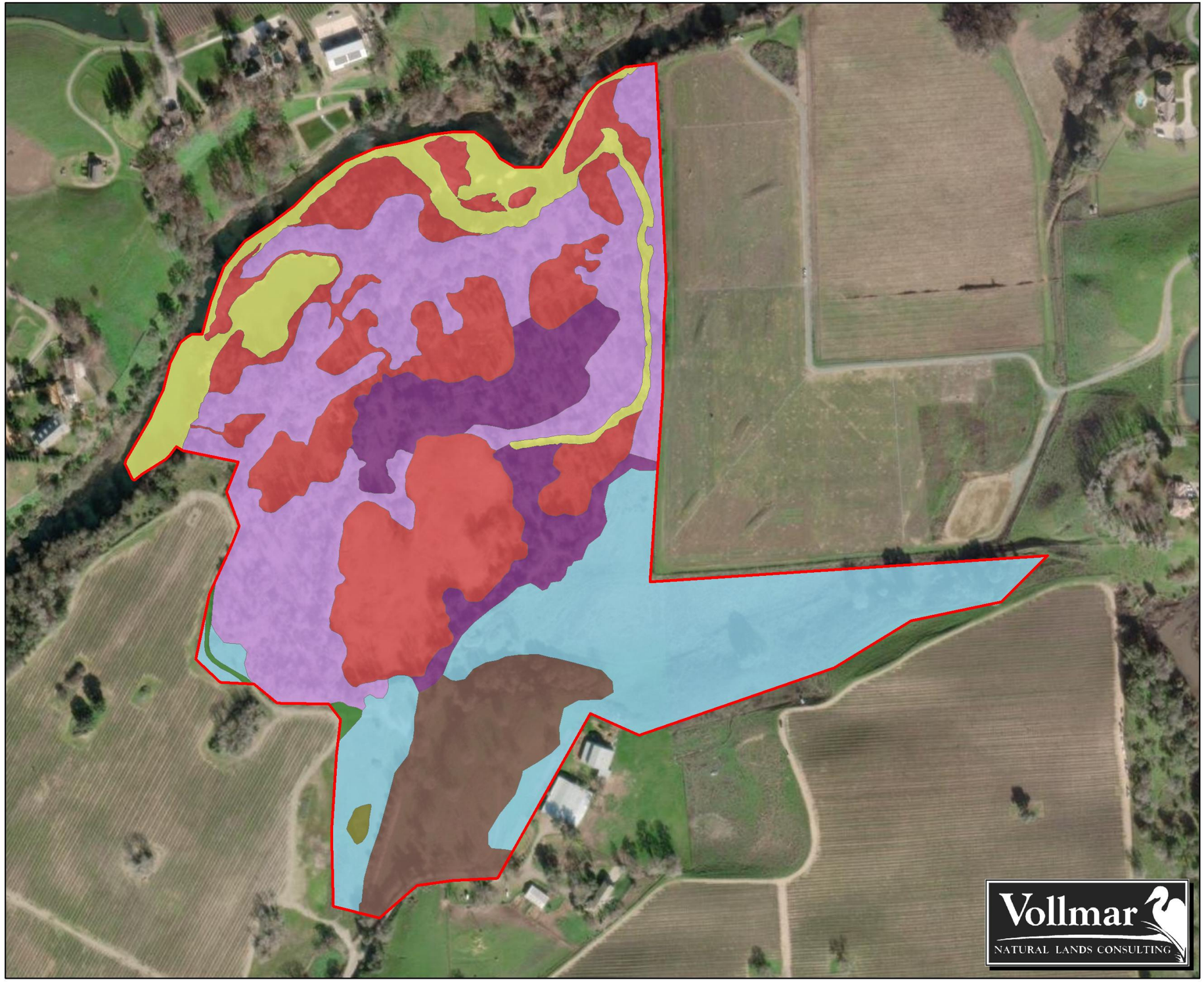
0 165 330 495 660 Feet

Vollmar
NATURAL LANDS CONSULTING

Data Sources: ESRI/MAXAR, 2026 | VNLC, 2025
Map Produced by: Vollmar Natural Lands Consulting
GIS/Cartography by T. Hurd, Feb. 2026
Map File: 637_Habitats_B-L_2026-0319.mxd

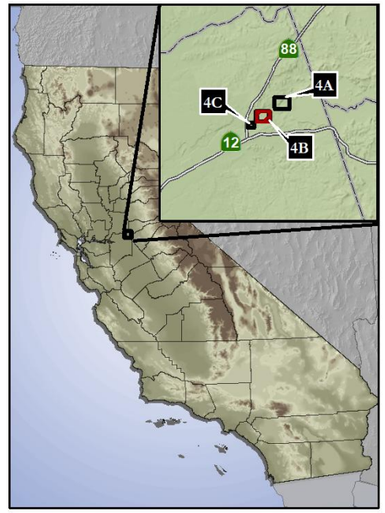
FIGURE 4B
Habitats Map

Mokelumne River Floodplain Reconnection and Restoration Project
San Joaquin County, California



Habitat Alliance

- California Annual and Perennial Grassland
- Other Waters
- Perennial Wetland
- Populus fremontii
- Quercus douglasii
- Quercus lobata - Quercus wislizeni
- Road
- Seasonal Wetland



N
W E
S

1:3,600

1 in. = 300 ft. at tabloid layout

0 40 80 120 160 Meters

0 145 290 435 580 Feet

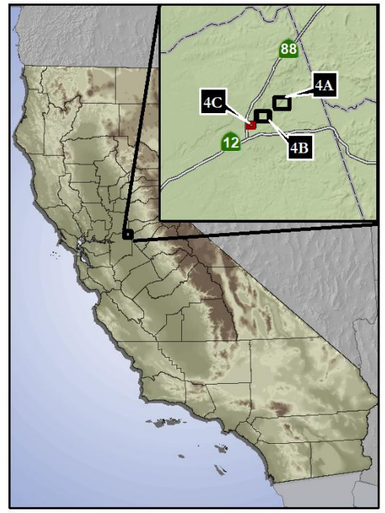
Data Sources: ESRI/MAXAR, 2026 | VNLC, 2025
Map Produced by: Vollmar Natural Lands Consulting
GIS/Cartography by T. Hurd, Feb. 2026
Map File: 637_Habitats_B-L_2026-0319.mxd

FIGURE 4C
Habitats Map

Mokelumne River Floodplain Reconnection and Restoration Project
San Joaquin County, California

Habitat Alliance

- California Annual and Perennial Grassland
- Other Waters
- Perennial Wetland
- Populus fremontii
- Quercus lobata - Quercus wislizeni
- Road



N
W E
S

1:1,600

1 in. = 133 ft. at tabloid layout

0 15 30 45 60 Meters

0 65 130 195 260 Feet

Vollmar NATURAL LANDS CONSULTING

Data Sources: ESRI/MAXAR, 2026 | VNLC, 2025
Map Produced by: Vollmar Natural Lands Consulting
GIS/Cartography by T. Hurd, Feb. 2026
Map File: 637_Habitats_B-L_2026-0319.mxd

5 SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR

5.1 Special-Status Wildlife Species

A total of 32 special-status wildlife species were determined to have potential to occur within the Study Area. These include two amphibians, 20 birds, two mammals, three invertebrates, four fish, and one reptile. **Table 3** provides a summary of these species including their names, listing statuses, potential to occur, and recommended avoidance and mitigation measures. **Table 4** provides a detailed description of each mitigation measure. **Figure 5** shows documented occurrences of these special-status species on or in the vicinity of the Study Area. Each species is also discussed in greater detail below. Additional special-status species known from region were determined not to have potential to occur in the Study Area due to a lack of suitable habitat and/or due to distance from any known historical or current populations. **Appendix A, Table A-1** includes a list of all special-status wildlife species evaluated for this report.

As a result of the large-scale conversion and development in the region over the past century, much of the local flora and fauna has experienced a significant loss of habitat. This has resulted in some species being listed as endangered, threatened, or rare by federal and/or state authorities. Special-status wildlife species targeted and analyzed in this report include those listed by U.S. Fish and Wildlife Service (USFWS) and/or California Department of Fish and Wildlife (CDFW) as rare, threatened, or endangered, as well as those proposed for listing or designated as a candidate for listing as threatened or endangered under ESA or CESA. Listing species as "Endangered, Rare, or Threatened" is defined in Section 15380 of the *California Environmental Quality Act* (*CEQA*) *Guidelines*. Section 15380(b) states that a species of animal or plant is "endangered" when its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors. A species is "rare" when either "(A) although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or (B) the species is likely to become endangered within the foreseeable future throughout all or a portion of its range and may be considered 'threatened' as that term is used in the Endangered Species Act (ESA)."

Wildlife species are also designated as "Species of Special Concern" (SSC) or "Fully Protected" (FP) by CDFW. Although these species have no legal status under the California Endangered Species Act (CESA), CDFW recommends their protection as their populations are generally declining and they could be listed as threatened or endangered (under CESA) in the future. "Fully Protected" species generally may not be taken or possessed at any time. The CDFW may only authorize take for necessary scientific research and may authorize live capture and relocation of "fully protected" birds to protect livestock. "Watch List" (WL) species are taxa that were previously SSCs but do not currently meet SSC criteria, and for which there remains concern. Bird species may also be designated as "Birds of Conservation Concern" (BCC) by the USFWS. This designation identifies both migratory and resident bird species that are recommended as focal species for conservation. These species are more likely to be at risk for population drops that could result in their listing under ESA.

The Study Area is located within the Central Zone of the San Joaquin County Multi-species Habitat Conservation and Open Space Plan (SJMSCP). Avoidance and minimization measures (AMMs) recommended in this report are at least as conservative as those written into the SJMSCP for any SJMSCP-

covered species with potential to occur in the Study Area. For any special-status species with potential to occur that are not covered by the SJMSCP, the report recommends AMMs that offer reasonable protections to those species based on the most current knowledge provided by agencies and other experts, and taking into consideration such variables as their likelihood to occur in the Sites and their perceived degree of sensitivity to Project activities (SJMSCP 2000).

TABLE 3. Special-status Species with Potential to Occur in the Study Area.

Species Name	Listing Status[1]	Potential to Occur in Study Area	Mitigation Measures
California Tiger Salamander Central Valley DPS, Pop. 1 *Ambystoma californiense*	FT, ST, WL	Moderate	BIO 1a, 1b &1c
Western Spadefoot *Spea hammondii*	FPT, SSC	Moderate	BIO 1a, 1b &1c
Tricolored Blackbird (nesting) *Agelaius tricolor*	ST, SSC, BCC	Low	BIO 2a & 2b
Golden Eagle *Aquila chrysaetos*	FP, WL	Low	BIO 3a & 3b
Cooper's Hawk *Astur cooperii*	WL	High	BIO 3a & 3b
Western Burrowing Owl *Athene cunicularia hypugaea*	SCE, SSC, BCC	Moderate	BIO 4a & 4b
Ferruginous Hawk *Buteo regalis*	WL	Low	BIO 3a & 3b
Swainson's Hawk *Buteo swainsoni*	ST	High	BIO 5a & 5b
Northern Harrier *Circus hudsonius*	SSC, BCC	High	BIO 3a & 3b
White-tailed Kite *Elanus leucurus*	FP	High	BIO 5a & 5b
Willow Flycatcher *Empidonax traillii*	SE	Low	BIO 6a & 6b
Prairie Falcon *Falco mexicanus*	WL	Low	BIO 3a & 3b
Common Loon *Gavia immer*	SSC	Low	BIO 7a & 7b
Bald Eagle *Haliaeetus leucocephalus*	SE, FP	Moderate	BIO 2a & 2b
Yellow-breasted Chat *Icteria virens*	SSC	Moderate	BIO 7a & 7b
Loggerhead Shrike *Lanius ludovicianus*	SSC	Moderate	BIO 7a & 7b
Osprey *Pandion haliaetus*	WL	High	BIO 3a & 3b

Species Name	Listing Status[1]	Potential to Occur in Study Area	Mitigation Measures
American White Pelican *Pelecanus erythrorhynchos*	SSC, BCC	Low	BIO 7a & 7b
Yellow-billed Magpie *Pica nuttalli*	BCC	Low	BIO 7a & 7b
Purple Martin *Progne subis*	SSC	Moderate	BIO 7a & 7b
Bank Swallow *Riparia riparia*	ST	Low	BIO 7a & 7b
Northern Yellow Warbler *Setophaga aestiva*	SSC	Moderate	BIO 7a & 7b
Pacific Lamprey *Entosphenus tridentatus*	SSC	Moderate	BIO 8a
Western River Lamprey *Lampetra ayresii*	SSC	Moderate	BIO 8a
Steelhead Central Valley DPS, Pop. 11 *Oncorhynchus mykiss irideus*	FT, SSC	High	BIO 8a
Chinook Salmon Central Valley Fall Run *Oncorhynchus shawytcha*	SSC	High	BIO 8a
Crotch's Bumble Bee *Bombus crotchii*	SCE	Moderate	BIO 9a & 9b
Monarch Butterfly, Pop. 1 *Danaus plexippus plexippus*	FPT	Low	BIO 10a & 10b
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus*	FT	High	BIO 11a & 11b
Pallid Bat (roosting) *Antrozous pallidus*	SSC	Moderate	BIO 12a & 12b
Western Red Bat (roosting) *Lasiurus frantzii*	SSC	Moderate	BIO 12a & 12b
Northwestern Pond Turtle *Actinemys marmorata*	SSC, FPT	High	BIO 13a & 13b
Valley Brodiaea *Brodiaea rosea* ssp. *vallicola*	CRPR 4.2	Low	BIO 14a
Bogg's Lake Hedge Hyssop *Gratiola heterosepala*	SE, CRPR 1B.2	Low	BIO 14a
Sanford's Arrowhead *Sagittaria sanfordii*	CRPR 1B.2	Low	BIO 14a

1. Listing Status: FE = Federally Endangered; FT = Federally Threatened; FPT = Federally Proposed Threatened; SE = State Endangered; ST = State Threatened; SCE = State Candidate Endangered; FP = State Fully Protected; SSC = State Special of Special Concern; WL = State Watch List; BCC = Bird of Conservation Concern; CRPR = California Native Plant Society California Rare Plant Rank: 1B = Rare, Threatened, or Endangered in California and elsewhere; 4 = Watch List, plants of limited distribution; Theat Rank: .2 = Moderately Threatened in California.

TABLE 4. Avoidance and Minimization Measures for Special-status Species with Potential to occur in the Study Area.

Mitigation Measures	Description
BIO 1a: Pre-construction Surveys Western Spadefoot and California Tiger Salamander	Prior to the start of Project activities, a qualified biologist will survey all suitable upland habitat for small mammal burrows that could support the species. A 50-foot buffer will be established around each of these burrows. If a burrow will be directly impacted by Project activities, it will be hand excavated under the supervision of a biologist and any discovered individuals will be relocated to the nearest burrow that is outside of the Project impact area.
BIO 1b: Amphibian Exclusion Western Spadefoot and California Tiger Salamander	If impacts to potential amphibian burrows are inevitable, they will be hand excavated under the supervision of a biologist and any discovered individuals will be relocated to the nearest burrow that is outside of the Project impact area. If work is being conducted during the breeding and migration period (November 1 – May 31) exclusionary fencing will be erected around the construction area following the hand excavation of impacted burrows, mentioned above. Fencing material and design require approval from USFWS and CDFW before installation. While the exclusion fencing is up, a qualified biologist will walk the perimeter to ensure the fence is intact and functioning as intended once a week.
BIO 1c: Construction Monitoring Western Spadefoot and California Tiger Salamander	Prior to the start of each workday, a biologist will inspect underneath equipment and in stored pipes with a diameter greater than 1.2 inches. Any trenches or holes will also be inspected for amphibians and covered. Uncovered trenches or holes will contain escape ramps no greater than 45 degrees. If the 72-hour weather forecast for the construction area has a 70% change or greater of rainfall all areas within 1.3 miles of a known CTS breeding pond, work will be halted until the threat of rain passes. If work needs to continue, a biologist will instead inspect the entire Study Area at the beginning of each workday. If rainfall is equal to or greater than 0.25 inches in a 24-hour period, all work will cease until no more rain is forecast. Hazardous materials such as fuel or oil will be stored in sealed containers at least 100 feet from wetlands or riverine channels. Spill containment measures will be implemented in case of accidental discharges.
BIO 2a: Pre-construction Surveys Tricolored Blackbird	Pre-construction surveys will be required to determine if active nests are present or if suitable habitat occurs in or within 500 feet of the Project footprint and if construction activities will occur during the breeding season (March 1 through September 15). A qualified biologist will conduct pre-construction surveys within 30 days and again within 3 days of ground-disturbing activities, in and within 500 feet of the Study Area to determine the presence of nesting. The surveys should be separated by at least three weeks. For example, surveys conducted in February (to meet pre-construction survey requirements for if work started in March) must be conducted within 14 days and 3 days in advance of ground-disturbing activities. If a nest is present, the following measures will be implemented: If active nests are found within 500 feet of the Project footprint, a 500-foot temporary buffer will be established around the nest until the young have fledged. An approved biologist experienced with Tricolored Blackbird behavior will monitor the nest throughout the nesting season to determine when the young have fledged.
BIO 2b: Construction Monitoring Tricolored Blackbird	If an active nest is found within 500 feet of the Study Area, a qualified biologist will be on-site daily while construction-related activities are taking place near the disturbance buffer. Work within the nest disturbance buffer will not be permitted. If the approved biologist determines that Tricolored Blackbirds are exhibiting agitated behavior, construction will cease until the buffer size is increased to a distance necessary to result in no harm or harassment to the nesting birds. If the biologist determines that the colonies are at risk, a meeting with CDFW will be held to determine the best course of action to avoid nest abandonment or take of individuals. The approved biologist will also train construction personnel on the required

Mitigation Measures	Description
	avoidance procedures, buffer zones, and protocols in the event that a Tricolored Blackbird flies into an active construction zone (outside of the buffer zone).
BIO 3a: Pre-construction Surveys Raptors	Nests can be built and active at almost any time of the year, although mating and egg incubation occurs from late January through August. If construction occurs between January 1 and August 31, a qualified biologist will conduct a preconstruction survey within 0.5 miles of the footprint, within 14 days of construction start to establish whether nests of Golden Eagles are present on the site and occupied. If nests are occupied, a temporary buffer will be established within 0.5 mile of active nests. If site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be appropriate or that a larger buffer should be implemented, the Project Proponent will coordinate with CDFW/USFWS to determine the appropriate buffer size.
BIO 3b: Construction Monitoring Raptors	If an active nest is identified within 0.5 mile of construction, a qualified biologist will be on-site daily while construction-related activities are taking place near the disturbance buffer. Work within the nest disturbance buffer will not be permitted. The approved biologist will also train construction personnel on the required avoidance procedures, buffer zones, and protocols in the event that a Golden Eagle flies into an active construction zone (i.e., outside the buffer zone).
BIO4a: Pre-construction Surveys Western Burrowing Owl	A qualified biologist will identify any potential Burrowing Owl breeding habitat within the Study Area. If the Project does not fully avoid impacts to suitable breeding habitat, pre-construction surveys will be required. The surveys will establish the presence or absence of Western Burrowing Owl, signs of the species, and/or habitat features and evaluate the Study Area for potential or confirmed use by owls in accordance with CDFW survey guidelines (California Department of Fish and Game 1993). On the parcel where the activity is proposed, the biologist will survey the proposed disturbance footprint and a 500-foot radius from the perimeter of the proposed footprint to identify burrows and owls. Adjacent parcels under different land ownership will not be surveyed. Surveys should take place near sunrise or sunset in accordance with CDFW guidelines. All potential burrows of appropriate size, any individual Burrowing Owls, and any other signs of the species observed will be identified and mapped. Surveys will take place no more than 30 days prior to construction. During the breeding season (February 1– August 31), surveys will document whether burrowing owls are nesting in or directly adjacent to disturbance areas. During the non-breeding season (September 1–January 31), surveys will document whether burrowing owls are using habitat in or directly adjacent to any disturbance area. Survey results will be valid only for the season (breeding or non-breeding) during which the survey is conducted. If burrowing owls or an active nest are found during the breeding season (February 1–August 31), the Project Proponent will avoid all nest sites that could be disturbed by Project construction during the remainder of the breeding season or while the nest is occupied by adults or young. Avoidance will include the establishment of a non-disturbance buffer zone (described below).
BIO 4b: Construction Monitoring Western Burrowing Owl	Construction may occur during the breeding season if a qualified biologist monitors any nests and determines that the birds have not begun egg-laying and incubation or that the juveniles from the occupied burrows have fledged. During the non-breeding season (September 1– January 31), the Project Proponent should avoid the owls and the burrows they are using, if possible. Avoidance will include the establishment of a buffer zone (described below). If occupied burrows for burrowing owls are not avoided, passive relocation will be implemented. Owls should be excluded from burrows in the immediate impact zone and within a 250-foot buffer zone by installing one-way doors in burrow entrances. These doors should be in place for 48 hours prior to excavation. The Project area should be monitored daily for 1 week to confirm that the owl has abandoned the burrow. Whenever possible, burrows should be excavated using hand tools and refilled to prevent reoccupation (California

Mitigation Measures	Description
	Department of Fish and Game 1995). Plastic tubing or a similar structure should be inserted in the tunnels during excavation to maintain an escape route for any owls inside the burrow.
BIO 5a: Preconstruction Surveys Swainson's Hawk and White-Tailed Kite	If construction occurs during the nesting season (February 1–August 31), a preconstruction survey will be required. A qualified biologist will conduct a preconstruction survey no more than 1 month prior to construction to establish whether Swainson's hawk nests within 0.5 miles of the Study Area are occupied. A qualified biologist will inspect all large trees with binoculars. The survey will be conducted according to the Swainson's Hawk Technical Advisor Committee's methodology (May 31, 2000) or updated methodologies as issued by USFWS or CDFW. If occupied nests are identified, the Project Proponent will avoid and minimize impacts to these nests in compliance with the Migratory Bird Treaty Act and the Fish and Game Code. If potentially occupied nests within 0.5 miles are off the Study Area, then their occupancy will be determined by observation from public roads or by observations of Swainson's hawk activity (e.g., foraging) near the Study Area. If nests are occupied, minimization measures and construction monitoring are required (see BIO 5b, below).
BIO 5b: Construction Monitoring Swainson's Hawk and White-Tailed Kite	During the nesting season (February 1–August 31), activities within 0.5 miles of occupied nests or nests under construction will be prohibited to prevent nest abandonment. If site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be used, the Project Proponent will coordinate with CDFW/USFWS to determine the appropriate buffer size. If young fledge prior to August 31, construction can proceed normally. While the nest is occupied, activities outside the buffer can take place. All active nest trees will be preserved on-site.
BIO6a: Preconstruction Surveys Willow Flycatcher	If construction takes place during the nesting season (February 1-August 31) then a preconstruction survey will be required. A qualified biologist will survey all areas with suitable nesting habitat, following methodology from "*A Survey Protocol for Willow Flycatcher in California*" (Bombay et al. 2003). If active nests are found, a no-disturbance buffer of 500 feet will be established. If site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be appropriate or that a larger buffer should be implemented, the Project Proponent will coordinate with CDFW/USFWS to determine the appropriate buffer size.
BIO 6b: Construction Monitoring Willow Flycatcher	If an active nest is identified within 500 feet of construction, a qualified biologist will be on-site daily while construction-related activities are taking place near the disturbance buffer. Work within the nest disturbance buffer will not be permitted. The approved biologist will also train construction personnel on the required avoidance procedures, buffer zones, and protocols in the event that a non-listed raptor flies into an active construction zone (i.e., outside the buffer zone).
BIO7a: Preconstruction Surveys Other Birds	If construction takes place during the nesting season (February 1-August 31) then a preconstruction survey will be required. A qualified biologist will survey all areas with suitable nesting habitat. Biologists will use binoculars to survey within 1,000 feet of the Study Area boundaries as well. If active nests are found, a no-disturbance buffer of at least 250 feet will be established. If site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be appropriate or that a larger buffer should be implemented, the Project Proponent will coordinate with CDFW/USFWS to determine the appropriate buffer size.
BIO 7b: Construction Monitoring Other Birds	If an active nest is identified within the minimum buffer distance from construction, a qualified biologist will be on-site daily while construction-related activities are taking place near the disturbance buffer. Work within the nest disturbance buffer will not be permitted. The approved biologist will also train construction personnel on

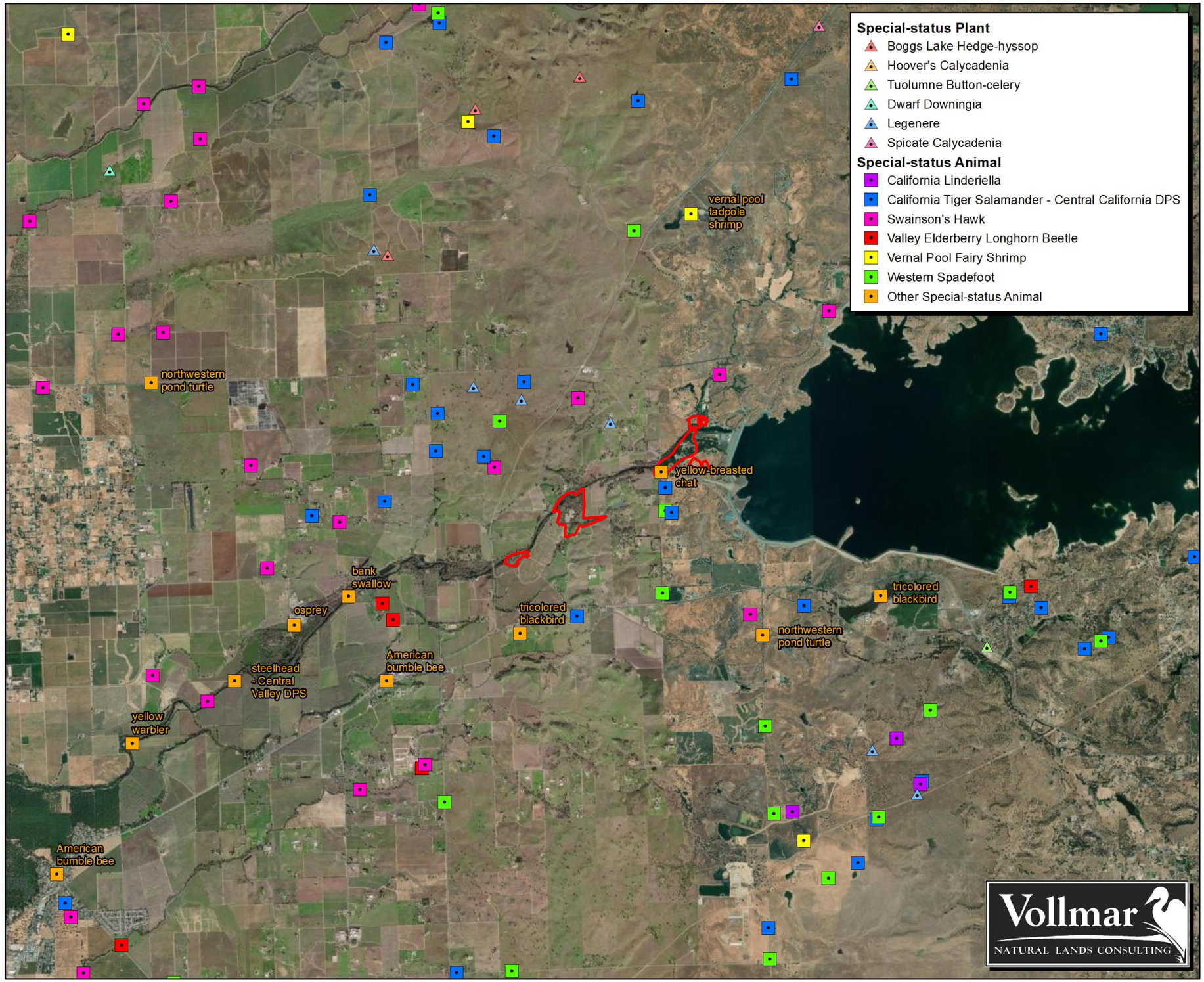
Mitigation Measures	Description
	required avoidance procedures, buffer zones, and protocols in the event that a sensitive bird species enters an active construction zone (outside the buffer zone).
BIO 8a: Construction Monitoring Salmonids	In channel work will be limited to low-flow water releases from the Camanche Reservoir below 500 cubic feet per second (CFS) to minimize potential impacts to emigrating salmonids. In channel construction activity will additionally be limited to daylight hours and weekdays so that nighttime and weekends are open to passage for individuals. BMP's for the staging of equipment will be developed so that the risk of contaminants entering the waterway from construction work is minimized. If individuals of the species are observed, the National Marine Fisheries Service will be notified and given access to the site in order to evaluate species presence and habitat conditions. If bank stabilization is necessary, it will be constructed so that it minimizes predator habitat, erosion potential, and can support riparian vegetation.
BIO 9a: Pre-construction surveys Bumblebees	No survey protocols have been published for Crotch's bumble bee at the time of writing. However, CDFW has published guidelines on survey considerations for candidate bumblebee species (2023). Surveys should consist of at least three site visits, spaced 2-4 weeks apart, prior to Project implementation. These surveys should take place during the colony active season (April 1-September 31) in order to maximize detection chance. Surveyors should target floral resources and any areas suitable for bumble bee nests. In large sites, meandering transects may also be used (ibid). If an active nest is found, another survey, no more than seven days prior to scheduled ground disturbance needs to be conducted. If the nest is still found to be active, a 45-foot buffer will be created around it (CDFW 2025).
BIO 9b: Construction Monitoring Bumblebees	If active nests are found, a qualified biologist must be on site to ensure that work stays outside of the active nest buffer. If, during the time of construction, the nest becomes inactive, construction may continue as normal. If a bumblebee enters the active work area, all construction activities will cease until they leave the area. Care will be taken to ensure that construction activities have the minimal possible effect on suitable floral resources.
BIO 10a: Pre-construction surveys Monarch Butterfly	Prior to the start of Project-related activities, a qualified biologist will conduct a survey to identify any milkweeds present within the Study Area. If milkweed is present, the biologist will examine every or a subset of plants depending on abundance (IMMP 2025).
BIO 10b: Construction Monitoring Monarch Butterfly	A qualified biologist will be present on-site during construction activities to ensure that no milkweed plants supporting monarchs larvae or eggs are disturbed by Project activities. If an adult monarch enters to the Study Area, work will halt until the individual has left the area.
BIO 11a: Pre-construction surveys Valley Elderberry Longhorn Beetle	Prior to the start of Project-related activities, a qualified biologist will conduct a survey to identify any elderberry shrub within the Study Area. Each elderberry shrub located within a 100-foot buffer of proposed activities will be inspected for VELB exit holes in stems greater than one inch in diameter.
BIO 11b: Construction Monitoring Valley Elderberry Longhorn Beetle	A qualified biologist will be present on-site during construction activities to ensure that no mechanical disturbance takes place within the 100-foot buffer. People may be allowed within the buffer as long as no disturbance occurs to the elderberry shrub.
BIO 12a: Pre-construction surveys Pallid and Western Red Bat	No more than 14 days or less than 7 days prior to the start of construction activities a qualified biologist will survey all suitable roosting habitat. These surveys may consist of visual surveys or use ultrasonic detectors. If conducting visual surveys, any trees within 0.25 miles of construction activities will be inspected. If bats are detected, the number and species will be recorded. Appropriate buffers will also be established. Equipment use will be disallowed within a 150-foot buffer of the roosting site, stationary exhaust sources within 250 feet, and unshielded light sources within 400 feet (Harvey and Associates 2019).

Mitigation Measures	Description
BIO 12b: Construction Monitoring Pallid and Western Red Bat	A qualified biologist will be present on-site during construction activities to ensure that the buffer zone is not violated. During construction, a sonogram may be used to ensure that bats are not disturbed by construction noise (ibid).
BIO13a: Habitat Protection Northwestern Pond Turtle	A qualified biologist will conduct a field investigation to delineate northwestern pond turtle aquatic habitat within the Project footprint and within 300 feet of the Project footprint. If construction activities have the potential to cause erosion or runoff into potential NWPT habitat, then runoff control measures such as straw wattles, filter rolls, filter fences, or silt fences will be installed to contain disturbed soil materials. Runoff control will be in place prior to groundbreaking. If straw wattles are used, they will consist of certified sterile, weed-free rice straw or similar, suitable for use in sensitive habitat. If filter fences or mesh are used, they will consist of materials, and employ a design, approved by CDFW and USFWS as safe for amphibians and reptiles.
BIO13b: Pre-construction Surveys Northwestern Pond Turtle	No more than twenty-four (24) hours prior to the date of initial ground disturbance, a pre-construction survey for the northwestern pond turtle will be conducted by a qualified biologist at the Study Area. The survey will consist of walking the Project limits to ascertain suitable habitat and possible presence of the species. The qualified biologist will investigate all potential areas that could be used by the northwestern pond turtle. If any pond turtles are found, the qualified biologist will relocate the turtle to suitable habitat outside of the construction area at a sufficiently safe distance
BIO 13c: Construction Monitoring Northwestern Pond Turtle	If construction activities occur during the NWPT active season (September 1 through April 30), a construction monitor will be on-site daily and will inspect for NWPT prior to daily construction start. The qualified biologist will also train construction or maintenance personnel on the required avoidance procedures if a northwestern pond turtle enters the site.

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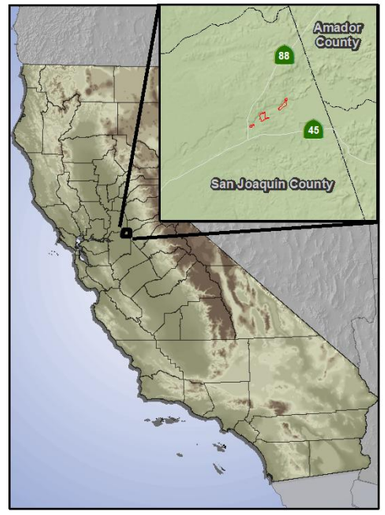
FIGURE 5
Regional Special-Status Species Map

Mokelumne Floodplain Restoration Project
San Joaquin County, California



Legend

Project Boundary



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1:63,360

1 in. = 1 mile at tabloid layout

0 0.625 1.25 1.875 2.5 Kilometers

0 0.5 1 1.5 2 Miles

Data Sources: VNLC, 2025 | ESRI/MAXAR (Imagery), 2025
GAP, 1998 | USGS, various | FlowWest, 2025 | CDFW, 2026
Map Produced by: Vollmar Natural Lands Consulting
GIS/Cartography by T. Hurd, Feb. 2026
Map File: 637_BRE_CNDDB_B-L_2026-0202.mxd

5.1.1 California Tiger Salamander – *Ambystoma californiense* (Federal Threatened, State Threatened, CDFW Watch List)

California tiger salamander (CTS) is a California-endemic Mole Salamander belonging to the family Ambystomatidae. Adult salamanders are relatively large and stocky with a broad, rounded snout and small protuberant eyes with black irises. Adult salamanders have a black back with large pale yellow to cream-colored spots and bars. Larvae are typically olive or greenish-grey in color (Stebbins and McGinnis 2012). CTS inhabits primarily grassland, scrub, and oak savanna habitats within portions of the Central Coast Range, Sacramento-San Joaquin Delta, and San Joaquin Valley regions (Laabs 2002).

CTS spend the majority of their lives underground, living in mammal burrows in upland habitats (Loredo 2010). They show a strong preference for grassland and scrub habitat, avoiding woodlands and forest (Wang, Savage et al. 2009). They typically migrate between burrows on rainy nights (Stebbins and McGinnis 2012). At the onset of autumn rains, some adults will migrate from the uplands to ponds and wetlands to breed. Females attach hundreds of eggs one at a time to vegetation or other objects along the pond bottom. Young larvae prey on aquatic invertebrates; larger larvae eat other amphibian larvae (including, at times, smaller CTS larvae) (Zeiner, Laudenslayer et al. 1988). As ponds dry in spring or summer, larvae metamorphose and migrate into the upland. In the case of perennial ponds, larvae may stay in the pond until the onset of autumn rains, or may even over-winter in the pond (Alvarez 2004). CTS breed primarily in seasonal waters such as large vernal pools, sag ponds, and man-made stock ponds. Breeding ponds must typically pond for at least 90 continuous days for the species to complete its breeding cycle (USFWS 2014).

The Central Valley distinct population segment (DPS) is listed under the Federal Endangered Species Act ("ESA") as Threatened. All CTS are listed under the California Endangered Species Act ("CESA") as Threatened. The decline in CTS populations is primarily due to the introduction of non-native predators, such as the American Bullfrog, and extensive habitat losses. Agriculture, housing, and other forms of development have destroyed large amounts of vernal pools and other seasonal ponds where CTS breed most effectively.

Two breeding sites are known from 0.2 and 0.5 miles south of Site 1, and 0.8 miles east of Site 2. The proximity of these ponds and the presence of appropriate upland burrowing habitat in Site 1 mean that dispersing CTS may use portions of this Site as upland refugia. The seasonal wetland in Site 2 may also provide potential CTS breeding habitat.

Potential Project Impacts

Potential impacts from construction, maintenance, or management of the Project could include temporary noise disturbances to any burrows. However, the Project will include pre-construction surveys and all construction will occur outside a buffer zone around any active burrows, so loss of nests from mechanical disturbance is not expected to occur. Therefore, avoidance measures should be implemented to ensure that this Project has a **less-than-significant** impact on this species during construction, maintenance, or management actions.

Recommended Avoidance Measures

BIO 1a, 1b & 1c (see **Table 4**)

5.1.2 Western Spadefoot – *Spea hammondi* (Federal Proposed Threatened, CDFW Species of Special Concern)

Western spadefoot (WSF) is an anuran (frogs, toads, and relatives) belonging to the family Scaphiopodidae. It is medium-sized and varying in color from greenish, cream or gray-brown above. Individuals often have four irregular, light-colored stripes on the back along with dark blotches. Their eyes are wide-set with no cranial boss between them. Hind legs each have a glossy, black, wedge-shaped spade (Stebbins and McGinnis 2012).

WSF inhabits a variety of different habitats including washes, floodplains of rivers, alluvial fans, playas, alkali flats. They are primarily a species of the lowlands, but they also appear in valley and foothill grasslands, open chaparral, and pine-oak woodlands. WSF prefers areas of open vegetation and short grasses, where soil is sandy or gravelly (Stebbins and McGinnis 2012). Their diet consists of a variety of invertebrates, including adult beetles, larval and adult moths, crickets, flies, ants, spiders, and earthworms. Tadpoles feed on planktonic organisms, algae, small invertebrates, dead aquatic larvae of amphibians, and may exhibit cannibalism (Bragg 1964).

WSF requires rain pools which do not contain bullfrogs, fish, or crayfish for breeding. Breeding sites include vernal pools and other temporary rain pools, cattle tanks, and pools of intermittent streams. Typically, the pools are turbid with little or no cover. Adults remain in underground burrows for most of the year, and move to breeding pools after heavy rains, typically in February and March. Interestingly, WS is an opportunistic breeder, meaning it is physiologically capable of breeding at any time if conditions are favorable (Ervin and Cass 2007). WS breeding usually occurs 1-2 days after heavy rains. Development is rapid with egg to transformation occurring in 8-16 days (Stebbins and McGinnis 2012). Temporary breeding pools must last for at least 30 days for successful transformation of larvae. Recently metamorphosed individuals seek refuge in the immediate vicinities of breeding pools for up to several days after transformation. They have been witnessed hiding in drying mud cracks and beneath boards and other surface objects (Weintraub 1980). Dry periods are spent in self-made burrows or those made by gophers, ground squirrels or kangaroo rats. WS are nocturnal, with the majority of their activity occurring at night and during spring and summer rains.

No spadefoot were observed during field surveys in 2025, however multiple documented occurrences exist within 2 miles of the Study Area.

Potential Project Impacts

There is one seasonal wetland in the Study Area, which may provide potential breeding habitat for WSF. Nearby grasslands may provide burrowing habitat or temporary shelter for the species.

Potential impacts from construction, maintenance, or management of the Project could include temporary noise disturbances to any individuals which may be present. However, the Project will include targeted pre-construction surveys, and all construction will occur outside of a buffer zone around any active burrows;

loss of nests from mechanical disturbance is not expected to occur. Avoidance measures will be implemented to ensure that this Project has a **less-than-significant** impact on WSF during construction, maintenance, or management actions.

Recommended Avoidance Measures

BIO 1a, 1b & 1c (see **Table 4**)

5.1.3 Tricolored Blackbird – *Agelaius tricolor* (State Threatened, CDFW Species of Special Concern, USFWS Bird of Conservation Concern)

Tricolored Blackbirds are most often found in large freshwater marshes, especially those saturated with cattails and tule. They historically nested in large marshes or areas with protective, spiny vegetation and high abundance of insect prey, but now they can also be found nesting in agricultural fields. Their nesting behavior is highly social, and they form the largest nesting colonies of any bird in North America. They prefer to establish these colonies in areas that provide them with adequate foraging substrate (typically grasslands, wetlands, and cultivated fields or feedlots) and sufficient insect prey within a short radius of the nest (Shuford and Gardali 2008). Breeding takes place from mid-March through July (Kaufman 2005).

Unlike the Red-winged Blackbird, which is abundant throughout the continent, the Tricolored Blackbird has a very small range in the Pacific states, including the Central Valley and coastal areas from northern California into upper Baja California, Mexico. Tricolored Blackbird populations have seriously declined in recent decades due to habitat destruction. It is speculated that the species' habit of nesting in dense colonies makes it more susceptible to population decline (Cook and Toft 2005).

Tricolored Blackbirds are known from approximately 0.9 miles south of Site 3. No birds were observed during CRAM surveys conducted in August, late in the nesting season.

Potential Project Impacts

Potential nesting habitat is present within the Study Area. Tricolored Blackbirds nest in large wetland and marsh features, especially with large protective plants. Restoration of side channels could be beneficial for Tricolored Blackbirds as these channels will eventually recruit cattails, tule and willows.

Potential impacts from construction or management of the Project could include temporary noise disturbances. However, pre-construction surveys will be performed by a qualified biologist, and all construction will occur outside of avoidance buffers for any active nests observed; for this reason, no nest loss is expected to occur due to Project activities. These avoidance measures should be implemented to ensure that this Project has a **less-than-significant** impact on this species during construction, maintenance, or management actions.

Recommended Avoidance Measures

BIO 2a & 2b (see **Table 4**)

5.1.4 Golden Eagle - *Aquila chrysaetos* (CDFW Watch List, Fully Protected)

Golden Eagles are very large, dark brown, feather-legged birds of prey that are found across the northern hemisphere. They can be found in a multitude of open habitats including grasslands, canyonlands, and deserts. Their preferred nesting habitat is cliffs, but they also nest in large trees and on a variety of man-made structures such as telephone poles. Golden Eagles are monogamous, and mating pairs raise one brood per year, with one to three eggs laid per clutch. Eggs are incubated between January and August over 41 to 45 days, with a total nesting period of between 45 and 81 days. Immature eagles are smaller in size and have white patches at their wing centers and at the base of their tail. Golden Eagles prey mainly on small-to-medium sized mammals, but they are capable of preying on larger and more varied game, such as cranes, deer, coyotes, and even bighorn sheep (Kaufman 1996, Kochert et al. 2002).

The conservation status of Golden Eagles in California is uncertain compared to other species, but populations are thought to be decreasing in number (CDFW 2026b). This is likely due to several factors, including loss of breeding and nesting habitat due to development, as well as pesticide and lead poisoning from tainted prey. While no Golden Eagles were observed during the 2025 field surveys, there is one iNaturalist observation of the species from Site 1 in 2022.

Potential Project Impacts

Potential impacts from construction, maintenance, or management of the Project could include temporary noise disturbances to any nests. However, the Project will include pre-construction surveys and all construction will occur outside a buffer zone around any active nests, so loss of nests from noise disturbance is not expected to occur. Therefore, avoidance measures should be implemented to ensure that this Project has a **less-than-significant** impact on this species during construction, maintenance, or management actions.

Recommended Avoidance Measures

BIO 3a & 3b (see **Table 4**)

5.1.5 Cooper's Hawk – *Astur cooperii* (CDFW Watch List)

A breeding resident throughout most of the wooded portion of the state. Breeds in southern Sierra Nevada foothills, New York Mts., Owens Valley, and other local areas in southern California. Ranges from sea level to above 2700 m (0-9000 ft). Dense stands of live oak, riparian deciduous, or other forest habitats near water used most frequently (Curtis et al. 2006; Zeiner et al.1988-90).

Catches small birds, especially young during nesting season, and small mammals; also takes reptiles and amphibians. Hunts in broken woodland and habitat edges; catches prey in air, on ground, and in vegetation. Often dashes suddenly from perch in dense cover and pursues prey in air through branches. Sometimes runs prey down in dense thickets. Uses cover to hide, attack, and approach prey; also soars and makes low, gliding search flights. Seldom found in areas without dense tree stands, or patchy woodland habitat (ibid).

Potential Project Impacts

Potential impacts from construction, maintenance, or management of the Project could include temporary noise disturbances to any nests. However, the Project will include pre-construction surveys and all construction will occur outside a buffer zone around any active nests, so loss of nests from noise disturbance is not expected to occur. Therefore, avoidance measures should be implemented to ensure that this Project has a **less-than-significant** impact on this species during construction, maintenance, or management actions.

Recommended Avoidance Measures

BIO 3a & 3b (see **Table 4**)

5.1.6 Western Burrowing Owl - *Athene cunicularia hypugaea* (State Candidate Endangered, CDFW Species of Special Concern, USFWS Bird of Conservation Concern)

The Western Burrowing Owl occurs throughout non-mountainous western North America; within California, this species can be found from Mexico to the northern Central Valley in the lowlands and desert regions (ICF 2012). Burrowing Owls prefer open habitat with short vegetation and minimal trees. They inhabit grasslands, shrublands, and agricultural areas and utilize abandoned burrows created by animals such as ground squirrels to nest. Nesting season occurs from early March to mid-July (Wilkerson and Siegel 2010). Western Burrowing Owls hunt insects and small mammals within close proximity to their nest, typically less than one mile away (Shuford and Gardali 2008).

While the range of Western Burrowing Owl within California has not significantly decreased, breeding birds have disappeared from many parts of their range, and abundance appears to have declined significantly in the latter half of the 1900s (ICF 2012). Surveys from 1991-1993 estimated that breeding pairs statewide were around 6,577 and decreased by 2.7 percent to 6,408 in a 2006-2007 survey (Wilkerson and Siegel 2010). Current threats to Western Burrowing Owl include loss of habitat from urban development, pesticides in their prey, and mortality from vehicle strikes (Shuford and Gardali 2008).

Although no Western Burrowing Owls were observed during field surveys, Site 1 supports grassland habitat with some suitable small mammal burrows. Furthermore, there are multiple Western Burrowing Owl observations documented online (iNaturalist) from the vicinity of the Study Area.

Potential Project Impacts

Potential impacts from construction, maintenance, or management of the Project could include temporary noise disturbances to nests. However, the Project will include pre-construction surveys and all construction will occur outside a buffer zone around any active nests, so loss of nests from noise disturbance is not expected to occur. These avoidance measures should be implemented to ensure that this Project has a **less-than-significant** impact on this species during construction, maintenance, or management actions.

Recommended Avoidance Measures

BIO 4a & 4b (see **Table 4**)

5.1.7 Ferruginous Hawk – *Buteo regalis* (CDFW Watch List)

Ferruginous Hawks are common in the parts of the United States, but are only found in California as occasional winter residents (Polite and Pratt 1999). They typically nest in trees and shrubs, but can also use utility poles and ground outcrops (Becchard and Schmutz 2005). Their preferred foraging habitat is open grassland or other areas with short vegetation and perches such as fence posts or lone trees from which they can wait for prey (ABC 2023). Ferruginous Hawks also hunt from the ground, waiting near burrows for prey such as ground squirrels to surface and sometimes engage in ground pursuit wherein they chase prey on foot (ABC 2023).

Ferruginous Hawks are threatened by loss of breeding habitat due to urbanization and agricultural conversion, as well as improper livestock grazing and exotic weed colonization, both of which can degrade foraging habitat (Collins and Reynolds 2005).

Potential Project Impacts

Potential impacts from construction, maintenance, or management of the Project could include temporary noise disturbances to nests. However, the Project will include pre-construction surveys and all construction will occur outside a buffer zone around any active nests, so loss of nests from noise disturbance is not expected to occur. These avoidance measures should be implemented to ensure that this Project has a **less-than-significant** impact on this species during construction, maintenance, or management actions.

Recommended Avoidance Measures

BIO 3a & 3b (see **Table 4**)

5.1.8 Swainson's Hawk – *Buteo swainsoni* (State Threatened)

The Swainson's Hawk is a migratory bird that's distinguishable from most other hawks by its long, narrow, pointed wings. Its plumage is polymorphic, with a light phase, dark phase, and intermediate colorations. The light phase is a whitish or buffy-white wing linings against darkly barred brown flight feathers, whitish to pale underparts, and a dark bib. The dark phase is largely dark brown, with white undertail coverts. It does not have sharp contrast between wing linings and flight feathers. Intermediate colorations include a reddish plumage (Scott 1987). Most birds are light to intermediate color (England 1997).

Swainson's Hawks largely consume insects, including grasshoppers, crickets, and dragonflies, and are an important part of their diet throughout the year (England 1997; Woodbridge 1991). However, the hawks have also been known to prey on mice, gophers, ground squirrels, rabbits, large arthropods, amphibians, reptiles, and birds (Zeiner et. al. 1990). Its foraging habitats consist of relatively open stands of desert, grassland, relatively sparse shrublands, and croplands containing scattered, large trees, or small groves (Zeiner et. al. 1990). Much of the natural habitats have been converted to urban developments or cultivated agricultural uses. However, areas of moderate agricultural development, besides orchards and vineyards, are often used by Swainson's Hawks as foraging grounds, particularly alfalfa crop (Battistone 2016; England 1997).

Swainson's Hawks breed in western United States and Canada, and winters in South America (Battistone 2016). It often nests peripheral to riparian systems. Nests are built out of a platform of sticks, bar, and fresh leaves, and are typically located in a tree, bush, or utility pole peripheral to or adjacent to riparian systems and suitable foraging habitat, usch as agricultural fields or pastures (Zeiner et. al. 1990; Battistone 2016). If no other nesting options are available, some hawks will nest on the ground. Females lay one to four eggs, typically in early March to April (England 1997).

Although the Swainson's Hawk population has increased since the species was listed, the amount of increase is still significantly below original population estimates. The greatest threat to Swainson's Hawks are loss of natural foraging habitats and breeding grounds. Other threats also include climate change, infrastructure placement, disease, pesticide poisoning, and electrocution (Battistone 2016).

Potential Project Impacts

Potential nesting habitat is present in the Study Area due to the presence of large trees in the riparian areas along Site 1 and 2. Grassland in the Study Area provides suitable foraging habitat. This Project may have short-term impacts to nesting habitat from disturbances during the construction period, but could ultimately increase the number of large trees within the Study Area due to the increase in riparian habitat. Due to the potential improvement of nesting potential the impact of this Project is **less-than-significant** with the incorporation of the following avoidance and minimization measures.

Recommended Avoidance Measures

BIO 5a & 5b (see **Table 4**)

5.1.9 Northern Harrier – *Circus hudsonius* (CDFW Species of Special Concern, USFWS Bird of Conservation Concern)

Northern Harriers are commonly seen foraging above mostly open, treeless habitats including meadows, saltwater and brackish marshes, annual and perennial grasslands, sagebrush flats, and occasionally croplands (Smith et al. 2020). They forage for small mammals, birds, reptiles and insects in low passes over the landscape. The Northern Harrier has a widespread range throughout North America and in California is found year-round in the northeastern plateau and coastal regions and less commonly in the Central Valley and other arid regions of its range.

Breeding occurs from April to September, with clutch sizes averaging five eggs (Craighead and Craighead 1956). While the range of Northern Harrier is still wide and they can be found in high numbers in localized areas, the California population has been decreasing in recent decades (Remsen 1978). Destruction and fragmentation of large swathes of wetland habitat, grasslands, and other native habitats are major reasons for decline (ibid).

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species onsite. With the incorporation of the

following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 3a & 3b (see **Table 4**)

5.1.10 White-tailed Kite – *Elanus leucurus* (CDFW Fully Protected)

The White-tailed Kite is a falcon-shaped bird that has a small range in the U.S. but can be found in several countries throughout South and Central America (BirdLife International 2016). Within the U.S. White-tailed Kites can be found in coastal states from southern Washington to Baja California, Mexico. White-tailed Kites forage in grasslands, meadows, wetlands, farmlands, and other open areas with high prey abundance. White-tailed Kites primarily prey on small mammals, which make up 95% of their diets. However, they do occasionally prey on birds, insects, reptiles, and amphibians (Polite 1988). In California, kites largely rely on populations of California voles (*Microtus californicus*), with habitat quality depending on the abundance and availability of California voles (Niemela 2007). Alfalfa, hay, and irrigated pasture agricultural areas are preferred foraging grounds, with lightly grazed or ungrazed fields generally supporting larger prey populations. Wetlands or marshes, where California voles tend to be more abundant, are also important habitats.

They are known to nest in dense stands of oaks, willows or other tree species. White-tailed Kite nests also tend to be surrounded by more agriculture, grassland, riparian, and woodland habitat, and significantly less chaparral habitat (ibid). White-tailed Kites nest from January through August, building platforms of sticks in trees or tall bushes (County of Riverside 2003; Dunk 1995). White-tailed Kite populations were threatened with extinction in North America in the early 20th century due to shooting and egg collecting, but have recovered as available habitat areas have increased due to year-round irrigation of agricultural land. Land development can threaten the species by depriving them of nest trees, and modern farming techniques can eliminate vegetation for its main prey (Dunk 1995).

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species within the Study Area. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 5a & 5b (see **Table 4**)

5.1.11 Willow Flycatcher – *Empidonax traillii* (State Endangered)

The willow flycatcher is a sparrow sized species of tyrant flycatcher. They are a rare to locally uncommon in wet meadows and montane riparian habitats at elevations of 600-2500 meters (Gaines 1988). They can

also be found in lowland portions of California, although recent documentations are lacking. They require dense willow thickets for reproduction and typically nest 2-10 feet above the ground (Stein 1963).

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 6a & 6b (see **Table 4**)

5.1.12 Prairie Falcon – *Falco mexicanus* (CDFW Watch List)

The prairie falcon is an uncommon medium to large sized raptor native to western North America. They are permanent residents in most of their range. The species inhabits a large array of habitats but is most commonly associated with perennial grasslands, savannahs, rangelands, desert scrub, and sometimes agricultural fields (Pratt 1988). They are crepuscular hunters, primarily eating small mammals, birds, and reptiles. They require open space for foraging. They nest in cliff faces, bluffs, and rock outcrops nearby suitable foraging habitat, typically within ¼ mile of a water source (Denton 1975). Breeding takes place from mid-February to mid-September, with a peak in April through early August (Pratt 1988).

An iNaturalist occurrence of this species was recorded in the day use area in 2025.

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 3a & 3b (see **Table 4**)

5.1.13 Common Loon – *Gavia immer* (CDFW Species of Special Concern)

The common loon is a common migrant, present from September through May, that inhabits estuarine and subtidal marine habitats along the California coast. It is found less commonly in large lakes in the valley and foothill regions of the state (Granholm 1988). It is also rarely found in alpine lakes such as Lake Tahoe. They primarily eat fish and crustaceans, although aquatic plants can make up a significant minority of their diet. They are occasionally seen eating snails, leeches, amphibians, and other aquatic birds. They can dive up to 200 feet in order to catch food (ibid). Due to the location of their legs, set far back on their bodies,

they are incapable of taking off from land, and require a minimum of 60 feet of open water for flight (Palmer 1962).

They require deep freshwater lakes for reproduction with sufficient prey populations, regardless of size. They nest on islets or protected areas on shore less than 4 feet from water (ibid). Nest sites must be minimally disturbed by human activity and will usually be used for multiple years (Terres 1980).

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 7a & 7b (see **Table 4**)

5.1.14 Bald Eagle – *Haliaeetus leucocephalus* (State Endangered, CDFW Fully Protected, Federally Delisted)

The Bald Eagle is the national bird of the United States and has been since 1782. It is a large bird of prey with a signature brown body, white head, and long, hooked yellow beak. Historically, bald eagles were abundant across the lower 48 states, yet the widespread use of pesticides (especially DDT) and hunting threatened the species with extirpation. Their population was reduced from the hundreds of thousands to less than 500 nesting pairs in the lower 48 states. They build the largest nests of any birds, and have 1-3 eggs per clutch, with 1 brood per year. Their incubation time is shorter than Golden Eagles, taking roughly 34-36 days. However, their nestling period is somewhat longer than Golden Eagles, estimated to be 56-98 days in length. They are opportunistic predators but prefer fish as their main prey item. Additionally, they consume carrion when it is found (Buehler 2022, CDFW 2026a).

No individuals were observed during surveys in 2025; however, multiple observations in and around the day use area have been recorded in iNaturalist.

Potential Impacts

Potential impacts from construction, maintenance, or management of the Project could include temporary noise disturbances to nests. However, the Project will include pre-construction surveys and all construction will occur outside a buffer zone around any active nests, so loss of nests from noise disturbance is not expected to occur. Therefore, avoidance measures should be implemented to ensure that this Project has a **less-than-significant** impact on this species during construction, maintenance, or management actions.

Recommended Avoidance Measures

BIO 3a & 3b (see **Table 4**)

5.1.15 Yellow-breasted Chat – *Icteria virens* (CDFW Species of Special Concern)

The Yellow-breasted Chat is a formerly widespread species of bird that is now rare or absent from much of the Central Valley. It is still relatively common in parts of its range, such as the Colorado River and northwestern California, but has suffered a 35% reduction in breeding range overall (Shuford and Gardali 2008). They inhabit early successional riparian habitats with well-developed shrub layers and an open canopy. Nesting habitat is restricted to a narrow band along streams, creeks, sloughs, and rivers, often located in dense tangles and thickets of grapes (*Vitis* spp.), willows (*Salix* spp.), and blackberries (*Rubus* spp.) (Grinnel and Miller 1944). They primarily feed on insects, arachnids, and fruits (Eckerle and Thompson 2001).

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 7a & 7b (see **Table 4**)

5.1.16 Loggerhead Shrike – *Lanius ludovicianus* (CDFW Species of Special Concern)

The Loggerhead Shrike is a resident and winter visitor throughout the foothills and lowlands of California (Granholm 1988). They inhabit open habitats with fences, posts, trees, scattered shrubs, utility lines, or other such perches (ibid). The Loggerhead Shrike is most common in valley foothill hardwood-conifer, open-canopied valley foothill hardwood, pinyon-juniper, valley foothill riparian, desert riparian, and Joshua tree habitats. They rarely occur in heavily urbanized areas, but are often observed in open cropland (ibid). They eat insects, spiders, amphibians, reptiles, and small mammals or birds. Their diet is dominated by insects during the breeding season, but they rely more on vertebrate prey in the winter months. Loggerhead Shrikes are commonly known to impale larger prey on sharp objects such as thorns and barbed wire, to cache food for winter when prey is scarce. The Loggerhead Shrike can be found across much of the U.S. and most of Mexico.

The species was not recorded during 2025 surveys, but has been recorded in the vicinity.

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 7a & 7b (see **Table 4**)

Recommended Avoidance Measures

5.1.17 Osprey – *Pandion haliaetus* (CDFW Watch List)

The Osprey is a large raptor that is mostly white from below, with dark patches at the wrists. The head is also white with a prominent brown stripe through the eye. They breed in the central Sierra Nevadas north through the Cascade range, from March to September. They nest in the tops of large snags, dead-topped trees, cliffs, and human made structures up to 250 feet from the ground. Nests are usually within ¼ mile of a fish bearing water body but can be found up to a mile away. The species is known to form colonies during the breeding season. They feed primarily on fish, but may also eat mammals, birds, reptiles, invertebrates, and amphibians (Polite 1988)

Over a dozen occurrences of this species have been recorded within the day use area of the Study Area to the Comanche Dam.

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 3a & 3b (see **Table 4**)

5.1.18 American White Pelican – *Pelecanus erythrorhynchos* (CDFW Species of Special Concern, USFWS Bird of Conservation Concern)

The American white pelican is a large species of waterbird with broad wings, a long neck, and huge bill. They are mostly white, with black flight feathers. The bill and legs are orange to yellow. They breed in large colonies at a number of sites, primarily in the North American interior but a few non migratory colonies exist along the coasts of Texas and Mexico (Shuford and Gardali 2008). Colonies are often multi-species collections of other colonial birds and are located in areas with minimal disturbance from humans or other land predators (Evans and Knopf 1993). The species often forages in flocks in shallow inland waters such as marshes and lake margins. They feed on fish, crustaceans, and amphibians (ibid).

The species has no documented occurrences within the Study Area, but it has been observed in the Comanche reservoir to the east.

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 7a & 7b (see **Table 4**)

5.1.19 Yellow-billed Magpie – *Pica nuttalli* (USFWS Bird of Conservation Concern)

The yellow-billed magpie is a common year-round resident in the California Central Valley and central coast ranges. It lives in valley foothill hardwood, hardwood-conifer, and riparian as well as agricultural lands, pasture, and urban areas. It builds large nests made of twigs, lined with mud, roots, and grass with a dome made of twigs (Harrison 1978). Paired birds nest singly or in small colonies from late February to mid-July. The yellow-billed magpie is opportunistic and will eat invertebrates, carrion, bird eggs, nestlings, acorns, fruits, and more (Green 1988).

No documentations of the species exist within 2 miles of the Study Area.

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 7a & 7b (see **Table 4**)

5.1.20 Purple Martin – *Progne subis* (CDFW Species of Special Concern)

The purple martin is an uncommon-to-rare summer resident and rare spring and fall migrant in wooded, low-elevation habitats throughout California. It inhabits montane woodlands, riparian areas, and low elevation coniferous forests where ponderosa pine, douglas fir, and Monterey pine are the dominant species. They can occasionally be found in residential areas. For reproduction, they nest in abandoned woodpecker cavities, nesting boxes, under bridges, and in culverts (Green 1988). They nest from April through August and may do so colonially.

There are no nearby occurrences of this species. The closest documentation is 15 miles west of the Study Area, in Galt.

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 7a & 7b (see **Table 4**)

5.1.21 Bank Swallow – *Riparia riparia* (State Threatened)

The bank swallow is listed as State Threatened. It is the smallest North American swallow with a weight of 13.5 grams (Bank Swallow Technical Advisory Committee 2013). Bank swallows are migratory birds that breed in North America, Europe and Asia, and winter in Central and South America (Garrison 1999). The California populations of Bank swallows breed in the northern and central portion of the state with the vast majority (70-90%) of individuals occurring in the Sacramento River and its tributaries (CDFW 1992).

Bank swallows construct nest burrows along eroded, vertical banks of rivers and creeks with friable soils (Garrison et al. 1987). Bank swallows favor river and creek systems with native, over-bank riparian vegetation (Bank Swallow Technical Advisory Committee 2013). Bank swallows nest in early spring when pairs lay 3 to 5 eggs. Nesting colonies can range from 3 to 3,000 nest burrows. Burrows are often destroyed by erosional forces from year to year so there is typically low site fidelity to nesting locations (ibid).

One non-specific occurrence of the species exists two miles west of the Study Area, centered on the Mokelumne River.

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 7a & 7b (see **Table 4**)

5.1.22 Northern Yellow Warbler – *Setophaga aestiva* (CDFW Species of Special Concern)

The northern yellow warbler is a small, energetic, finch sized species of bird that can be found in almost all of continental North America. It has a large, straight bill with medium length tails and a round head. They are yellow, and males have red streaks on the underside (Cornell n.d.). Within California, it is as a migrant and summer resident from March through October. It breeds from April to July (Shuford and Gardali 2008). Most of their historic range within the state is intact, with the exception of breeding habitat in the Central

Valley. Their population is generally trending down but varies by region and locality. Is still common in parts of the state (ibid). They inhabit riparian zones and wet meadows (Lowther et al. 1999), utilizing a variety of species such as willows, cottonwoods, and ash. Nests are built in vertical forks of bushes and small trees between 10 and 40 feet off of the ground. (Cornell n.d.). Their diet overwhelmingly consists of insects and spiders, with small amounts from other sources (Beal 1907).

Multiple documentations of the species exist on the north side of the Mokelumne River, directly across from the day use area.

Potential Project Impacts

Construction activities could have temporary impacts on nesting or foraging of this species, though the overall Project is expected to improve habitat quality for this species on site. With the incorporation of the following avoidance and minimization measures, this Project is expected to have a **less-than-significant** impact.

Recommended Avoidance Measures

BIO 7a & 7b (see **Table 4**)

5.1.23 Pacific Lamprey – *Entosphenus tridentatus* (CDFW Species of Special Concern)

The Pacific lamprey is a species of jawless fish that is widespread within the state of California. It can be distinguished from other species of lamprey by its size, being the largest in California at over 40cm in length. The supraoral plate is also helpful for identification, with three sharp cusps, where the middle one is the smallest (CDFW n.d.[b]). They are separate from other species of North American lamprey, being placed in the *Entosphenus* genus rather than *Lampetra*.

Similar to salmonids, the Pacific is an anadromous species of fish, spending a portion of its life in the ocean before returning to a river system to spawn. Some individuals may also be residents, leading to confusion about whether some river systems have multiple runs of lamprey or if only some portions of the population actually migrate (Anglin 1994). Multiple runs have still been observed, particularly in the Russian River where a spring-run and fall-run were observed (CDFW n.d.[b]). They typically migrate between March and June, but may also start as early as January (CDFW n.d.[b]).

The species is still declining however, being easily blocked from reaching reaches of waterways above things like dams. They may be capable of quickly recolonizing areas when these barriers are removed, partially because of their relative lack of spawning area fidelity (CDFW n.d.[b]

Potential Project Impacts

The Project activities include work directly in the mainstem Mokelumne River and in adjacent side channels. This will result in temporary disturbances to any present individuals from mechanical means or increased sediment load. The following avoidance and minimization measures, which are designed for salmonids but cover minimum standards for lamprey, should be incorporated to ensure that this Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 8a (see **Table 4**)

5.1.24 Western River Lamprey – *Lampetra ayresii* (CDFW Species of Special Concern)

The western river lamprey is an uncommon species of lamprey that has had very little research within the state of California. It is considered to be potentially in decline. The species reaches a maximum length of 17-18 cm. The supraoral plate has two cusps that appear as separate teeth (CDFW n.d.[c]). Like many species of lamprey, they are anadromous. They need clean, gravelly rifles in perennial waterways for spawning (ibid).

Potential Project Impacts

The Project activities include work directly in the mainstem Mokelumne River and in adjacent side channels. This will result in temporary disturbances to any present individuals from mechanical means or increased sediment load. The following avoidance and minimization measures are designed for salmonids, but cover minimum standards for lamprey, should be incorporated to ensure that this Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 8a (see **Table 4**)

5.1.25 Steelhead – Central Valley DPS – *Oncorhynchus mykiss irideus* pop. 11 (Federally Threatened, CDFW Species of Special Concern)

Steelhead is the name given to the anadromous form of the rainbow trout which is a salmonid native to western North America and the eastern coast of Asia. Unlike Pacific species of salmon, steelhead may spawn multiple times, although this is not especially common and varies between populations (McEwan 2001). Currently, only winter-run steelhead are known to exist in the Central Valley. Summer-run steelhead were historically present, but have been extirpated with the construction of dams. The species almost always co-occurs in drainages where Chinook salmon are present and are typically found further upstream as well (Voight and Gale 1998). While the historical distribution of steelhead in the Central Valley is not well known, the wide historical distribution of Chinook salmon suggests that the species used to be much more widespread.

The Mokelumne River Hatchery, located at the base of the Comanche Dam, along the eastern border of the day use area, produces steelhead among other species of salmonids. Despite the lack of occurrences within the Study Area, the proximity of the hatchery means that the presence of the species can be assumed, at least during the months that the hatchery operates.

Potential Project Impacts

The Project activities include work directly in the mainstem Mokelumne River and in adjacent side channels. This will result in temporary disturbances to any present individuals from mechanical means or

increased sediment load. The following avoidance and minimization measures should be incorporated to ensure that this Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 8a (see **Table 4**)

5.1.26 Chinook Salmon – Central Valley fall/late fall-run ESU – *Oncorhynchus tshawutscha* pop. 13 (CDFW Species of Special Concern)

Chinook salmon are a species of anadromous salmonid native to western North American and eastern Asia. The Central Valley fall and late fall runs of the species are less affected by dams than other runs because of the tendency to spawn at low elevations of 500-1000 feet (CDFW n.d.[d]). However, they are still restricted by the presence of dams. The species historically reached the Kings River, which originates in the Sierra Nevada's and runs south of Fresno. However, the species currently only reaches as far south as the San Joaquin and Merced Rivers confluence because of an impassable dam (ibid).

The Mokelumne River Hatchery, located at the base of the Comanche Dam, along the eastern border of the day use area, produces Chinook salmon among other species of salmonids. The species has almost three dozen occurrences between the day use area and base of the Comanche Dam. It is unknown whether any natural salmon populations are present in the river, or only hatchery spawn.

Potential Project Impacts

The Project activities include work directly in the mainstem Mokelumne River and in adjacent side channels. This will result in temporary disturbances to any present individuals from mechanical means or increased sediment load. The following avoidance and minimization measures should be incorporated to ensure that this Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 8a (see **Table 4**)

5.1.27 Crotch's Bumble Bee – *Bombus crotchii* (State Candidate Endangered)

Crotch's bumble bee is distinguished by a relatively rounded midleg and ankle, and a squared face shape. Their coloration is also unique, with a thick yellow stripe on the abdomen as well as a yellow stripe on the thorax just behind the head. Depending on sex/life stage, they may have black faces or faces with yellow hair. CBB in southern and central California often have reddish/orange coloration at the bottom of the abdomen, but in some individuals (particularly northern populations), this is black. Identification can be challenging for non-experts and/or without having the animal in hand. Nesting often takes place underground in rodent burrows, rock piles, or grass clumps. This species utilizes drier shrub and grasslands and was formerly widespread in the Central Valley. Habitat loss has driven much of this species' decline, but other threats include introduced bee species and widespread use of pesticides.

No nearby occurrences of this species exist within the vicinity of the Study Area.

Potential Project Impacts

The Project will impact upland areas that have potential to support nesting or foraging habitat for bumblebees. The following avoidance and minimization measures should be incorporated to ensure that this Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 9a & 9b (see **Table 4**)

5.1.28 Monarch Butterfly – *Danaus plexxipus plexxipus* pop 1 (Federal Proposed Threatened)

Adult monarch butterflies feature bright orange wings with black margins and venation. Larvae feed exclusively on milkweed (*Asclepias* sp.) and enter pupation between 9 and 18 days old. Adult monarchs emerge after 6 to 14 days, typically living for two to five weeks, though overwintering adults may live for six to nine months. Overwintering typically occurs in coastal zones, but adult monarchs visit many parts of California to reproduce and feed.

No occurrences exist within the vicinity of the Study Area.

Potential Project Impacts

During surveys conducted in 2025, no milkweed (*Asclepias* spp.) plants were found. However, since the species is known from the vicinity of the Study Area and could support milkweed plants. The following avoidance and minimization measures should be incorporated to ensure that this Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 10a & 10b (see **Table 4**)

5.1.29 Valley Elderberry Longhorn Beetle – *Desmocerus californicus dimorphus* (Federal Threatened)

The Valley elderberry longhorn beetle (VELB), like most longhorn beetles, has a long, tube-like body, with antennae that are 2/3 the length of its body. Females are slightly shorter and broader than males, all measure under around 2 inches. Males have red-orange wing covers while females are more darkly colored (Swenty, 2016).

Its range has greatly diminished and only extends from Fresno to Shasta County (Swenty, 2016).

The species gets its name from its host plant, the red or blue elderberry, which is found along riverbeds. Females will lay eggs in the plant and the larvae will burrow into the bark. The adults eat elderberry flowers while the larvae eat the stems (Swenty, 2016).

The VELB is considered Federally Threatened due to habitat loss caused by agricultural land use, urban development, levee construction and non-native animals that prey on the VELB's eggs and larvae (Swenty, 2016; U.S. Fish and Wildlife Service).

Exit holes typical of this species were found in multiple blue elderberry shrubs within Site 1 during surveys in 2025.

Potential Project Impacts

The Project activities are not overlapping or immediately adjacent known elderberry shrubs. However, since the species is known from the Study Area, the following avoidance and minimization measures should be incorporated to ensure that this Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 11a & 11b (see **Table 4**)

5.1.30 Pallid Bat – *Antrozous pallidus* (CDFW Species of Special Concern)

The pallid bat is a locally common species of bat in low elevation regions of California. It is a resident of all parts of the state except for high elevations in the Sierra Nevada's. It occurs in much of western North America. They roost in rocky outcrops, cliffs, and crevices where access to open habitat for foraging is easily accessible (Harris 1988). They may also use buildings or hollow trees. They feed on insects and arachnids (ibid).

Potential Project Impacts

The Project include removing some large cottonwoods and oaks to make room for new floodplain side channels. The following avoidance and minimization measures should be incorporated to ensure that the Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 12a & 12b (see **Table 4**)

5.1.31 Western Red Bat - *Lasiurus frantzii* (CDFW Species of Special Concern)

The western (or desert) red bat has somewhat recently split from the southern red bat (*Lasiurus blossevillii*). It is found in the western United States and extends into much of Central and South America. This species roosts in large trees, especially sycamore and cottonwood, where their rusty coloration helps them blend with the arboreal vegetation (Bat Conservation International 2026). Unlike most species of bat, western red bats can have multiple young per litter; as many as four in some cases. They primarily feed on flying insects such as moths and flies, but they will also eat ants. According to Bat Conservation International, they are negatively affected by habitat loss, and are killed by wind turbines and pesticides (ibid). As such, they are a CDFW Species of Special Concern.

Potential Project Impacts

Project activities include removing some large cottonwoods and oaks to make room for new floodplain side channels. The following avoidance and minimization measures should be incorporated to ensure that the Project has a **less-than-significant** impact on this species.

Recommended Avoidance Measures

BIO 12a & 12b (see **Table 4**)

5.1.32 Northwestern Pond Turtle - *Actinemys marmorata (CDFW Species of Special Concern, Federal Proposed Threatened)*

This turtle primarily inhabits aquatic habitats, including ponds, slow-moving streams, lakes, marshes, canals, rivers, wetlands, reservoirs, and brackish estuarine waters (Holland 1994; Jennings and Hayes 1994). Northwestern pond turtles often bask on logs or other objects outside of the water, but quickly re-enter if they are threatened. They prefer habitats with areas for cover (vegetation, logs) and basking sites (rocks and other substrates) (Holland 1994). Summer droughts and cold winters are survived by aestivating or burying in loose soil or mud. Females leave drying creeks from May to July to lay eggs in sunny upland habitats, including grazed pastures (Zeiner and Laudenslayer 1990). Northwestern pond turtles are omnivores, with the potential to be opportunistic predators and scavengers (Holland 1985a, 1985b; Bury 1986). Females leave drying creeks from May to July to lay eggs in sunny upland habitats, including grazed pastures (Zeiner and Laudenslayer 1990). The northwestern pond turtle has lost habitat throughout a large portion of its range. It is almost extinct in the San Joaquin Valley and has seen extensive habitat loss, in part due to predation as well as competition from introduced animals, including bullfrogs and exotic pet turtles that have been released into the wild (ibid).

Northwestern pond turtle consists of two recognized species in the genus *Actinemys* (family Emydidae); some authors alternatively use the genus *Emys* (family Emydidae). The two recognized species are named the northwestern pond turtle (*Actinemys marmorata*) and the southwestern pond turtle (*Actinemys pallida*). The southwestern pond turtle ranges from the Monterey Bay along the Coast Range into northern Baja California while the northwestern pond turtle's range covers the Central Valley, including the Sacramento Delta where the Study Area is located, the Sierra Nevada foothills, and north of the Monterey Bay to Washington State (Shaffer and Scott 2022). The northwestern pond turtle is declining in most of its range. It is almost extinct in the San Joaquin Valley and has seen extensive habitat loss, in part due to predation as well as competition from introduced animals, including exotic pet turtles that have been released into the wild (Zeiner and Laudenslayer 1990).

For the purpose of this report, the turtles within the Study Area will be referred to as the northwestern pond turtle (*Actinemys marmorata*, NWPT) following the taxonomy used in the California Department of Fish and Wildlife "Special Animals List" (CNDDB 2026).

The nearest occurrence of this species is over five miles to the southeast.

Potential Project Impacts

The Mokelumne River and drainage ditches within the Study Area provide suitable habitat for NWPT. If northwestern pond turtles are present within the work area when construction commences, individual turtles could be impacted or harmed. However, the Project will likely benefit NWPT overall due to the restoration of suitable wetland and basking habitat. The following avoidance and mitigation measures are recommended to ensure that construction-related impacts remain at a **less-than-significant** level.

Recommended Avoidance Measures

BIO 13a, 13b & 13c (see **Table 4**)

5.2 Special Status Plant Species

Special-status plants include species that are designated by USFWS and/or CDFW as rare, threatened, or endangered, as well as candidate species for listing. Special-status plants also include species considered rare or endangered under the conditions of Section 15380 of the CEQA Guidelines, such as those plant species identified by the California Native Plant Society (CNPS) as California Rare Plant Rank (CRPR) 1A, 1B, or 2 in the Inventory of Rare and Endangered Vascular Plants of California (Rare Plant Inventory, or RPI). Finally, special-status plants may include other species that are considered sensitive or of special concern due to limited distribution or lack of adequate information to permit listing or rejection for state or federal status, such as those identified as CRPR 3 or 4 in the RPI.

There are three special-status plant species with potential to occur in the Study Area. These species and the remaining special-status plant species known from the region (but not expected to occur) are included in **Figure 4, Appendix A, Table A-2**. Protocol-level plant surveys have not been conducted in the Study Area, and the reconnaissance-level surveys done in 2025 were not conducted during the blooming period for most of these species.

The three special-status plant species with potential to occur include:

- Valley brodiaea *(Brodiaea rosea* ssp. *vallicola;* CRPR 4.2),
- Bogg's Lake hedge-hyssop (*Gratiola heterosepala;* State Endangered (SE) and CRPR 1B.2), and
- Sanford's arrowhead (*Sagittaria sanfordii;* CRPR 1B.2).

5.2.1 Valley Brodiaea (CRPR 4.2)

Valley brodiaea is listed as State Rare and designated by CNPS as CRPR 4.2, indicating it is a "plant of limited distribution" ("4") and "fairy threatened in California" ("0.2") (CNPS 2025). This species is a moderately sized perennial herb in the brodiaea family (Themidaceae) which is found in valley grassland habitat. It is threatened by erosion, recreational activities, and invasive species. The flowers are white to pale violet, and they bloom from April to May (ibid).

5.2.2 Bogg's lake hedge-hyssop (SE and CRPR 1B.2*)*

Bogg's Lake hedge-hyssop is designated by CNPS as CRPR 1B.2, indicating it is "rare, threatened, or endangered in California and elsewhere" ("1B") and "moderately threatened in California" ("0.2") (CNPS 2025). The species is also listed as endangered within the state of California. This is a small annual herb in the plantain family (Plantaginaceae), and is found in vernal pools and shallow freshwater emergent marshes. It is threatened by erosion, development, and invasive species. The flowers are white to yellow, and bloom from April to September.

5.2.3 Sanford's arrowhead (CRPR 1B.2)

Sanford's arrowhead is designated by CNPS as CRPR 1B.2 (CNPS 2025). This is a perennial herb found in freshwater emergent marshes and wetland-riparian. It is a member of the water-plantain family (Alismataceae). It is 'seriously' threatened by habitat destruction/degradation and possibly herbicide poisoning. The flowers are white, and bloom from May to October (ibid).

Potential Project Impacts

Valley brodiaea, Bogg's Lake hedge-hyssop, and Sanford's arrowhead have potential to occur within the Study Area. Potential impacts to habitats present in the Study Area should remain at a **less-than-significant** impact with the incorporation of the following avoidance measures:

Recommended Avoidance Measures

BIO 14a: Rare Plant Surveys

Protocol-level botanical surveys will be conducted in any areas that are expected to be impacted by construction activities and within a 100-foot buffer around those areas. Surveys will be conducted by a qualified botanist, and they will conform to both an 'Intuitive Controlled' survey protocol and CDFW-recommended protocols (as described in BLM 2019, CDFW 2018). Protocol-level surveys will involve three rounds which correspond to the early spring, peak spring, and summer blooming periods. Actual survey timing will be influenced by seasonal weather conditions and phenology of targeted plant taxa.

The surveys will target all plant taxa with a designated California Rare Plant Rank (CRPR 1-4), which includes all federal and state listed species. In the event that any special-status plants are identified during field surveys, the botanist will immediately inform the Project Proponent of the occurrence. Data collection for CRPR plants will involve the thorough documentation of population statistics, including (but not limited to) percent of individuals in each life stage (vegetative/bud, flower, and fruiting), number of individuals in the population, population quality, site slope and aspect, soil conditions, hydrology, general habitat abundance and quality, and threats to the population(s).

If none of the targeted species are present in the survey area, no further action will be required and construction may proceed.

If any special-status species are present, the following measures will be required:

i. Annual Plant Taxa:

1) Flag or otherwise demarcate and ensure workers avoid any disturbance of the protected species where said species are present.

2) If possible, schedule potential disturbance activities for timeframes when the special-status taxa occurring in the work area is senescent and/or after seed as set.

3) If an individual or population must be removed, one of two options can be employed and monitoring conducted to ensure that no net loss of the species occurs.

i. Seeds of the annuals shall be collected from existing onsite populations or from the same watershed (to maintain local genetic stock) and distributed in appropriate habitat outside the work area (within the same watershed) or in the work area following completion of work.

ii. A nursery with experience growing special-status plants can be employed to grow seedlings of the species (from seeds collected locally) that shall be planted in appropriate habitat outside the work area or in the work area following completion of work. It should be noted that seeds derived from plants in the same watershed as the impact area may be available from local nurseries, and local nurseries may also be able to propagate seeds from adults grown from collected seeds. In this case, seeds do not need to be collected from a specific impact area site.

ii. Perennial Plant Taxa:

1) Mark populations in the field with distinct flagging.

2) If an individual or population must be removed, one of two options can be employed (subject to CDFW approval) and monitoring conducted to ensure that no net loss of the species occurs.

i. The individual or population can be dug up and relocated to appropriate habitat outside the work area.

ii. A nursery with experience growing special-status plants can be employed to grow seedlings of the species that shall be planted in appropriate habitat outside the work area or in the work area following completion of work. The selected relocation site shall be within the same watershed as the impact area, and shall be approved of by CDFW botanical staff.

A monitoring plan shall be developed that details the following components. Conduct annual monitoring of seeded or replanted locations within the Study Area for a minimum of 3 years and up to 5 years, dependent upon CDFW botanical staff recommendation and site monitoring results. The new population should match typical populations for the species as available from rare plant inventories (e.g., from CNDDB, USFWS data, or regional mitigation banks). Due to normal variations in populations from year to year as a result of weather fluctuations, average population data for annual taxa can be calculated from several years (at least three) of data collected from known populations in the region.

5.3 Jurisdictional Wetlands and Waters

Potential jurisdictional wetlands and waters within the Study Area include Perennial Wetland (21.136 acres), Seasonal Wetland (0.135 acres), and Other Waters (12.787 acres). These wetlands and waters are described in **Section 3.5** above and shown on **Figures 4A-4C**. The actual acreages will be refined through formal verification of these delineated resources by the U.S. Army Corps of Engineers.

Potential Project Impacts

Proposed restoration activities could impact state and/or federal jurisdictional wetland features, including any features under jurisdiction of the U.S. Army Corps of Engineers (Section 404 of the Federal Clean Water Act), the Regional Water Quality Control Board (Clean Water Act Section 401), or the California Department of Fish and Wildlife (Section 1602 of the California Fish and Game Code). However, the proposed Project is designed to improve the quality and extent of wetland habitat on-site. Therefore, with the incorporation of the proper permitting measures, these impacts are expected to be self-mitigating and **less-than-significant**.

Recommended Avoidance and Mitigation Measures

Any indirect or direct impacts to jurisdictional features will require completion of proper permit processes, including U.S. Army Corps of Engineers Section 404 and/or 408, Regional Water Quality Conservation Board Section 401, and CDFW Section 1602.

6 POTENTIAL IMPACTS TO SPECIAL-STATUS SPECIES AND HABITATS

As shown in **Table 3**, potential impacts to the 32 special-status wildlife species and three special-status plant species determined to have potential to occur in the Study Area are expected to be **less-than-significant** impacts with the incorporation of the Project avoidance and minimization measures described above.

The Study Area may support additional nesting and migrating birds protected by the Migratory Bird Treaty Act and California Fish and Game Code 3503. With the incorporation of the Project's avoidance and minimization measures, these impacts are expected to be **less-than-significant.**

Finally, the Study Area encompasses potentially jurisdictional aquatic habitats, including wetland and riparian vegetation. Since the Project is designed to improve the habitat quality and increase the extent of wetlands on-site, these impacts are also expected to be **less-than-significant** with the incorporation of the Project's avoidance and minimization measures.

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APPENDIX A

SPECIAL-STATUS SPECIES IN PROJECT REGION

Table A-1. Special-status Wildlife Species Documented in the Vicinity of the Project

Note: Species highlighted in gray have some level of potential to be present within the Study Area.

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Amphibians			
California tiger salamander – Central California Distinct Population Segment (DPS) *Ambystoma californiense pop. 1*	FT/ST/WL	Grassland, scrub, and oak savanna habitats in Central California. Live in upland mammal burrows during warm, dry summer months and migrate during rainy nights to vernal pools, seasonal ponds, or stock ponds for breeding.	**Potential.** Suitable vernal pool and stock pond breeding habitat may not be present in the Study Area itself, but CTS may breed in nearby pools and live in the uplands within the Study Area during the non-breeding season. During surveys from 2012 to 2018, multiple CTS larvae and adults were detected in a constructed pond immediately S of Site 1 (with connectivity to Site 1). The next nearest recorded sighting occurred in April 2015 (4 larvae observed), just over 1 mi NW of Site 2, but the location of this sighting is separated from the Study Area by several roadways. Other CNDDB records include an unverified 2009 observation of the species in the general area surrounding Site 3 and two documented sightings of larvae from 2008 about 1.2 mi and 3.5 mi NW of Site 2.
Western spadefoot *Spea hammondii*	FPT/--/SSC	Inhabits grasslands with shallow seasonal pools. Adults remain in underground burrows in the uplands during most of the year. During large rain events, adults emerge en masse and breed in the seasonal pools, then return underground.	**Potential**. Study Area contains some potentially suitable habitat in the form of grassy uplands near seasonal wetlands, and the species is known from the Project vicinity. Spadefoot of varying life stages have been observed multiple times between 2010 and 2022 less than 0.5 mi S of Site 1 (on land with connectivity to Site 1) and also slightly further away (above Hwy 88). Another nearby occurrence was recorded about 0.6 mi NNW of Site 3 in 2020 (in same general grazed grassland/vernal pool area where species has been documented regularly since 1978).

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Birds			
Tricolored Blackbird *Agelaius tricolor*	--/ST/SSC, BCC	Forages in a variety of habitats including pastures, agricultural fields, rice fields, and feedlots; nests in freshwater marshes with tule or cattails, or in other dense thickets of willow, thistle, blackberry, or wild rose in close proximity to open water.	**High Potential.** The Project area provides suitable foraging and nesting habitat for this species, and there have been several citizen science observations within 1 mi of Site 1 between 2012 and 2025. The most recent documented sightings include a flock of approximately 25 individuals in the Mokelumne Day Use Area in April 2025, a flock of ~50 just NW of Site 1 in April 2023, and a flock of ~23 just NE of Site 1 in January 2023 (eBird 2025r). The nearest recorded CNDDB sighting occurred approximately 0.6 mi S of Site 3 in 2000, when 8 individuals were observed calling (and presumably nesting) in cattails.
Mountain Plover *Anarhynchus* [*Charadrius*] *montanus*	--/--/SSC, BCC	Occurs in open, dry habitats with low vegetation such as short-grass prairies and alkali flats. Breeds in high-elevation arid grasslands, grassy semideserts, and agricultural lands that mimic these habitats. Female lays eggs in two nests, and both sexes incubate. Winters mainly in the Central Valley and Imperial Valley, often in sparsely vegetated farmland. Once widespread in California, now occurs primarily as an uncommon winter visitor.	**Not Expected.** The Study Area may provide potential winter foraging habitat, but the species has not been recorded nearby. The two nearest documented observations of this species in eBird were from 2001, approximately 13 to 15 mi SSE of the Project area. The nearest sightings after 2003 are all more than 35 mi to the W and NW (eBird 2025j).
Golden Eagle *Aquila chrysaetos*	--/--/FP, WL	Forages in open terrain such as grassland, desert, savannah, or young forest and shrub habitat. Constructs large nests on platforms of steep cliffs or in large trees in open areas.	**High Potential:** The Study Area provides suitable foraging habitat and potentially suitable nesting habitat, and there have been multiple documented citizen science observations of the species in the Mokelumne Day Use Area between 2012 and 2025. Numerous other sightings have been reported in the surrounding area, with the nearest being in December 2018 and November 2025 roughly 2 mi NE of Site 1 (eBird 2025h).

Common Name ***Scientific Name***	**Status**[1]	**Description of Habitat Requirements**	**Potential to Occur in Study Area**
Short-eared Owl *Asio flammeus*	--/--/SSC, BCC	One of the world's most widely distributed owls. Usually found in large open areas with low vegetation, including grasslands, open fields, marshes, and a wide variety of other habitats. Winter habitat is even broader and includes highly disturbed areas such as gravel pits, woodlots, weedy fields and dumps. Often seen in daylight. Roosts on the ground in tall grass. Typically nests in dry, slightly raised areas with dense vegetation. Occasionally still breeds in northern California.	**Not Expected.** The Sites may provide suitable roosting and nesting habit, but the species is not known to occur in the immediate surrounding area. The nearest documented observations were roughly 10 mi to the NNW (in 2019) and SSW (in 2017). The nearest recorded occurrence from the last five years was approximately 13 mi WNW of the Project area in February 2024 at Waldo Holt Preserve (eBird 2025s).
Cooper's Hawk *Astur cooperii*	--/--/WL	Found in forests, woodlands, and often suburbs with trees. Nests in dense woods of pines, oaks, Douglas firs, beeches, spruces, and other trees, often in areas with flat ground, usually about 25 to 50 ft up in a tree. Eats mainly medium-sized birds, but also preys on small mammals.	**High Potential.** The Study Area provides potentially suitable nesting (and overwintering) habitat with its numerous oak and other large trees. Many sightings have been documented in eBird between 2021 and 2025 in the Mokelumne Day Use Area, including multiple sightings as recently as August and November of 2025. (eBird 2025g)
Western Burrowing Owl *Athene cunicularia hypugaea*	--/SCE/ SSC,BCC	Occurs in open, treeless areas with low, sparse vegetation, usually on gently sloping terrain. Subterranean nester that moves into existing cavities (generally with openings >10 cm and depth >150 cm); reliant on fossorial mammals, especially the California ground squirrel, for digging its burrows.	**Low Potential**. Portions of the Project area provide potentially suitable habitat for this species, though most existing burrows observed were too small (openings <10 cm dia.). There have been several observations recorded within a few miles of the site in recent years, with the nearest being less than a mile away at the intersection of SR88 and SR12 in December 2018. BUOW have been observed as recently as January 2025 just S of SR12, about 2 mi SE of the Project area (eBird 2025e).
Ferruginous Hawk *Buteo regalis*	--/--/WL	Frequents open grasslands, sagebrush flats, desert scrub, low foothills surrounding valleys, and fringes of pinyon-juniper habitats. Cliffs, rocky outcrops, or tree groves often part of breeding habitat. Roosts in open areas, usually in a lone tree or on a utility pole. Spends winters in grasslands or deserts with abundant small mammals.	**Potential.** The Study Area provide suitable foraging habitat. There are multiple sightings in eBird in the Mokelumne Day Use Area, with one as recent as December 2023. Plenty of other sightings within 2 mi of the Sites are documented as well. One of these was in January 2025 along SR88, WNW of the Project area (eBird 2025h).

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Swainson's Hawk *Buteo swainsoni*	--/ST/--	Breeds in stands with few trees in juniper-sage flats, riparian areas, and in oak savannah in the Central Valley. Forages in adjacent grasslands or suitable grain or alfalfa fields, or livestock pastures.	**High Potential**. The Study Area provides suitable foraging and nesting habitat for this species. Observations of individuals and pairs have been consistently documented within the day use area every year since 2008 in eBird. There are many other recorded sightings within a mile of the Project area, some as recent as 2025 (eBird 2025t). In CNDDB, a pair was documented nesting in a blue oak about 1.7 mi WNW of Site 3 in 2022, and there are older sightings of other nesting pairs from 0.5 to 1.7 mi NE of Site 1 (2002-2003).
Northern Harrier *Circus hudsonius*	--/--/SSC, BCC	Inhabits marshes, grasslands, and open fields. Prefers areas with low vegetation and abundant prey for foraging and breeding. Still widespread, but declining.	**High Potential**. The Study Area provide potential foraging and nesting habitat for this species. Many observations of the species have been documented within the day use area (as recently as November 2024) and at other points along the Mokelumne River and on the edge of the Camanche Reservoir within a few mi of the Sites (eBird 2025n).
White-tailed Kite *Elanus leucurus*	--/--/FP	Prefers undisturbed open woodlands, grasslands, marshes, and farmlands for foraging. Nests near top of dense oak, willow, or other tall tree stands.	**Potential.** The Study Area offer some areas of suitable foraging and nesting habitat. There are many recorded observations of the species in the day use area and along the river in the immediate vicinity of the Sites from 2005 to 2018. There was a more recent sighting of an individual (August 2025) just S of the Project area along SR12 (eBird 2025v).
Willow Flycatcher *Empidonax traillii*	--/SE/--	Inhabits areas with willows and/or other shrubs near running water. Breeds in North America and overwinters in Central and South America. Nests in low shrubs (usually willows, but not always) about 2 to 5 feet off of the ground.	**Potential.** The Study Area offer some potentially suitable breeding habitat. Many sightings of the species have been documented in the day use area and next to the Hatchery, with an individual being observed most recently in June 2025. The most recent sighting of a pair occurred in 2021 (eBird 2025w).

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Prairie Falcon *Falco mexicanus*	--/--/WL	Nests in open terrain with cliffs and rock outcrops, often on a ledge with a protective overhang. Forages in grasslands, savannahs, desert scrub, and sometimes agricultural fields. In winter, diet typically changes from mainly small mammals to mainly birds.	**High Potential.** The Study Area provide potential foraging habitat for this species, There have been many documented observations of individuals in and near the day use area, including two observations from 2025. One was recorded in November within the day use area, and the other was recorded in September less than a mile S of the Study Area (eBird 2025q).
Common Loon Gavia *immer*	--/--/SSC	Breeds mostly north of the contiguous U.S. and migrates south for the winter. During migration/overwintering, may be found near coastal shores as well as those of inland reservoirs and lakes. Generally only comes ashore to nest because not well suited to land. Needs a long "runway" of water (30 yd+) for flight takeoff.	**Low Potential.** An individual was observed in the Mokelumne Day Use Area salmon run in April 2024, and there have been many documented sightings on the western shore of and in the western portion of nearby Camanche Reservoir as recently as 2024. Although the species appears to use the reservoir as migratory/winter habitat at times, the Project area itself does not necessarily offer appropriate habitat (no large bodies of water). It is quite possible that a bird may accidentally enter and/or become stranded in one of the Sites, though (eBird 2025f).
Bald Eagle *Haliaeetus leucocephalus*	FD/SE/FP	Nests in old growth, lower montane coniferous forest next to large bodies of water. Builds the largest nests of all North American birds. Can be found near many of California's aquatic features in winter.	**Present.** The Study Area provides some perching habitat along the river. There have been numerous observations recorded in and around the day use area (Site 1) and adjacent Hatchery as recently as November 2025, including sightings of individuals and pairs. An EBMUD biologist also observed an individual in Site 2 in March 2025 (eBird 2025b).
Yellow-breasted Chat *Icteria virens*	--/--/SSC	Breeds in shrubby habitats throughout North America; overwinters in Central America. Usually stays hidden in dense thickets. California's Central Valley is used mainly as migratory habitat for this species.	**High Potential.** Shrubby portions of the Study Area provide suitable migratory and potentially suitable breeding habitat. There have been many documented citizen science observations within the Project Area, with the most recent sighting in the day use area (Site 1) being from September 2024. There was also a recorded observation in Site 2 from 2008 (eBird 2025y). A CNDDB record states that two adults were observed using the site during breeding season (May) in 1994.

Common Name ***Scientific Name***	**Status**[1]	**Description of Habitat Requirements**	**Potential to Occur in Study Area**
Loggerhead Shrike *Lanius ludovicianus*	--/--/SSC	Common resident and winter visitor in lowlands and foothills of California. Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. Often nests in thorny vegetation a few feet above the ground.	**Potential**. The Study Area provide potential foraging and migratory habitat for this species. The most recent documented sighting in Site 1 is from 2021; there are also multiple recorded observations within a mile of the Study Area from 2022 and 2023. The majority of these sightings occurred between the months of November and January (eBird 2025l).
Osprey *Pandion haliaetus*	--/--/WL	Forages in large (and often shallow) bodies of water with plentiful fish near the surface including rivers, lakes, reservoirs, bays, estuaries, and surf zones. Nests in tall trees or other elevated sites within a short distance of these areas.	**High Potential**. The Study Area and nearby Camanche Reservoir provide suitable foraging habitat. There have been numerous documented observations of this species in the Project Area over the last few decades, including several occurrences in 2025. These observations have occurred in nearly every month of the year, which suggests that the birds may be using the area as more than simply migratory or overwintering habitat (eBird 2025p).
American White Pelican *Pelecanus erythrorhynchos*	--/--/SSC, BCC	Breeds mainly on isolated islands in freshwater lakes; forages in shallow inland waters (often 30+ mi from nesting site). Can use deeper lakes for feeding in late summer when fish come to surface to sun themselves. Favors shallow coastal waters in winter.	**High Potential.** The Project Area provides potential migratory/nonbreeding foraging habitat (and perching habitat for resting between feedings) in and along the river. There are many recorded observations of the species in Site 1 (most recently in November 2025) and the surrounding area (eBird 2025a).
Yellow-billed Magpie *Pica nuttalli*	--/--/BCC	Prefers open oak and riparian woodland, grassy oak savannas, and agricultural fields with tall trees in central California (restricted to this area). Forages mainly on the ground but also in trees; opportunistic feeder. Nests in proximity to year-round water and insect supply, often in a mistletoe clump high up in a tree. Forms loose colonies when nesting and larger flocks during non-breeding season.	**High Potential.** The Project Area provides suitable habitat for this species, and there have been many documented observations in Site 1 (as recently as April 2025 and in almost all months of the year). There are plenty of older sightings (within the last 10-20 years) recorded within a few miles of the Study Area, including two observations in Site 2 in February 2007 (eBird 2025x).

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Purple Martin *Progne subis*	--/--/SSC	Breeds in eastern half of U.S. and some other parts of North America, including in California's Central Valley and coastal regions. In the West, nests in woodpecker holes in dead snags. Hunts for insects high above open areas and scoops water from pond surfaces during flight. Migrates to South America in large flocks after breeding season. Individuals often return to the same nesting grounds each year.	**Low Potential.** The Study Area provides potentially suitable habitat, but the nearest recorded observations were in 2020 (roughly 8 mi SW of Study Area) and 2023 (almost 10 mi NE of Study Area). The nearest observations from 2025 are much further away (over 30 mi SE at New Melones Lake and about 30 mi NNW along the American River) (eBird 2025r).
Bank Swallow *Riparia riparia*	--/ST/--	In summer, restricted to riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils, into which it digs nesting holes. In migration, flocks with other swallows over many open habitats including freshwater and estuarine wetlands.	**Low Potential.** Potentially suitable migratory habitat may be present in the Study Area. The nearest documented sightings of this species were at Stillman Magee Park, along the Mokelumne River about 1.3 mi WSW of Site 3. The species was recorded there in April through June of 2009 and 2010 (juveniles and adults). More recently, in 2021, a sighting was documented just over 2 mi SE of Site 1 (eBird 2025c).
Northern Yellow Warbler *Setophaga aestiva* [*petechia*]	--/--/SSC	Breeds across much of U.S. and Canada in thickets and other disturbed/regrowing habitats, particularly along streams and wetlands. Often found in willows, and may occur at elevations of up to 9,000 ft in the West. Nests are built in a small tree or bush, usually within 10 ft of the ground, but sometimes higher up. In winter, migrates south to portions of Central and South America and coastal Mexico.	**High Potential**. Suitable breeding habitat is present in the Sites' willow thickets. There have been documented observations of the species in Site 1 for many years between April and October (most recently in September 2025). The species was also recorded in Site 2 in September 2023. Many of the documented sightings in and around the Study Area were of multiple individuals (eBird 2025o).
Crustaceans			
Vernal pool fairy shrimp *Branchinecta lynchi*	FT/--/--	Lives in vernal pools, seasonal wetlands, and stagnant ditches that fill with water during fall and winter rains and dry up in spring and summer.	**Not Expected**. No suitable habitat present in the Study Area
Vernal pool tadpole shrimp *Lepidurus packardi*	FE/--/--	Found in muddy bottoms of ephemeral freshwater habitats including vernal pools, alkaline pools, clay flats, vernal lakes, vernal swales, and other seasonal wetlands. Range includes the Central Valley, Delta, and eastern San Francisco Bay.	**Not Expected**. No suitable habitat present in the Study Area

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Fish			
Riffle sculpin *Cottus gulosus*	--/--/SSC	Lives in permanent, cool, mid-elevation and headwater streams where riffles and rocky substrates predominate. May also be found in larger rivers. Requires constant flowing water for sufficient dissolved oxygen content; shelters from strong currents under rocks and logs. Usually co-occurs with several other native fish species.	**Not Expected**. The Study Area is at a lower elevation than the streams where this species is found. While they are known to occasionally inhabit waterways below dams that receive coldwater releases, the nearest occurrence of the species is over 20 miles away; it is absent from the Cosumnes River (Moyle et al. 2010)
Pacific lamprey *Entosphenus tridentatus*	--/--/SSC	Spends about 1 to 3 years in the Pacific Ocean, then migrates to freshwater to spawn. Spawns between March and July in streams with gravel bottoms. Has been known to travel up to 870 mi upstream of the ocean in rivers.	**Low Potential**. The Study Area is part of this species' historical range, but no known extant populations exist nearby. The nearest documented occurrence is over 20 miles away.
Western river lamprey *Lampetra ayresii*	--/--/SSC	Uses clean, gravelly riffles in permanent streams for spawning. Found in scattered, isolated populations from California to Alaska. In California, has been found in the lower Sacramento and San Joaquin rivers (especially in Stanislaus and Tuolumne rivers), tributaries to the San Francisco Bay, tributaries to the lower Russian River, and a few other areas. More surveys are needed to get a better idea of current distribution.	**Low Potential.** Limited habitat exists on site. The nearest documented occurrences are over 20 miles away.
Sacramento hitch *Lavinia exilicauda exilicauda*	--/--/SSC	Inhabits warm, lowland waters including clear streams, turbid sloughs, lakes, and reservoirs. Prefers shallow streams with small gravel or mud bottoms. Exists in small, spotty populations.	**Not expected.** Limited habitat exists on site but cold water releases from the Camanche Reservoir likely exclude the species. No individuals have been documented within 20 miles of the Study Area.
Hardhead *Mylopharodon conocephalus*	--/--/SSC	Found at low to mid-elevations in relatively undisturbed stream habitats within the Sacramento-San Joaquin drainage basin. Appears to prefer deep, clear stream pools with rocky or sandy bottoms. May also inhabit lakes and reservoirs. Spawning most likely occurs by May-June in the Valley and extends into August in the foothills.	**Not Expected.** No deep pools suitable for spawning or sheltering are present in the Study Area. No documented occurrences within the vicinity of the Study Area.
Steelhead – Central Valley DPS *Oncorhynchus mykiss irideus pop. 11*	FT/--/SSC	Anadromous. Hatches and partially develops in freshwater environments, migrates to ocean to mature, then returns to natal streams for spawning. (Group includes all naturally spawned Central Valley steelhead populations in the Sacramento and San Joaquin rivers and their tributaries.)	**Present**. Known occurrences and potential habitat is mapped up to the base of the Camanche Dam just east of the Study Area. The population source could be partially natural or purely from a hatchery located downstream in Lodi. Present during a site visit in November 2025.

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Chinook salmon – Central Valley fall / late fall-run ESU *Oncorhynchus tshawytscha pop. 13*	--/--/SSC	Inhabits streams, rivers, estuaries, and the Pacific Ocean. Spawns in coarse material that allows sufficient water flow in the Sacramento and San Joaquin River watersheds as far as the first impassible dams, typically up to 1,000 ft above sea level.	**Present.** Nearly 3 dozen iNaturalist occurrences are present within Site 1 and east to the Camanche Dam. Present during a site visit in November 2025.
Sacramento splittail *Pogonichthys macrolepidotus*	--/--/SSC	Utilizes brackish marshes and freshwater delta habitats for foraging and rearing. Spawns in floodplains and marshes.	**Not Expected.** No tidal wetlands exist on site. Nearest documented occurrence is 17 miles downstream in Lodi from 2003.
Longfin smelt *Spirinchus thaleichthys*	--/ST/--	Lives in nearshore waters, estuaries, and lower portions of freshwater streams. Typically found in the middle or deeper parts of the water column. Does not occur within non-tidal riverine habitats.	**Not Expected**. No tidal habitat exists within the Study Area.
Insects			
Crotch's bumble bee *Bombus crotchii*	--/SCE/--	Occurs in open scrub, grassland, and semi-arid habitats with abundant spring and early-summer flowering plants. Nests underground or at the surface in abandoned rodent burrows or grass tussocks. Formerly widespread across central and southern California, it is now rare and localized due to habitat loss, pesticide exposure, and declines in native floral resources.	**Potential.** The Study Area provides potentially suitable nesting habitat; some grassy areas with rodent burrows are present. It also provides potentially suitable foraging habitat in the form of various native and non-native flowering plants. The nearest sighting of these species in Bumble Bee Watch was approximately 17 mi ENE of the Project (in 2020). An iNaturalist occurrence ot his species was documented 5 miles east in 2017.
Monarch butterfly – California overwintering population *Danaus plexippus plexippus pop. 1*	FPT/--/--	Most known overwintering sites in California are near the coast, but there are some desert sites near Death Valley and further south. Overwintering microhabitats usually consist of a grove of tall trees with an opening (often south-facing) providing dappled sunlight and wind protection and with a nearby water source (stream, grassy patch with dew, etc.). Individuals may gather in groups of thousands and form large clusters while overwintering.	**Potential.** There are no known overwintering sites documented in the regional vicinity of the Project (Xerces 2025b). Individuals may enter the site to forage on milkweeds (*Asclepias* sp.). Foraging individuals known from the vicinity (within 5 miles).
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT/--/--	Found on the red or blue elderberry (*Sambucus* sp.) along riverbeds. Females lay their eggs in the plant and larvae burrow into the bark. Occurs in specific locations from Fresno County to southern Shasta County, mostly along the Merced River, American River, and Putah Creek.	**Present**. Blue elderberry shrubs with old VELB exit holes were observed in Site 1 by VNLC biologists in 2025. CNDDB records from 1991 indicate that adult individuals and old exit holes were found in two locations about 1.3 mi WSW of Site 3.

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Mammals			
Pallid bat *Antrozous pallidus*	--/--/SSC	Occurs in open, dry landscapes with rocky areas (for roosting) and water nearby. Habitats may include mountainous areas, intermontane basins, lowland desert scrub, arid deserts, and grasslands; in some areas, this species also inhabits open coniferous forest and woodland. Day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, hollow trees, and various human structures such as bridges, barns, porches, bat boxes, and buildings. Feeds on arthropods, other small animals, and cactus fruit and nectar. Highly sensitive to noise pollution.	**Low Potential.** Some buildings potentially suitable for roosting present on site, as well as limited foraging habitat. Nearest occurrence over 20 miles away.
Western red bat *Lasiurus frantzii*	--/--/SSC	Strongly associated with riparian habitats, particularly mature stands of cottonwood/sycamore trees in the Central Valley and lower reaches of the large rivers that drain the Sierra Nevada. May also be found in fruit/nut orchards. Hunts for insects in open areas along forest edge. Roosts almost exclusively in trees, usually alone (sometimes in small clusters).	**Potential.** Low riparian habitats and large mature trees (including cottonwoods) are present in the Study Area. Nearest documented occurrence over 20 miles away.
American badger *Taxidea taxus*	--/--/SSC	Lives in open areas across North America including grasslands, prairies, and agricultural fields. Yearlong range includes nearly the entire state of California (excluding two counties in extreme northwestern portion of state). Forages for burrowing rodents and other small animals. Excavates dens in dry, friable soils where young are born. Usually solitary, but pairs and family groups are sometimes observed.	**Not Expected.** No large mammal burrows observed by VNLC biologists during surveys. Limited habitat in the form of grassland and agricultural fields exist in the Study Area and adjacent properties. Nearest occurrence over 20 miles away.

Common Name *Scientific Name*	Status[1]	Description of Habitat Requirements	Potential to Occur in Study Area
Reptiles			
Northwestern pond turtle *Actinemys marmorata*	FPT/--/SSC	Perennial ponds, deep slow-moving streams, marshes, and lakes are habitat for this species at and below 6,000 ft in elevation. Eggs are laid in loose soil on land in oak woodlands, mixed coniferous forests, broadleaf forests and grasslands, usually within 400 ft of ponds, lakes, slow streams and marshes with vegetated borders, rocks, or logs. Logs, rocks, cattail mats, and exposed banks are required for basking.	**Potential**. Suitable basking and/or nesting habitat is present in ponds and agricultural canals/ditches within the Study Area. The nearest documented occurrence is 2.7 miles to the southeast.
Coast horned lizard *Phrynosoma blainvillii*	--/--/SSC	Generally found in open areas with sandy soil and low vegetation in valleys, foothills, and semi-arid mountains. Feeds primarily on ants.	**Not Expected.** No suitable foraging habitat on site. Nearest occurrence over 20 miles away.
Giant garter snake *Thamnophis gigas*	FT/ST/--	Found primarily in marshes, sloughs, drainage canals, and irrigation ditches, especially around rice fields, and occasionally in slow-moving creeks. Basks on vegetation near water in spring and utilizes animal burrows and vegetation piles during hotter weather.	**Not Expected.** Some limited habitat present on site but preferred habitats absent. Not known from the vicinity of the Study Area

Notes: Species list compiled from CNDDB 9-quad search centered on the Clements quadrangle and IPAC report generated using Project boundaries. Observation details from CNDDB 2025a unless otherwise specified (Xerces, eBird, VNLC survey). Habitat information from multiple sources cited in References. Elevation within the Study Area ranges from approx. 89 to 190+ ft.

[1] **Status Codes:** FE – Federal Endangered; FT – Federal Threatened; FPT – Federal Proposed Threatened; FD – Federal Delisted; SE – State Endangered; SCE – State Candidate Endangered; ST – State Threatened; BCC – USFWS Bird of Conservation Concern; SSC – CDFW Species of Special Concern; FP – CDFW Fully Protected; WL – CDFW Watch List. Species with a blank status box do not hold any of the previous designations but are otherwise rare and/or sensitive. Birds with no other special designation are protected by the Federal Migratory Bird Treaty Act.

Table A-2. Special-status Vascular Plant Species Documented in the Vicinity of the Project

Note: Species highlighted in gray have some level of potential to be present within the Study Area.

Scientific Name **Common Name (Family)**	**Status[1]: Federal/ State/CRPR**	**Habitat, Elevation, and Blooming Period**	**Potential to Occur in Study Area**
Agrostis hendersonii Henderson's bent grass (Poaceae)	--/--/3.2	Vernal pools, Valley and foothill grassland (mesic); 230-1000 ft; April-June	**Not Expected.** Study Area is below species' preferred elevation. No vernal pools present.
Arctostaphylos myrtifolia Ione manzanita (Ericaceae)	FT/--/1B.2	Chaparral, Cismontane woodland; Microhabitat: Ione soil, Acidic, Clay (sometimes), Sandy (sometimes); 195-1905 ft; November-March	**Not Expected.** Study Area is outside the known distribution of the species
Brodiaea rosea ssp. *vallicola* Valley brodiaea (Themidaceae)	--/--/4.2	Vernal pools, Valley and foothill grassland; Microhabitat: Silt, Alluvial Terraces, Gravelly, Sandy; 35-1100 ft; April-May (June)	**Low potential.** Marginally suitable habitat present (Grasslands are highly disturbed. Alluvial terraces and sandy and gravelly microhabitats present.) Nearest documented occurrences are over 10 miles away.
Calycadenia hooveri Hoover's calycadenia (Asteraceae)	--/--/1B.3	Cismontane woodland, Valley and foothill grassland; Microhabitat: Rocky; 215-985 ft; July-September	**Not Expected.** Study Area is below species' preferred elevation. No rocky habitat is present. The nearest and most recent record in CNDDB is from the foothills near Wallace in 1978, roughly 3 mi SE of Study Area (and noted to have been collected at an elevation of 220 ft).
Calycadenia spicata Spicate calycadenia (Asteraceae)	--/--/1B.3	Cismontane woodland, Valley and foothill grassland; Microhabitat: Adobe, Clay, Disturbed areas, Dry, Gravelly, Openings, Roadsides, Rocky; 130-4595 ft; May-September	**Low Potential.** Some suitable habitat present, most of the Study Area is below the minimum elevation.
Castilleja campestris var. *succulenta* Succulent owl's-clover (Orobanchaceae)	FT/SE/1B.2	Vernal pools (often acidic); 165-2460 ft; (March) April-May	**Not Expected.** No suitable vernal pool habitat on site.
Crocanthemum suffrutescens Bisbee Peak rush-rose (Cistaceae)	--/--/3.2	Chaparral; Microhabitat: Ione soil (often), Disturbed areas (often), Burned areas (often), Gabbroic (often); 245-2200 ft; April-August	**Not Expected.** Study Area is below species' preferred elevation, no chaparral present on site.
Downingia pusilla Dwarf downingia (Campanulaceae)	--/--/2B.2	Valley and foothill grassland (mesic), Vernal pools; 5-1,460 ft; March-May	**Not Expected.** No suitable vernal pool habitat on site.

Scientific Name **Common Name (Family)**	**Status[1]: Federal/ State/CRPR**	**Habitat, Elevation, and Blooming Period**	**Potential to Occur in Study Area**
Eriogonum apricum var. *apricum* Ione buckwheat (Polygonaceae)	FE/SE/1B.1	Chaparral (openings, Ione soil); 195-475 ft; July-October	**Not Expected.** Study Area has no chaparral habitat and is below species' preferred elevation.
Eryngium pinnatisectum Tuolumne button-celery (Apiaceae)	--/--/1B.2	Cismontane woodland, Lower montane coniferous forest, Vernal pools; Microhabitat: Mesic; 230-3000 ft; May-August	**Not Expected.** No suitable habitat on site, below the species' minimum elevation.
Erythranthe marmorata Stanislaus monkeyflower (Phrymaceae)	--/--/1B.1	Cismontane woodland, Lower montane coniferous forest; 330-2955 ft; March-May	**Not Expected.** Study Area are below species' preferred elevation, and lower montane coniferous forest is not present.
Gratiola heterosepala Bogg's Lake hedge-hyssop (Plantaginaceae)	--/SE/1B.2	Vernal pools, Marshes and swamps (lake margins); Microhabitat: Clay; 35-7790 ft; April-August	**Low Potential.** Study Area falls within species' preferred elevation range, and clay is present, providing potentially suitable habitat for this species in seasonally wet areas. The nearest recorded observation was in vernal pool habitat about 3 mi NW of the Study Area in May 1990 (5 subpopulations, over 1000 plants total).
Horkelia parryi Parry's horkelia (Rosaceae)	--/--/1B.2	Chaparral, Cismontane woodland; Microhabitat: Ione formation and other soils; 260-3510 ft; April-September	**Not Expected.** Study Area is below species' preferred elevation. No suitable habitat present.
Jepsonia heterandra Foothill jepsonia (Saxifragaceae)	--/--/4.3	Cismontane woodland, Lower montane coniferous forest; Microhabitat: Metamorphic, Rocky; 165-1640 ft; August-December	**Not Expected.** No suitable habitat is present. Study Area is slightly below species' preferred elevation.
Juncus leiospermus var. *ahartii* Ahart's dwarf rush (Juncaceae)	--/--/1B.2	Valley and foothill grassland (mesic); 100-750 ft; March-May	**Not Expected.** No suitable vernal pool habitat on site.
Legenere limosa Legenere (Campanulaceae)	--/--/1B.1	Vernal pools; 5-2885 ft; April-June	**Not Expected.** No suitable vernal pool habitat on site.
Navarretia myersii ssp. *myersii* Pincushion navarretia (Polemoniaceae)	--/--/1B.1	Vernal pools; Microhabitat: Acidic (often); 65-1085 ft; April-May	**Not Expected.** No suitable vernal pool habitat on site.

Scientific Name **Common Name (Family)**	**Status[1]: Federal/ State/CRPR**	**Habitat, Elevation, and Blooming Period**	**Potential to Occur in Study Area**
Navarretia paradoxiclara Patterson's navarretia (Polemoniaceae)	--/--/1B.3	Meadows and seeps; Microhabitat: Drainages (often), Openings, Serpentine, Vernally Mesic; 490-1410 ft; May-June (July)	**Not Expected.** Study Area is below species' preferred elevation.
Orcuttia viscida Sacramento Orcutt grass (Poaceae)	FE/SE/1B.1	Vernal pools; 100-330 ft; April-July (September)	**Not Expected.** No suitable vernal pool habitat on site.
Sagittaria sanfordii Sanford's arrowhead (Alismataceae)	--/--/1B.2	Marshes and swamps (shallow freshwater); 0-2,135 ft; May-October (November)	**Potential.** Suitable habitat is present within the Study Area, but species has not been documented in the local vicinity. Multiple documented occurrences lower in the Mokelumne River watershed.

Notes: Species list compiled from CNDDB 9-quad search centered on the Clements quadrangle and IPAC report generated using Project boundaries. Plant information from CNPS RPI. Observation details from CNDDB 2025a. Bloom Periods in parentheses indicate that the species *occasionally* blooms during that period. Elevation within the Study Area ranges from approx. 78 to 180+ ft.

[1]**Rarity Status Codes:** FE = Federal Endangered, FT = Federal Threatened, SE = State Endangered, ST = State Threatened.

CRPR Codes: 1A = Plants presumed extirpated in California and either rare or extinct elsewhere; 1B = Plants rare, threatened or endangered in CA and elsewhere; 2A = Plants presumed extirpated in California but common elsewhere; 2B = Plants rare, threatened or endangered in California but more common elsewhere; 3 = More information is needed about plant; 4 = Plants of limited distribution, a watch list. Suffixes: '.1' = Seriously threatened in CA; '.2' = Fairly threatened in CA; '.3' = Not very threatened in CA.

APPENDIX F: FEMA NO RISE ANALYSIS

"NO-RISE" HYDRAULIC MODEL EVALUATION FOR THE MOKELUMNE RIVER FLOODPLAIN HABITAT RESTORATION PROJECT

PREPARED FOR: James Pearson, EBMUD

PREPARED BY: Nicholas Steinke, FlowWest

DATE: **6/1/2026**

PURPOSE

EBMUD is planning to restore more than 25 acres of floodplain habitat along the Mokelumne River between river miles 61 and 64, downstream of Camanche Dam. The project will excavate off-channel floodplain habitat and place spawning gravel in the channel at three project sites: the Day Use Area, the Colburn Upstream site, and the Colburn Downstream site. The project sites and FEMA floodway are shown in Figure 1 below. Only the Colburn Upstream and Colburn Downstream sites are within the regulatory floodway.

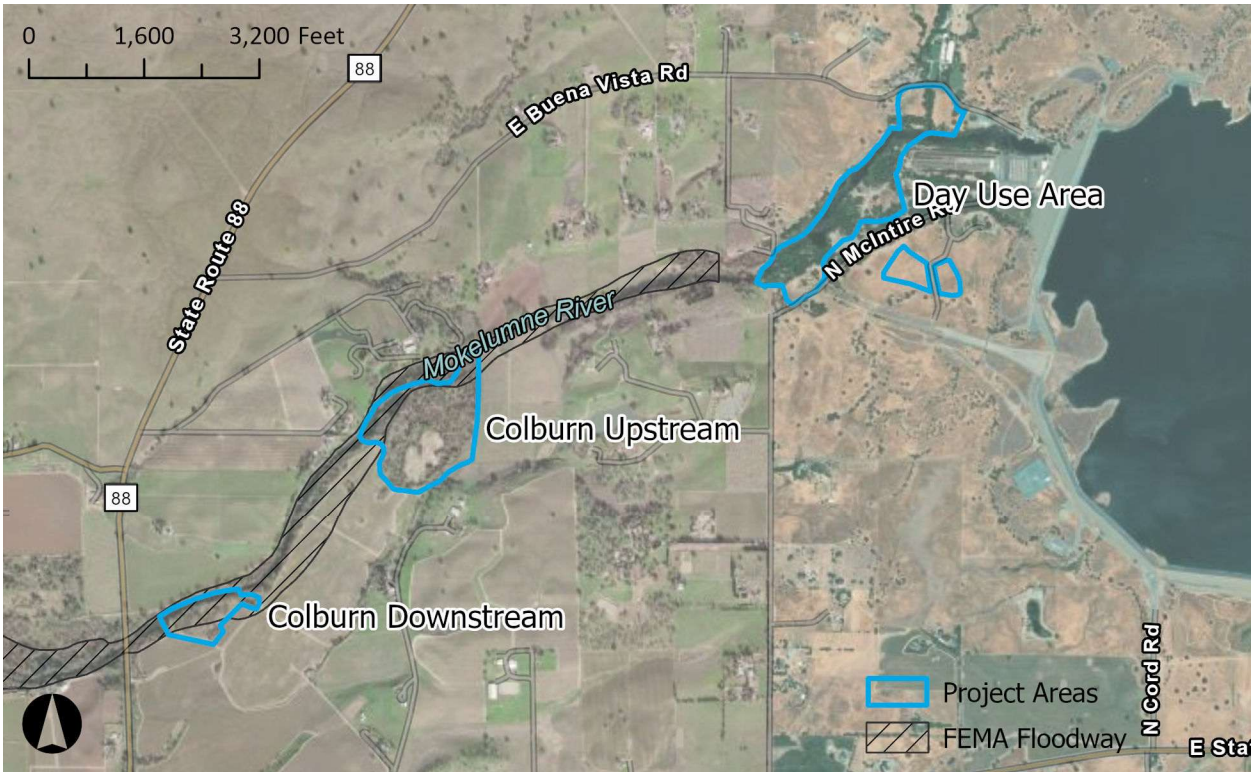


FIGURE 1: PROJECT AREAS

FEMA "NO-RISE" REQUIREMENTS

FEMA requires that any project proposed within the designated floodway demonstrate "through hydrologic or hydraulic analyses that it will not cause an increase in flood stages at any point in the

community"[1]. **Error! Reference source not found.** is a map of the area considered as "the community" in this analysis. This is normally called a "no-rise" analysis. Meeting this criterion means there will be no rise greater than 0.00 feet anywhere within the regulatory floodway.

MODEL DEVELOPMENT SUMMARY

To investigate whether the Mokelumne Project would meet the FEMA "no-rise" criteria, we used a 2D HECRAS hydrodynamic model. The full model report is provided as an appendix to this memorandum. The model used LiDAR terrain and bathymetry surveyed 2024 to supplement 2014 LiDAR of the entire Mokelumne river. Roughness values were assigned based on field investigations. The model was calibrated to dam releases between 325 and 1125 cfs. The Central Valley Flood Protection Board stipulated 9700 cfs or the 100-year return interval flow be used to compare pre- and post-project flood elevations. 9700 cfs was found to be larger than the 100-year flow so it is used in this analysis.

The model domain is shown in Figure 2.

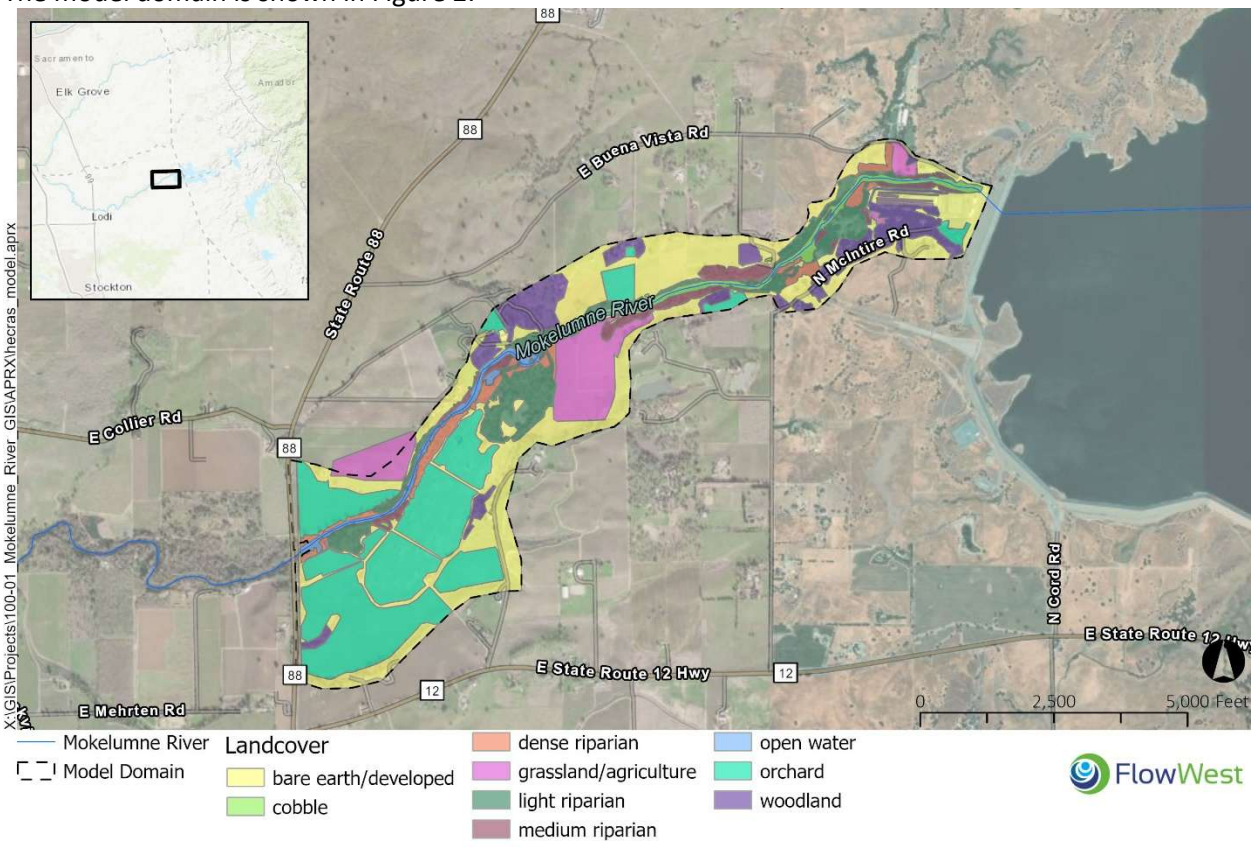


FIGURE 2: HYDRODYNAMIC MODEL DOMAIN

[1] FEMA 2019. Guidance for Flood Risk Analysis and Mapping. November 2019. Available at https://www.fema.gov/sites/default/files/2020-02/FloodwayAnalysis_and_Mapping_Nov_2019.pdf

MODEL RESULTS

Model results were compared by raster subtraction between the pre- and post-project condition water surface elevations (included in the transmittal of this memorandum). A raster consists of a matrix of cells organized into rows and columns (a grid) where each cell represents a numeric value (e.g., water surface elevation). Raster subtraction is the process by which the value in each cell of one raster is subtracted from the cell values of another raster where they overlap geographically. After subtraction, positive raster values indicate WSEs increased by the project and negative values indicate decreased WSEs.

Model results show that at no place within the FEMA Floodway does the project increase water surface elevations by more than 0.00 feet for the 9700 cfs flow (Figure 3).

Upstream of the FEMA Floodway, model results show a small area of increased WSEs along the northern bank near the Day Use Area (shown in inset). Since this model result is upstream of the regulatory floodway and is the only instance of results showing increases in WSE, it does not impact the "no-rise" findings of this memorandum.

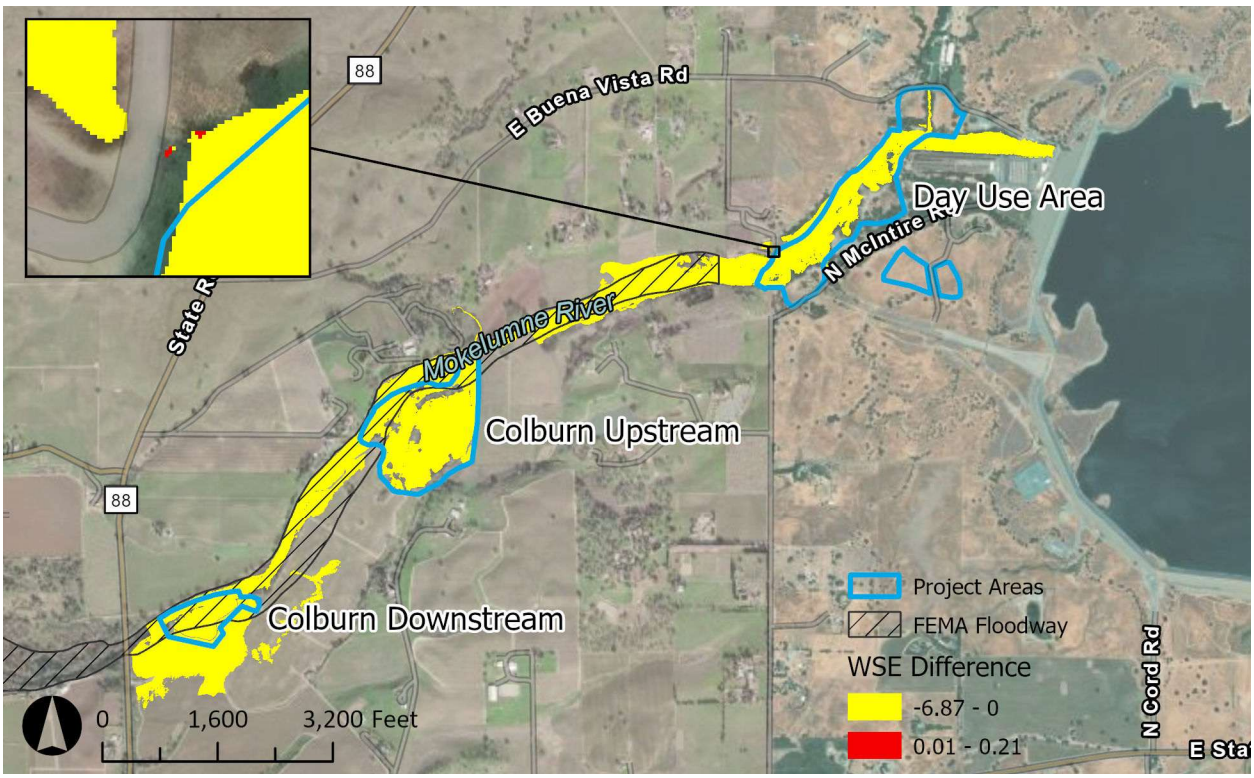


FIGURE 3: POST PROJECT CHANGE IN WATER SURFACE ELEVATIONS AT 100-YEAR FLOW

APPENDIX G: PROJECT SPECIFICIATION

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Project description and Work covered by the Contract Documents.
   2. Work sequence and phasing.
   3. Work days, hours, and schedule restrictions.
   4. Contractor use of the Site, access, and staging.
   5. Protection of existing facilities.
   6. Permits and environmental compliance.
   7. Tribal coordination.
   8. Equipment cleaning for invasive species prevention.
   9. Stormwater pollution prevention.
   10. Future work.

B. Related Sections:
   1. Section 01 56 39 (Temporary Tree and Plant Protection)
   2. Section 02 03 41 (Selective Demolition)
   3. Section 31 11 00 (Clearing and Grubbing)
   4. Section 31 20 00 (Earth Moving)
   5. Section 31 23 19 (Control of Water)
   6. Section 32 90 00 (Planting)
   7. Section 32 92 19 (Seeding)
   8. Section 35 42 01 (Large Wood)
   9. Section 41 11 01 (Gravel Processing)

1.2 DEFINITIONS

A. District: East Bay Municipal Utility District.

1.3 PROJECT DESCRIPTION

A. The Mokelumne River Floodplain Habitat Restoration Project is being undertaken by East Bay Municipal Utility District to create floodplain and in-stream rearing habitat for juvenile salmonids along the Lower Mokelumne River below Camanche Dam. The Project is located near Clements, California, in San Joaquin County, between Camanche Dam and the State Route 88 bridge.

B. The Work is located at three separate Sites, as shown on the Drawings:
   1. Day Use Area: Located on District property directly below Camanche Dam, with work areas on both banks of the Mokelumne River. The Work includes excavation of floodplain terraces and side channels, deepening and widening of existing channels, removal and replacement of the existing boat launch, and construction of an in-stream riffle.

2. Colburn Upstream Site: Located approximately 0.8 miles downstream of the Day Use Area, on private property on which the District holds a conservation easement. The Work includes widening and deepening of an existing side channel; excavation of branching side channels and floodplain areas that connect existing ponds and topographic depressions; placement of spoils to fill a portion of an existing pond; and placement of sorted and washed gravel to construct an in-stream riffle and within the existing backwater pond.
3. Colburn Downstream Site: Located approximately 0.1 miles upstream of the State Route 88 bridge, on private property on which the District holds a conservation easement. The Work includes three breaches in the existing riverbank, construction of a setback berm, floodplain excavation, placement of excess spoils in an existing disconnected pond, and placement of sorted and washed gravel to construct an in-stream riffle.

C. The Work includes, but is not limited to, the following, as shown on the Drawings and specified in the referenced Sections:
1. Temporary protection of trees and vegetation to remain, per Section 01 56 39 (Temporary Tree and Plant Protection).
2. Selective demolition, including removal and replacement of the existing boat launch, per Section 02 03 41 (Selective Demolition).
3. Clearing and grubbing, including tree removal, per Section 31 11 00 (Clearing and Grubbing).
4. Excavation, grading, and fill placement, per Section 31 20 00 (Earth Moving).
5. Coordination of in-channel Work and management of incidental water, per Section 31 23 19 (Control of Water).
6. Screening, washing, and placement of gravel, per Section 41 11 01 (Gravel Processing).
7. Salvage and placement of large wood, per Section 35 42 01 (Large Wood).
8. Planting, per Section 32 90 00 (Planting).
9. Seeding, per Section 32 92 19 (Seeding).

D. Furnish all labor, materials, equipment, services, temporary controls, and incidentals required to complete the Work in its entirety as described in the Contract Documents. Items or details not mentioned above, but required by the Drawings and Specifications, shall be performed, placed, constructed, removed, or installed in accordance with the Contract Documents.

E. References to the "Owner" or "Owner's Representative" on the Drawings mean the District. References to the "Property Owner" mean the District at the Day Use Area and the private landowner at the Colburn Sites.

1.4 WORK SEQUENCE AND PHASING

A. The Project is anticipated to be constructed in phases. Phase 1 consists of the Colburn Upstream and Colburn Downstream Sites and is anticipated to be completed in a single construction season. Subsequent phases (Phases 2 through 4) will occur at the Day Use Area as shown on the Drawings and are subject to change by the District.

B. Sequence and time the Work at each Site as needed to:
1. Minimize overall Site disturbance.
2. Allow for safe and efficient progress of the Work.
3. Comply with all Project permits.
4. Complete the Work within the specified milestone dates and number of contract days.

C. Perform planting and seeding at each Site following completion of grading, within the planting and seeding periods specified in Section 32 90 00 (Planting) and Section 32 92 19 (Seeding).

1.5 WORK DAYS AND HOURS

A. Perform earthwork and in-channel Work during the dry-season construction window of May 15 through October 15. Planting and seeding may be performed outside this window, within the periods specified in Section 32 90 00 (Planting) and Section 32 92 19 (Seeding).

B. Work at the Site shall be performed between 7:00 a.m. and 7:00 p.m., Monday through Saturday, unless otherwise approved in writing by the District.

C. Schedule restrictions in the Project permits, including in-water work windows and restrictions to protect nesting birds and other protected species, take precedence over the work days and hours specified in this Section and over restrictions shown on the Drawings. Review all Project permits and adhere to all schedule restrictions.

D. Coordinate the timing of in-channel Work with the District's Camanche Dam release schedule per Section 31 23 19 (Control of Water).

1.6 CONTRACTOR USE OF SITE

A. Confine operations to the limits of work, access routes, and staging areas shown on the Drawings.

B. Day Use Area: The Day Use Area is a public recreation area used for fishing, boating, birdwatching, and general recreation. Control, restrict, and prevent public access to active work areas and areas in various degrees of completion using signs, fencing, or other effective means reviewed by the District. Provide, erect, and maintain all barricades and warning signs necessary to protect the public. Maintain public access to areas outside the limits of work as coordinated with the District.

C. Colburn Sites: The Colburn Upstream and Colburn Downstream Sites are located on private property on which the District holds a conservation easement. Coordinate all access to the Colburn Sites through the District. Confine all operations to the limits of work shown on the Drawings. Do not interfere with ongoing vineyard operations or the property owner's use of adjacent areas, including existing vineyard roads, except as coordinated through the District.

D. Do not unreasonably encumber the Site with materials or equipment. Assume full responsibility for the protection and safekeeping of products stored at the Site.

1.7 PROTECTION OF EXISTING FACILITIES

A. An underground section of the Folsom South Canal passes through the Day Use Area adjacent to the limits of work. Protect the Folsom South Canal from damage during construction. Coordinate with the District before operating heavy equipment or placing materials over or adjacent to the canal alignment.

B. Notify Underground Service Alert (USA) prior to excavation. Locate and protect existing utilities.

C. Repair or replace existing improvements damaged by construction operations, at the Contractor's expense, to their original condition as acceptable to the District.

1.8 PERMITS AND ENVIRONMENTAL COMPLIANCE

A. Conduct all Work in compliance with the conditions and mitigation measures of the Project permits. Where requirements of the Project permits differ from these Specifications or the Drawings, the requirements of the Project permits shall take precedence.

B. Special-status plant and wildlife species have the potential to occur within the Project area, including, but not limited to, valley elderberry longhorn beetle, northwestern pond turtle, Central Valley steelhead, Central Valley fall-run Chinook salmon, Swainson's hawk and other nesting birds and raptors, and Crotch's bumble bee. Implement all protective measures for special-status species identified in the Project permits.

1.9 TRIBAL COORDINATION

A. The District coordinates with the Buena Vista Rancheria of Me-Wuk Indians on implementation of the Project.

B. Prior to the start of excavation, all construction personnel shall complete training, as coordinated with the District, on procedures to minimize impacts to artifacts and culturally sensitive sites.

C. If cultural materials or human remains are encountered, immediately stop Work in the vicinity of the find and notify the District. The District will implement its established procedures, including repatriation of remains. Do not resume Work in the vicinity of the find until authorized by the District.

D. Notify the District prior to trimming or removing any elderberry shrubs so that the District can coordinate involvement of the Buena Vista Rancheria of Me-Wuk Indians.

1.10 EQUIPMENT CLEANING

A. Clean all equipment prior to delivery to the Site to remove soil, seeds, plant material, and other debris that may introduce or spread invasive species. Inspect and clean equipment before transport between Sites and before working in water.

B. Use hand tools, such as brooms, brushes, shovels, and rakes, on tracks, tires, blades, and buckets to remove visible soil and debris that may harbor invasive plant material. When water is used to clean equipment, treat the resulting water and slurry as contaminated and contain it to prevent the introduction and spread of invasive plants.

C. Prior to mobilizing equipment to the Site, submit a signed statement to the District that the equipment has been cleaned in accordance with this Article.

1.11 STORMWATER POLLUTION PREVENTION

A. The Project is subject to the State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit).

B. Prepare a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the Construction General Permit. The SWPPP shall be prepared by a Qualified SWPPP Developer (QSD) and submitted to the District for review prior to the start of ground-disturbing activities.

C. Implement, inspect, and maintain all best management practices in the SWPPP under the direction of a Qualified SWPPP Practitioner (QSP). Keep a copy of the SWPPP at the Site at all times. Maintain SWPPP compliance until final stabilization of the Site is achieved and the Notice of Termination is accepted.

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 NOT USED.

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Protection of existing trees, shrubs, and other vegetation to remain during construction.
   2. Protection-zone fencing and signage.
   3. Excavation and grading near trees to remain, and root and crown pruning.
   4. Repair and replacement of vegetation damaged by construction.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 31 11 00 (Clearing and Grubbing)
   3. Section 31 20 00 (Earth Moving)
   4. Section 32 90 00 (Planting)

1.2 REFERENCES

A. ANSI A300 (Part 1), Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices (Pruning), latest edition.

1.3 DEFINITIONS

A. DBH: Diameter at breast height; the diameter of a trunk measured by a diameter tape at a height of 54 inches above the ground.

B. Dripline: The outer edge of a tree's canopy, projected vertically to the ground.

C. Tree-Protection Zone: The area within the dripline of a tree to remain.

D. Plant-Protection Zone: The area surrounding shrubs, groups of shrubs, or other vegetation to remain, as shown on the approved Tree Protection Plan.

E. Vegetation: Trees, shrubs, groundcovers, grasses, and other plants.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Special-status species have the potential to occur within the Project area, including valley elderberry longhorn beetle, which depends on elderberry shrubs. Implement the protective measures in the Project permits, as specified in Section 01 11 00 (Summary of Work).

B. Do not trim or remove elderberry shrubs except where shown on the Drawings and allowed by the Project permits. Notify the District before trimming or removing any elderberry shrub, in accordance with Section 01 11 00 (Summary of Work).

1.5 SUBMITTALS

A. Tree Protection Plan: Submit for the District's approval before clearing begins. The plan shall show:

1. All existing trees within the limits of work and all trees with driplines extending into the limits of work, each with a tree identification number.
2. Trees to be removed, as indicated on the Drawings.
3. Locations and extents of protection-zone fencing, signage, and gates, and their relation to equipment routes and material storage areas.

B. Pruning Schedule: A written schedule of pruning of trees to remain that interfere with or are affected by construction, including the species and size of each tree, its identification number, the reason for pruning, and a description of the pruning to be performed.

C. Existing Conditions: Photographs or video recordings of trees and other vegetation to remain, with notations of existing wounds and damage, sufficient to establish preconstruction conditions.

D. Arborist Qualifications: Name and certification of the arborist.

1.6 QUALITY ASSURANCE

A. Arborist: An arborist certified by the International Society of Arboriculture (ISA) shall direct all pruning, all cutting of roots larger than 4 inches in diameter, and all repair of damaged trees.

B. Guarantee: The Contractor is responsible for the health of existing trees designated for protection for three years, measured from the start of construction. Trees with declining health due to construction activities shall be replaced as specified under Repair and Replacement.

1.7 PROJECT CONDITIONS

A. The following are prohibited within tree-protection and plant-protection zones unless otherwise indicated or approved by the District:
1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Excavation, trenching, grading, or other soil disturbance.
4. Addition, removal, or storage of soil.
5. Impoundment of water, or alteration of existing surface drainage or the existing water table.
6. Attachment of signs, ropes, cables, or other materials to trees.
7. Skinning, bruising, or other mechanical damage to trunks, roots, or branches.
8. Dumping of paint, petroleum products, contaminated water, or other deleterious materials.
9. Burning, and use of heat sources, flames, or other ignition sources, within or near protection zones.
10. Use of herbicides within tree canopies without the written approval of the District.

B. Do not direct vehicle or equipment exhaust toward protection zones.

PART 2 PRODUCTS

2.1 MATERIALS

A. Plastic Protection-Zone Fencing: Plastic construction fencing of high-density extruded and stretched polyethylene fabric with a 2-inch maximum opening and weighing a minimum of 0.4 lb/ft; remaining flexible from minus 60 to plus 200 degrees F; inert to most chemicals and acids.
   1. Height: 48 inches.
   2. Color: High-visibility orange, nonfading.

B. Posts: Tubular or T-shape galvanized-steel posts.

C. Gates: Swing access gates matching the material and appearance of the fencing, to allow access for maintenance within protection zones.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with prepunched, reinforced attachment holes, legibly printed with nonfading black lettering at least 3 inches high on a white background. Sign text shall identify the area as a tree- or plant-protection zone and prohibit entry.

PART 3 EXECUTION

3.1 PREPARATION

A. Clearly stake the limits of work before the arborist's first site visit.

B. Locate and clearly flag trees, shrubs, and other vegetation to remain.

C. Protect root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials, and from ponding, erosion, or excessive wetting.

D. Verify that temporary erosion- and sediment-control measures are in place and that water redirected from construction areas does not enter or cross protection zones.

3.2 PROTECTION-ZONE FENCING AND SIGNAGE

A. Install protection-zone fencing along the edges of protection zones, as shown on the approved Tree Protection Plan, before materials or equipment are brought to the Site and before clearing begins. The District will confirm the fencing installation before clearing begins.

B. Install plastic fencing in accordance with the manufacturer's written instructions, supported by posts spaced not more than 96 inches apart, set or driven into the ground without concrete footings.

C. Install gates where shown on the approved Tree Protection Plan, and adjust them to operate smoothly and latch securely.

D. Install protection-zone signage in visibly prominent locations approved by the District, spaced approximately every 35 feet along protection-zone fencing, with no fewer than 2 signs per protection zone, each facing a different direction.

E. Maintain fencing and signage in good condition and keep protection zones free of weeds and trash. Do not remove fencing, even temporarily, for deliveries or equipment access. Remove fencing and signage when construction operations are complete and equipment has been removed from the Site.

3.3 EXCAVATION AND GRADING NEAR TREES TO REMAIN

A. Wherever feasible, do not excavate or grade within the tree-protection zone of a tree to remain. Where the Drawings or the District require excavation or grading within a tree-protection zone, use methods that minimize damage to root systems.

B. Do not allow exposed roots to dry out. Cover exposed roots with temporary earth cover or four layers of wet, untreated burlap, wetted to the point of runoff at least daily, and more often in hot weather. Backfill excavations within 24 hours; where this is not possible, shade the side of the excavation adjacent to the tree with burlap or canvas.

C. Backfill approved excavations within tree-protection zones with approved excavated material, conforming to adjacent grades. Wet the backfill when the excavation is half full and again when full, so that no air pockets remain around roots. Do not use mechanical equipment or air tamping to compact backfill within tree-protection zones; tamp carefully with hand tools.

3.4 ROOT PRUNING

A. Prune roots that are affected by construction by cutting them cleanly with sharp pruning tools. Do not break, tear, or chop roots, and do not use a backhoe or other equipment that rips, tears, or pulls roots.

B. Do not cut roots larger than 4 inches in diameter without the approval of the arborist.

C. Temporarily support and protect roots from damage, cover exposed roots with burlap, and keep them moist until they are covered with soil. Backfill in accordance with Section 31 20 00 (Earth Moving).

3.5 CROWN PRUNING

A. Prune branches of trees to remain that interfere with or are affected by construction, as directed by the arborist and in accordance with ANSI A300 (Part 1).

B. Prune to remove only injured, broken, dying, or dead branches, and branches that must be removed for access or safety. Canopy thinning or pruning shall not exceed 30 percent of the existing branching structure and requires approval of the District.

C. Cut branches with sharp pruning tools; do not break or chop. Do not paint or apply sealants to wounds. Topping of trees is prohibited.

D. Chip removed branches and dispose of them in accordance with Section 31 11 00 (Clearing and Grubbing).

3.6 REPAIR AND REPLACEMENT

A. Repair or replace trees, shrubs, and other vegetation to remain that are damaged by construction operations, in a manner approved by the District.

B. Repair damaged trunks, branches, and roots within 24 hours, in accordance with the arborist's written instructions.

C. Replace trees to remain that are more than 25 percent dead or in unhealthy condition before the end of the guarantee period, or that are damaged during construction and determined by the District to be incapable of restoring to a normal growth pattern. Provide replacement trees at the Contractor's expense, at the sizes and replacement ratios required by the Project permits or, where the permits do not specify, as determined by the District. Plant, maintain, and guarantee replacement trees as specified in Section 32 90 00 (Planting). Install replacement trees within 6 months of the District's request.

3.7 DISPOSAL

A. Manage removed trees and woody material in accordance with Section 31 11 00 (Clearing and Grubbing), and excess excavated material in accordance with Section 31 20 00 (Earth Moving). Remove trash and debris and legally dispose of them off-Site.

END OF SECTION

SECTION 02 03 41

SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolition / removal and replacement of the existing hand boat launch in the Day Use Area.
   2. Protection of existing Site improvements to remain.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 01 56 39 (Temporary Tree and Plant Protection)
   3. Section 31 11 00 (Clearing and Grubbing)
   4. Section 31 20 00 (Earth Moving)
   5. Section 31 23 19 (Control of Water)

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. EPA: Environmental Protection Agency
   2. ANSI: American National Standards Institute

B. Definitions:
   1. Remove: Detach items from existing construction and legally dispose of them off-Site unless they are indicated to be removed and salvaged or recycled.
   2. Remove and Salvage: Detach items from existing construction prior to demolition.
   3. Existing to Remain: Existing items of construction that are protected in place and that are not otherwise indicated to be removed and salvaged, or recycled.

C. Reference Standards:

ANSI A10.6	Safety & Health Program Requirements for Demolition Operations
CAL/OSHA	Title 8 Regulations, Chapter 4 Division of Industrial Safety, Subchapter 4 Construction Safety Orders

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:
   1. Coordinate with the District in scheduling Work that creates significant dust, noise, or traffic impacts.
   2. Schedule removal of the boat launch below the water line as in-channel Work, during periods of reduced or no flow release from Camanche Dam, in accordance with Section 31 23 19 (Control of Water).

B. Public Safety: The Day Use Area is a public recreation area. Control public access to demolition areas in accordance with Section 01 11 00 (Summary of Work).

C. Stormwater: Implement the Storm Water Pollution Prevention Plan (SWPPP) required by Section 01 11 00 (Summary of Work) during demolition.

1.4 SUBMITTALS

A. Site Quality Control Submittals:
   1. Photographs, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and Site improvements that might be misconstrued as damage caused by demolition.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with ANSI A10.6.
   2. Comply with the rules and regulations of CAL/OSHA, Title 8, Chapter 4, Subchapter 4, "Construction Safety Orders."
   3. Comply with applicable local and state agencies having jurisdiction.
   4. Comply with EPA notification regulations.
   5. Comply with applicable state and local regulations regarding stormwater pollution control, dust control, and noise mitigation during construction.

1.6 SITE CONDITIONS

A. Existing Conditions:
   1. Perform preliminary investigations as required to ascertain the extent of the Work.
   2. Unless otherwise indicated, demolition waste shall become the property of the Contractor. Dispose of demolished material off-Site in accordance with applicable laws and regulations.
   3. Do not dispose of removed materials to the general public by sale, gift, or in any other manner at the Site.
   4. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed contractors or material suppliers, provided materials are removed from the Site by the Contractor.
   5. Unidentified Materials: If unidentified materials are discovered, including hazardous materials that will require removal beyond that required by the Contract Documents, immediately report the discovery to the District. If necessary, the District will arrange for testing or analysis of the discovered materials and will provide instructions for their removal and disposal.

PART 2 PRODUCTS

2.1 SOILS MATERIALS

A. Backfill excavations resulting from demolition with native fill conforming to Section 31 20 00 (Earth Moving), placed to the lines and grades shown on the Drawings.

PART 3 EXECUTION

3.1 PREPARATION

A. Provide barricades and safety lights per Section 12 of the Caltrans Standard Specifications, as required.

B. Protection of In-Place Conditions:
   1. Protect and maintain benchmarks and survey control points during construction.
   2. Protect existing Site improvements to remain during construction, including the existing ADA parking area and restroom in the Day Use Area shown on the Drawings.

C. Surface Preparation:
   1. Verify that the area to be demolished or removed has been vacated, and that adequate space has been made available to perform the Work.

D. Demolition/Removal:
   1. Where existing conditions conflict with representations of the Contract Documents, notify the District and obtain clarification. Do not perform Work affecting the conflicting conditions until clarification is received.

3.2 DEMOLITION

A. Provide noise and dust abatement per Sections 10 and 14 of the Caltrans Standard Specifications, as required to prevent contamination of adjacent areas.

B. Remove existing Work indicated to be removed, or as necessary for construction of the Work.

C. Remove the existing boat launch in the Day Use Area. The boat launch is to be replaced in like kind after completion of earthmoving as part of this Work.

3.3 RESTORATION

A. Restore damaged improvements to their original condition, as acceptable to the District.

3.4 DISPOSAL

A. Promptly dispose of demolished materials not indicated to be recycled off-Site. Do not allow demolished materials to accumulate on the Site.

B. Burning of demolished materials is prohibited.

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Clearing and grubbing of vegetation and debris within the limits of work, staging areas, and access routes.
   2. Removal of trees marked for removal on the Drawings.
   3. Salvage of trees, rootwads, logs, and willow cuttings for reuse in the Work.
   4. Handling and disposal of cleared materials, including invasive plant material.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 01 56 39 (Temporary Tree and Plant Protection)
   3. Section 31 20 00 (Earth Moving)
   4. Section 32 90 00 (Planting)
   5. Section 35 42 01 (Large Wood)

1.2 REFERENCES

A. State of California Department of Transportation (Caltrans), Standard Specifications, latest edition.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Special-status species have the potential to occur within the Project area. Schedule tree removal and clearing to comply with the restrictions for nesting birds and other protected species in the Project permits, as specified in Section 01 11 00 (Summary of Work).

B. Clean equipment before delivery to the Site and between Sites in accordance with Section 01 11 00 (Summary of Work).

C. Implement the Storm Water Pollution Prevention Plan (SWPPP) required by Section 01 11 00 (Summary of Work) during clearing and grubbing.

PART 2 PRODUCTS

2.1 SALVAGED MATERIALS

A. Salvage cleared materials for reuse in the Work in the following order of priority:
   1. Whole trees, rootwads, and logs: Salvage for use as large wood in accordance with Section 35 42 01 (Large Wood).
   2. Willows: If willows suitable for live cuttings are present within the clearing limits, salvage cuttings and store them in water in accordance with Section 32 90 00 (Planting) for use as live cuttings.

3. Brush and slash: Brush and slash not used under the items above may be chipped and spread on upland areas and spoils areas only. Do not spread chipped material on floodplain areas.

B. Cleared material not salvaged under this Article, other than invasive plant material, shall be considered non-usable debris.

PART 3 EXECUTION

3.1 PREPARATION

A. Locate, identify, and protect utilities to remain from damage.

B. Protect benchmarks, survey control points, and existing structures from damage or displacement.

C. Clearly mark the limits of work, access routes, excavation limits, and areas to be cleared and grubbed. The District will approve the nature and extent of clearing before clearing begins.

3.2 TREE REMOVAL

A. Remove only the trees marked for removal on the Drawings. Removal of any other tree requires approval of the District.

B. Protect all other existing trees and vegetation, including dead trees and snags, in accordance with Section 01 56 39 (Temporary Tree and Plant Protection).

C. Do not trim or remove elderberry shrubs except where shown on the Drawings and allowed by the Project permits. Notify the District before trimming or removing any elderberry shrub, in accordance with Section 01 11 00 (Summary of Work).

3.3 CLEARING AND GRUBBING

A. Clear and grub within the limits of excavation and fill in accordance with Section 17 of the Caltrans Standard Specifications, except as modified by the Contract Documents. Remove trees marked for removal, shrubs, brush, downed timber, rotten wood, heavy growth of grass and weeds, vines, rubbish, and debris.

B. Within fill areas and the setback berm footprint, grub to remove stumps and roots 1/2 inch or more in diameter to a minimum depth of 1.5 feet below the existing ground surface.

C. Clear other areas within the limits of work, staging areas, and access routes only as necessary to complete the Work. The District will approve the nature and extent of clearing before clearing begins.

D. Do not dispose of cleared or grubbed materials in the Mokelumne River or other waterways.

3.4 HANDLING OF CLEARED MATERIALS

A. Stockpile salvaged materials within the spoils areas shown on the Drawings, keeping each type of material separate, in accordance with Section 31 20 00 (Earth Moving).

B. Dispose of non-usable debris off-Site in a legal manner.

C. Do not burn combustible materials on the Site.

3.5 INVASIVE PLANT MATERIAL

A. Do not dispose of material containing invasive plant stems, fruits, roots, rhizomes, or soil indiscriminately. Dispose of invasive plant material by one of the following methods:
   1. Burial: Place invasive plant material at the base of fill within the spoils areas and cover it with clean fill. The District must approve the burial location and depth before invasive plant material is placed.
   2. Off-Site Disposal: Bag invasive plant material in heavy-duty, 3-mil or thicker contractor bags, tied securely. Transport the bags in a truck with a shell or tarp that is securely fastened over the load, to a disposal location coordinated with the District at least one week before disposal.

3.6 FIELD QUALITY CONTROL

A. Upon completion of clearing, obtain the District's acceptance of the extent of clearing.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavation of soil and sediment, and reuse of selected approved material in construction of the Work.
   2. Fill placement, including fill of existing ponds and construction of the setback berm at the Colburn Downstream Site.
   3. Salvage, stockpiling, and placement of topsoil.
   4. Stockpiling and management of excavated materials, and placement of excess spoils in the spoils areas.
   5. Grading to achieve the lines and grades indicated.
   6. Post-grading surface preparation of areas to be planted and seeded.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 31 11 00 (Clearing and Grubbing)
   3. Section 31 23 19 (Control of Water)
   4. Section 32 90 00 (Planting)
   5. Section 32 92 19 (Seeding)
   6. Section 35 42 01 (Large Wood)
   7. Section 41 11 01 (Gravel Processing)

1.2 REFERENCES

A. Reference Standards:
   1. California Test 216 (modified), Relative Compaction of Untreated and Treated Soils and Aggregates.
   2. California Test 231, Relative Compaction of Soils and Aggregates by the Area Concept Utilizing Nuclear Gages.
   3. ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   4. ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
   5. State of California Department of Transportation (Caltrans), Standard Specifications, latest edition.

1.3 DEFINITIONS

A. Backfill: Soil materials approved by the District and used to fill depressions resulting from removal of trees, stumps, large rocks, and other obstructions.

B. Borrow: Approved soil material imported from off-Site for use as fill.

C. Fill: Soil materials approved by the District and used to raise existing grades.

D. Spoils Areas: The areas designated as spoils areas on the Drawings.

E. Subgrade: The surface remaining after completing excavation, or the top surface of a fill or backfill immediately below topsoil or finish grade.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Special-status species have the potential to occur within the Project area. Implement the protective measures in the Project permits, as specified in Section 01 11 00 (Summary of Work).

B. Implement the Storm Water Pollution Prevention Plan (SWPPP) required by Section 01 11 00 (Summary of Work) during all earth-moving Work.

1.5 SUBMITTALS

A. Design Data:
   1. Grading and Access Plan: Include the sequence of grading work, type of equipment to be used, location of staging areas, location of access routes, locations of proposed access ramps, and proposed locations of temporary stockpiles within the spoils areas. Locations of access ramps into Work areas will be confirmed by the District at the time of construction.

B. Reports:
   1. Classification according to ASTM D2487 of each on-Site or borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve in conformance with ASTM D1557 for each on-Site or borrow soil material proposed for fill and backfill.
   3. If off-Site disposal of spoils is directed by the District, a summary of the quantity and destination of all spoils hauled off-Site.

PART 2 PRODUCTS

2.1 MATERIALS

A. Native Fill:
   1. Clean soil containing no organics or rocks larger than 4 inches, at a moisture content that allows it to meet the compaction requirements, as approved by the District.
   2. On-Site soils are considered suitable for use as fill provided the materials are placed as specified herein. If the District determines that the on-Site soils are not suitable for use as fill, the Contractor shall import fill that satisfies the material requirements. Highly expansive soils shall not be used as fill.

B. Topsoil:
   1. Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than the underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.
   2. Topsoil shall be salvaged from the Site only. Topsoil shall not be imported.

C. Spoils:
   1. Excavated material not classified as native fill, topsoil, or material for gravel processing under Section 41 11 01 (Gravel Processing). Excess stockpiled fill and topsoil that remains after completion of the Work shall be classified as spoils.
   2. Place excess spoils in the spoils areas as specified in Part 3. Spoils shall be disposed of off-Site only if directed by the District, in accordance with applicable regulations.
   3. Spoils generated from the Project shall not be marketed or sold for profit.

PART 3 EXECUTION

3.1 GENERAL

A. Perform work in accordance with Section 19 of the Caltrans Standard Specifications, as modified by the Contract Documents.

B. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

C. The use of explosives will not be permitted.

D. Provide sufficient notification to the District before starting earthwork so that the work can be properly observed.

3.2 CONTROL OF WATER

A. Comply with Section 31 23 19 (Control of Water) for coordination of in-channel Work timing and management of incidental water.

3.3 WET WEATHER CONDITIONS

A. Do not prepare subgrade or place or compact soil materials if the subgrade or materials are above optimum moisture content.

B. If the District allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the District.

3.4 TOPSOIL SALVAGE

A. Salvage topsoil only from areas within the grading limits that will be excavated and that meet all of the following criteria:
   1. The material meets the topsoil requirements in Part 2.
   2. The topsoil layer is at least 6 inches thick.
   3. The topsoil occurs as a continuous area large enough to be stripped and stockpiled separately with standard equipment.
   4. The area is not infested with invasive plants, such as Himalayan blackberry.

B. Notify the District when areas that appear to meet these criteria are encountered. Do not strip topsoil until the District has confirmed the area for salvage.

C. In areas confirmed for salvage:
   1. Clear and grub the area per Section 31 11 00 (Clearing and Grubbing).
   2. Strip the top 6 inches of topsoil before performing any excavation or grading.

3. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 1 inch in diameter, and other materials that would interfere with planting and seeding.
4. Remove weeds, roots, stones, subsoil, and similar foreign materials larger than 1/2 cubic foot in volume from the topsoil as it is stockpiled.
5. Do not strip, stockpile, or otherwise work topsoil when it is wet enough that its structure would be destroyed.

3.5 STOCKPILING

A. Stockpile excavated materials only within the spoils areas shown on the Drawings, at locations shown in the approved Grading and Access Plan.

B. Stockpile topsoil, native fill, material for gravel processing, and salvaged wood separately. Stockpile topsoil in areas that have been stripped of their organic layer so that it does not pick up additional weed seed.

C. Do not stockpile materials over existing facilities, within protected vegetation, or on completed Work.

D. Post signs indicating the proposed use of each stockpile. Signs shall be readable from all directions of approach and by equipment operators from their normal seated position.

3.6 EXCAVATION

A. Excavate to the lines, grades, and neat dimensions indicated on the Drawings, or as required to satisfactorily compact backfill.

B. Remove large rocks and other obstructions encountered during excavation, and manage them as native fill, material for gravel processing, or spoils, as applicable.

C. Perform excavations in accordance with Cal/OSHA safety standards. The stability and safety of excavations are the responsibility of the Contractor.

3.7 SUBGRADE PREPARATION

A. Before backfilling depressions created by the removal of large rocks, trees, and other obstructions encountered during clearing and grubbing and excavation, scarify the bottom of the excavation to an approximate depth of 8 inches and uniformly moisture condition the scarified surface to a moisture content at least 2 percent over optimum. Compact the scarified surface to a minimum of 90 percent relative compaction at above optimum moisture content.

B. Overexcavate any remaining soft (pumping) areas down to firm soil and backfill the area.

C. Maintain the subgrade in a moist, but not wet, condition by periodically sprinkling water before placing additional fill. Subgrade that has been permitted to dry out and loosen or develop desiccation cracking shall be scarified, moisture conditioned, and recompacted as specified above.

D. Prepare the subgrade under all areas that will receive fill, including existing ponds to be filled.

E. Obtain the District's approval of subgrades before placing fill.

3.8 FILL PLACEMENT AND COMPACTION

A. Place fill, including fill in existing ponds, in the dry, in uniformly moisture-conditioned lifts not exceeding 8 inches in loose thickness. Moisture condition and compact each lift before placing the next.

B. Adjust the soil moisture content as necessary to achieve compaction. This may require adding water and thoroughly mixing it into soils that are too dry, or scarifying and aerating soils that are too wet.

C. Perform compaction using rollers, pneumatic or vibratory compactors, or other equipment and mechanical methods approved by the District.

D. Compact fill to 90 percent relative compaction unless otherwise specified by the District.

3.9 SETBACK BERM

A. Construct the setback berm at the Colburn Downstream Site to the lines, grades, and sections shown on the Drawings.

B. Strip vegetation, topsoil, and organic material from the berm footprint, and prepare the subgrade as specified under Subgrade Preparation.

C. Construct the berm of native fill free of organics and rocks larger than 4 inches, placed in lifts not exceeding 8 inches in loose thickness. Compact each lift to 90 percent relative compaction (TBD, pending geotechnical review).

D. Finish the berm side slopes to the slopes shown on the Drawings, and seed the berm in accordance with Section 32 92 19 (Seeding).

3.10 GRADING

A. Uniformly grade the Project to the elevations indicated.

B. Tolerance for grading shall be plus or minus 0.1 foot.

C. Grade floodplain surfaces to drain toward the side channels as indicated. Finished floodplain surfaces shall have no depressions that hold water.

D. Round the tops and bottoms of slopes as indicated, or blend them with existing contours.

3.11 SPOILS PLACEMENT

A. Place excess spoils in the spoils areas shown on the Drawings. Do not place spoils within protected vegetation or outside the limits of the spoils areas.

B. Shape spoils to drain and to blend with the adjacent existing ground, with slopes no steeper than 3:1 unless otherwise shown on the Drawings.

C. Seed completed spoils areas in accordance with Section 32 92 19 (Seeding).

3.12 TOPSOIL PLACEMENT

A. Place salvaged topsoil in High Floodplain and Upland planting and seeding areas designated by the District. Do not place topsoil in side channels. If the quantity of salvaged

topsoil is not sufficient to cover all planting and seeding areas, the remaining areas will not receive topsoil.

B. Overexcavate designated areas to accommodate 6 inches of topsoil, so that the finished surface meets the lines and grades indicated after the topsoil is placed. A tolerance of 1 inch less or 3 inches more than 6 inches is acceptable in isolated areas.

C. Before placing topsoil, rip the subgrade to a depth of 6 inches to bond the topsoil with the subsoil. After the subgrade has been ripped, do not drive wheeled vehicles or equipment in the area.

D. Spread topsoil evenly with track loaders or dozers, working from one end of each area toward its edge to avoid excess compaction. Minimize tracked vehicle access. Do not spread topsoil when it is excessively wet or dry.

E. Minimally compact topsoil by track-walking it in one pass with a track vehicle weighing less than 10,000 lb, perpendicular to the slope.

F. Do not operate wheeled equipment on placed topsoil. Topsoil that has been driven over by wheeled equipment, or that the District determines has been compacted above 90 percent relative compaction, shall be ripped or rototilled and track-walked at the Contractor's expense.

3.13 POST-GRADING SURFACE PREPARATION

A. Rip compacted surfaces of staging areas, access routes, spoils areas, and other areas disturbed by construction that are to be seeded or planted to a minimum depth of 18 inches, using a dozer or other appropriate equipment. On slopes, rip along the contours.

B. Furrows resulting from ripping shall be no more than 6 inches high and shall be oriented parallel to the river and downslope to the greatest extent possible, so that surface runoff drains back to the floodplain. In graded floodplain areas, restore the finished surface to the grading tolerance after ripping.

C. Do not rip permanent access roads, the setback berm, areas that have received topsoil, or undisturbed surfaces.

D. Complete post-grading surface preparation before seeding and planting.

3.14 FIELD QUALITY CONTROL

A. Verify that design grades and compaction requirements have been achieved as indicated.

B. Site Tests:

1. The in-place density and moisture of soils may be determined by nuclear methods and the area concept in accordance with California Test 231.
2. Maximum density shall be determined as specified in Part II of California Test 216 (modified).

3.15 FIELD QUALITY ASSURANCE

A. The District will verify design grades and testing for purposes of acceptance of the Work and determination of measurement quantities for payment.

END OF SECTION

SECTION 31 23 19

CONTROL OF WATER

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Coordination with the District to schedule in-channel Work during periods of reduced or no flow release from Camanche Dam.
   2. Management of incidental water within the Work area.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 31 20 00 (Earth Moving)
   3. Section 41 11 01 (Gravel Processing)

1.2 SUBMITTALS

A. Site Quality Control Submittals:
   1. Schedule of proposed in-channel Work activities, coordinated with the District's Camanche Dam release schedule.

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Coordinate the timing of in-channel Work with the District so that it occurs during periods of reduced or no flow release from Camanche Dam, and within the dry-season construction window specified in Section 01 11 00 (Summary of Work). In-channel Work includes gravel placement for the in-stream riffles under Section 41 11 01 (Gravel Processing) and excavation of side channel connections to the Mokelumne River under Section 31 20 00 (Earth Moving).

B. Site grading shall promote drainage. Divert surface runoff from excavations and Work areas as needed to maintain a workable surface, and manage incidental water and runoff in accordance with the Storm Water Pollution Prevention Plan (SWPPP) required by Section 01 11 00 (Summary of Work).

C. No dewatering or stream diversion measures are required under this Section.

END OF SECTION

SECTION 32 90 00

PLANTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Furnishing, delivery, storage, handling, and installation of live cuttings, container plants, and herbaceous plugs.
   2. Plant layout, watering at the time of planting, invasive vegetation control, and plant replacement through the warranty period.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 01 56 39 (Temporary Tree and Plant Protection)
   3. Section 31 11 00 (Clearing and Grubbing)
   4. Section 31 20 00 (Earth Moving)
   5. Section 32 92 19 (Seeding)

1.2 REFERENCES

A. Reference Standards:
   1. ANSI Z60.1, American Standard for Nursery Stock, latest edition.
   2. The Jepson Manual: Vascular Plants of California, Second Edition (Baldwin et al., 2012).

1.3 SUBMITTALS

A. Qualifications: Submit a copy of the planting Contractor's or Subcontractor's California State Landscape Contractor's (C-27) License and the qualifications of the planting superintendent, as specified under Quality Assurance.

B. Planting Sequencing Plan: Submit a general sequencing plan for all significant planting elements of the Project, prepared in consultation with the District.

C. Live Cuttings:
   1. Documentation from the supplier of the harvest location and harvest date of the materials, demonstrating that the materials were harvested no more than 14 days prior to planting. Any deviation from these sourcing requirements requires approval of the District.
   2. Proposed color code for marking live cuttings by species.

D. Container Plants and Herbaceous Plugs:
   1. Name of the supplying nursery, and the species, sizes, and quantities to be furnished.
   2. Inspection, inventory, and receiving records of the plants at the time of delivery.

E. Herbicides: Prior to using any herbicide, submit a request for approval that includes the proposed product, reason for use, and proposed location.

1.4 QUALITY ASSURANCE

A. The Contractor or Subcontractor performing planting work shall hold a California State Landscape Contractor's (C-27) License.

B. Planting work shall be performed under the direction of a superintendent with a minimum of 5 years of experience installing California native plants in riparian or wildland restoration settings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Schedule a joint inspection of plant materials with the District upon delivery to the Site. Remove rejected plants from the Site immediately.

B. Store container plants and herbaceous plugs in a cool, shady, secure location where they can be watered easily and are protected from animals. Protect plants from damaging sun and wind, and water stored plants daily to maintain moisture in the root ball until planted.

C. The District may inspect stored plants at any time before planting. Plants that have become dry, brittle, or yellow during storage will be rejected and shall be replaced at the Contractor's expense with plants approved by the District.

D. Deliver live cuttings to the planting area in quantities no greater than can be planted within 24 hours after removal from storage. Wrap live cuttings not planted in a day in wet burlap and store them in a cool location until the next planting day.

1.6 WARRANTY

A. Planted areas guarantee: Areas that do not meet the planting success criteria specified in Part 3 one year following notice of substantial completion shall be replanted during the first available planting period, as determined by the District. Replanting shall be performed at the Contractor's expense and in conformance with this Section.

PART 2 PRODUCTS

2.1 LIVE CUTTINGS

A. Live cuttings consist of cuttings from live stems of shrubs or trees that are provided in an unrooted condition and have the ability to establish roots and shoots if planted under proper conditions.

B. Harvest live cuttings from healthy plants within 150 miles of the Site. Collect live cuttings as close to plant dormancy as feasible, and from an equal number of male and female donor plants where practicable.

C. Live cuttings salvaged on-Site under Section 31 11 00 (Clearing and Grubbing) are an acceptable source and are not subject to the 150-mile sourcing limit or the 14-day submittal documentation requirement; store and handle salvaged cuttings per the requirements of this Section from the time of salvage.

D. Harvest plant materials no more than 14 days before installation.

E. Live cuttings shall remain continuously wet from harvest to placement, stored in water and shade with approximately 80 percent of their length from the basal end submerged. Change the water every 1 to 2 days if cuttings are kept in a container.

F. Indicate the basal end (bottom) of each cutting by a clean, slanted cut. Remove all lateral stems at the juncture with the main stem. Indicate the top (distal end) of each cutting by a cut perpendicular to the stem.

G. Live cuttings shall be 0.5 to 1 inch in diameter at the basal end and a minimum of 4 feet long.

H. Mark the distal end of each cutting with latex paint according to the species color code submitted to the District. Bundle cuttings by species into groups of 5 to 25 cuttings, and label each bundle with a tag indicating the species and harvest date.

I. Maintain a list of the species and quantities of collected live cuttings at the end of each collection day, and provide the inventory to the District within 24 hours of a request.

J. Except as otherwise indicated or approved by the District, live cuttings shall consist of a mix of the following species:

Common Name	Scientific Name	Target Percentage
Arroyo willow	Salix lasiolepis	33%
Red osier dogwood	Cornus sericea	33%
Sandbar willow	Salix exigua	17%
Red willow	Salix laevigata	17%

2.2 CONTAINER PLANTS

A. Container plants shall consist of the following species and sizes:

Common Name	Scientific Name	Size
Cottonwood	Populus fremontii	5-gallon container
California boxelder	Acer negundo var. californicum	5-gallon container
Valley oak	Quercus lobata	5-gallon container
Elderberry	Sambucus mexicana	5-gallon container
Coyote bush	Baccharis pilularis	1-gallon container
Button bush	Cephalanthus occidentalis	1-gallon container

B. Nursery-grown plants shall be grown from seed or cuttings collected as close to the Project as feasible. Order nursery-grown plant materials no later than the spring before planting.

C. Plants shall have a growth habit normal to the species in accordance with ANSI Z60.1, and shall be sound, healthy, vigorous, and free from pathogenic fungus, insect pests, plant disease, sun scald, fresh bark abrasions, and other objectionable disfigurements.

D. Plants shall have normal, well-developed root systems, shall not be root bound, and shall be free of kinked or girdling roots.

E. Plant names shall conform to The Jepson Manual. Tag one plant of each species for identification.

2.3 HERBACEOUS PLUGS

A. Herbaceous plugs shall consist of the following species, installed in the planting zones indicated on the Drawings:

Common Name	Scientific Name	Size
Hardstem bulrush	Schoenoplectus acutus	10-cubic-inch cone-tainer
Common rush	Juncus effusus	10-cubic-inch cone-tainer
Creeping wild rye	Leymus triticoides	10-cubic-inch cone-tainer
Slender sedge	Carex praegracilis	10-cubic-inch cone-tainer
White root sedge	Carex barbarae	10-cubic-inch cone-tainer
Iris-leaf rush	Juncus xiphioides	10-cubic-inch cone-tainer

1. Plug size is pending confirmation of availability from a native plant nursery.

B. Herbaceous plugs shall meet the nursery growing, plant health, root system, and tagging requirements specified for container plants.

PART 3 EXECUTION

3.1 PLANTING PERIODS AND CONDITIONS

A. Planting may occur from July 15 through March 31, depending on weather and river flows. Install live cuttings no later than December 1.

B. Planting shall not be permitted during the following conditions unless otherwise approved by the District:

1. Temperatures less than 32 degrees Fahrenheit.
2. Temperatures greater than 90 degrees Fahrenheit.
3. Saturated soil conditions, for container plants and herbaceous plugs.
4. Wind velocities greater than 20 mph.

3.2 PREPARATION AND LAYOUT

A. Prepare planting areas in accordance with Section 31 20 00 (Earth Moving) before planting.

B. Mark plant locations in the field with pin flags color-coded by species. Groups of plants may be marked with a single flag. Mark the boundaries of the planting zones to guide planting and the application of seed mixes.

C. The District will review the flagged plant locations and planting zone boundaries before planting to confirm that plants are placed at appropriate elevations relative to surface water and groundwater. Do not begin planting in an area until the District has reviewed the layout for that area.

D. Unless otherwise approved by the District, proceed with planting in each area in the following sequence:

1. Mark the plant layout.
2. Excavate planting holes for container plants and herbaceous plugs.
3. Install live cuttings.
4. Apply seed in accordance with Section 32 92 19 (Seeding).
5. Install container plants and herbaceous plugs.

3.3 LIVE CUTTINGS

A. Install live cuttings in the Low Floodplain planting zone at the locations and densities indicated on the Drawings.

B. Install each cutting with the basal end down, approximately perpendicular to the finished grade, with a minimum of 3 feet of its length embedded below finished grade. Prepare a pilot hole where needed so that cuttings are not split or damaged during installation.

C. Backfill and tamp firmly around each cutting to remove air pockets and ensure good soil contact.

D. Take care during placement of construction materials around live cuttings to avoid damage to the materials.

3.4 CONTAINER PLANTS

A. Install container plants in the planting zones and at the densities indicated on the Drawings. Install elderberry in clusters spaced no more than 100 feet apart, in well-drained soils, as indicated on the Drawings.

B. Do not install trees, shrubs, or other woody plants within side channels.

C. Excavate a flat-bottomed planting hole twice the size of the rootball. Break apart soil clods and remove rocks and weeds from the planting hole. Smaller holes require approval of the District.

D. Remove each plant from its container with the rootball completely intact. Do not hold the plant by its stem or branches or in any way that may damage the plant. Lightly scarify the rootball and place it in the planting hole without bending or damaging the roots.

E. Set plants vertically, with the top of the rootball no higher than finished grade and no more than 1 inch below finished grade after the backfill has settled. Backfill with moist soil removed from the planting hole, and tamp firmly so the backfill makes good contact with the rootball and no air pockets remain. If the backfill settles below the top of the rootball, add soil to bring the backfill even with the top of the rootball.

F. Remove all plant containers from the Site and recycle them appropriately.

3.5 HERBACEOUS PLUGS

A. Install herbaceous plugs in the Side Channel and Low Floodplain planting zones at the densities indicated on the Drawings.

B. Install herbaceous plugs using the planting hole, placement, and backfill requirements specified for container plants. Field conditions may require smaller holes or modified methods; smaller holes require approval of the District. After installation, regrade the ground surface as needed to restore design elevations.

3.6 WATERING

A. Water each plant thoroughly at the time of planting to settle the backfill and eliminate air pockets around the roots.

B. No irrigation system or post-planting irrigation is required under this Section.

C. Water withdrawn from the Mokelumne River for watering shall be pumped only in conformance with the intake screening requirements of Section 41 11 01 (Gravel Processing) and the Project permits.

3.7 INVASIVE VEGETATION CONTROL

A. Remove invasive vegetation from planted areas as needed through the warranty period to achieve the planting success criteria. Invasive vegetation includes, but is not limited to, Himalayan blackberry (Rubus armeniacus) and water hyacinth (Eichhornia crassipes).

B. Herbicides:

1. Use of herbicides is subject to approval by the District and the regulatory agencies. Use only herbicides for which a "no effect" determination has been issued by the U.S. Environmental Protection Agency's Endangered Species Protection Program for species likely to occur within the Project area or downstream.
2. Herbicides and their use shall conform to state and county regulations and shall be approved for land or aquatic applications, as applicable. Herbicides shall be applied by a qualified licensed applicator in accordance with the manufacturer's label and the written recommendations of a licensed Pest Control Adviser.
3. Notify the District at least 24 hours before each herbicide application.

3.8 FIELD QUALITY CONTROL

A. Planting success criteria: The District will conduct surveys to verify planting success one year following notice of substantial completion. An area will be considered satisfactory if a minimum of 80 percent of the installed plant material has survived.

3.9 CLEANUP

A. Remove litter, trash, and debris related to planting from the Project area and dispose of it off-Site, avoiding impacts to planted and seeded areas. Debris includes, but is not limited to, flagging and stakes that are no longer needed, ties, twine, plastic bags, and plant containers.

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Furnishing and applying native seed mixes in the seeding zones and other disturbed areas indicated on the Drawings.
   2. Furnishing and applying hydromulch over all seeded areas.
   3. Seeding and mulch repair, and re-seeding through the guarantee period.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 31 20 00 (Earth Moving)
   3. Section 32 90 00 (Planting)
   4. Section 41 11 01 (Gravel Processing)

1.2 REFERENCES

A. State of California Department of Transportation (Caltrans), Standard Specifications, latest edition.

1.3 SUBMITTALS

A. Qualifications: Submit a copy of the seeding Contractor's or Subcontractor's California State Landscape Contractor's (C-27) License and the qualifications of the seeding superintendent, as specified under Quality Assurance.

B. Product Data:
   1. Seed: For each delivery, submit product certificates indicating the seed mix, the species and quantities delivered, and compliance with this Section, together with copies of the seed tags.
   2. Hydromulch fiber.
   3. Tackifier.

1.4 QUALITY ASSURANCE

A. The Contractor or Subcontractor performing seeding work shall hold a California State Landscape Contractor's (C-27) License.

B. Seeding work shall be performed under the direction of a superintendent with a minimum of 5 years of experience seeding California native plant communities in wildland or restoration settings.

C. Calibrate and adjust seeding equipment according to the manufacturer's specifications.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Supply each seed mix premixed to the rates specified. Each bag of seed shall bear a tag marked with (1) the name and address of the shipper, (2) net weight, (3) seed name, (4) percentages of purity and germination, (5) lot number, (6) date of test, and (7) maximum weed seed content, clearly marked for each kind of seed.

B. Store seed in airtight containers in a cool, dry place safe from fire, humidity, and predation by rodents and insects.

C. Deliver hydromulch fiber and tackifier in the manufacturer's unopened containers bearing original labels, and protect them from weather and other conditions that would damage or impair their effectiveness.

1.6 WARRANTY

A. Seeded areas guarantee: Areas that do not meet the seeding success criteria specified in Part 3 for native seed mix establishment on July 1 of the year following the Substantial Completion Date shall be re-seeded during the first available seeding period, as determined by the District. Re-seeding shall be performed at the Contractor's expense and in conformance with this Section.

PART 2 PRODUCTS

2.1 SEED

A. Seed shall be California native species, of the species and at the rates listed below, expressed in pounds of pure live seed (PLS) per acre. Obtain seed from sources as close to the Project as feasible.

B. High Floodplain Seed Mix: a combination of flood-tolerant grasses and perennials selected to stabilize soils on intermittently inundated floodplain areas while supporting biodiversity and pollinator habitat. Apply the High Floodplain Seed Mix in the High Floodplain Lower Slopes planting zone and, unless otherwise indicated on the Drawings, on staging areas, access roads, capped gravel wash sedimentation basins, and other disturbed areas outside the planting zones.

Common Name	Scientific Name	Pounds per Acre (PLS)
Mugwort	Artemisia douglasiana	0.5
Foothill clover	Trifolium ciliolatum	4.5
Three week fescue	Festuca microstachys	3
Creeping wildrye	Leymus triticoides	9
California deer grass	Muhlenbergia rigens	9
	Total	26

C. Crotch's Bumblebee Mix: a blend of native forbs and bunch grasses selected to provide season-long foraging resources for Crotch's bumble bee (Bombus crotchii) and bumble bee nesting substrate. Apply the Crotch's Bumblebee Mix in the Upland planting zone.

Common Name	Scientific Name	Pounds per Acre (PLS)
Yarrow	Achillea millefolium	0.1
Elegant clarkia	Clarkia unguiculata	0.2

Common Name	Scientific Name	Pounds per Acre (PLS)
California poppy	Eschscholzia californica	0.9
Gumplant	Grindelia camporum	1.0
Common sunflower	Helianthus annuus	0.4
Baby blue eyes	Nemophila menziesii	0.9
California phacelia	Phacelia californica	0.8
Tansy phacelia	Phacelia tanacetifolia	0.7
Alkali sacaton	Sporobolus airoides	0.1
Purple needlegrass	Stipa pulchra	1.1
Vinegarweed	Trichostema lanceolatum	1.9
Narrowleaf milkweed	Asclepias fascicularis	TBD (rec. 1.0)
Yellow pincushion	Chaenactis glabriuscula	TBD (rec. 0.8)
Arroyo lupine	Lupinus succulentus	TBD (rec. 4.0)
Chia	Salvia columbariae	TBD (rec. 0.5)
	Total	~14.4 (pending TBD rates)

1. Rates marked TBD are pending confirmation from a native seed supplier (e.g., Hedgerow Farms); the parenthetical figure is a preliminary recommended rate, not a verified agronomic rate.

D. Seed shall be healthy and vigorous and free of disease, insect pests, noxious weed seeds, other weed or non-specified seeds, stones, and other harmful or deleterious matter. Seed shall have been tested for certification within the three months before delivery. Any adjustments or substitutions in seed species or composition shall be approved by the District. Seed that has become wet, moldy, or otherwise damaged, or does not meet the Specifications, shall be legally disposed of off-Site and replaced at the Contractor's expense.

2.2 HYDROSEED MATERIALS

A. Where hydroseeding is approved, the hydroseed slurry shall include the following:

Material Description	Material Type	Application Rate
Seed	Seed mix as specified above	Twice the rates specified above
Fiber	Wood	1,500 lb/acre
Tackifier	Psyllium	125 lb/acre

B. Wood fiber and tackifier shall meet the requirements of Section 21 (Erosion Control) of the Caltrans Standard Specifications.

2.3 HYDROMULCH

A. Hydromulch shall include the following:

Material Description	Material Type	Application Rate
Fiber	Wood	2,000 lb/acre
Tackifier	Psyllium	300 lb/acre

B. Wood fiber and tackifier shall meet the requirements of Section 21 (Erosion Control) of the Caltrans Standard Specifications.

PART 3 EXECUTION

3.1 SEEDING PERIOD

A. Perform seeding after October 15.

3.2 PREPARATION

A. Prepare areas to be seeded in accordance with Section 31 20 00 (Earth Moving). Seed designated areas after decompaction and before hydromulching.

B. In planted areas, apply seed in the sequence specified in Section 32 90 00 (Planting), after installation of live cuttings and before installation of container plants and herbaceous plugs.

3.3 SEEDING

A. Seed all disturbed areas as indicated, with the seed mixes specified for each area in Part 2.

B. Spread seed uniformly over each area at the specified rates. Place seed in direct contact with the soil at a depth of 1/4 to 1/2 inch.

C. The seeding method used for each area shall be approved by the District. Acceptable methods are:
   1. Drill Seeding: Preferred method for relatively flat areas with slopes up to 3:1. Drill seed to a depth of 1/4 to 1/2 inch.
   2. Broadcast Seeding: Hand or mechanical broadcast seeding may be used for small or hard-to-reach areas. After broadcasting, lightly harrow or chain drag the seedbed to fully incorporate the seed with the soil and ensure seed-to-soil contact.
   3. Hydroseeding: Permitted only on slopes steeper than 3:1, using the hydroseed materials specified in Part 2 with seed at twice the specified rates. Perform hydroseeding as a separate operation from hydromulching; a small amount of fiber may be added to the seed slurry to show coverage. Apply the slurry within one hour after seed is added to the mixing tank.

D. Do not walk on seeded areas after the germination period has commenced.

3.4 HYDROMULCHING

A. Upon completion of seeding in each area, apply hydromulch uniformly over all seeded areas at the rates specified in Part 2, in accordance with Section 21 (Erosion Control) of the Caltrans Standard Specifications.

3.5 SEEDING AND MULCH REPAIR

A. Re-seed and re-apply hydromulch to areas previously seeded and hydromulched that are disturbed during planting or other Work. The District will designate the areas to be repaired. Perform repairs in accordance with this Section.

3.6 FIELD QUALITY CONTROL

A. Seeding success criteria: The District will conduct surveys to verify seeding success at the District's sole discretion. Overall coverage will be the dominant criterion, not species assemblage. An area will be considered satisfactory if it meets the following criteria:
   1. A minimum of 80 percent intended vegetative cover (noxious weeds and undesirable non-native species will not be considered intended vegetation);
   2. Not more than 10 percent of the seeded area with bare spots larger than 1 square foot; and
   3. Vegetation in healthy condition.

B. Seeding and hydromulching also serve as permanent erosion control for the Storm Water Pollution Prevention Plan required by Section 01 11 00 (Summary of Work).

END OF SECTION

SECTION 35 42 01

LARGE WOOD

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Salvage, handling, stockpiling, and placement of large wood (whole trees, rootwads, logs, and limbs) removed from the Site under Section 31 11 00 (Clearing and Grubbing), for reuse as floodplain and side channel habitat features.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 31 11 00 (Clearing and Grubbing)
   3. Section 31 20 00 (Earth Moving)
   4. Section 32 90 00 (Planting)

1.2 DEFINITIONS

A. Engineer: The Project design engineer identified on the Drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Large Wood: Whole trees, rootwads, logs, limbs, and other woody material salvaged during clearing and grubbing under Section 31 11 00 (Clearing and Grubbing).
   1. No minimum size, species, or condition requirements apply. Reuse as much of the salvaged material as practicable for placement as large wood.
   2. Material not selected for reuse as large wood shall be handled as specified in Section 31 11 00 (Clearing and Grubbing).

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate salvage of large wood with clearing and grubbing operations under Section 31 11 00 (Clearing and Grubbing). Handle whole trees and rootwads so as to avoid damage to the root ball.

B. Stockpile salvaged large wood in the spoils areas shown on the Drawings until placement, separate from other stockpiled materials, in accordance with Section 31 20 00 (Earth Moving).

3.2 PLACEMENT

A. Place large wood after grading of each area is complete and before post-grading surface preparation, seeding, and planting of that area.

B. Place large wood at the locations shown by the large wood symbols on the planting plans. The exact location, orientation, and configuration of individual pieces shall be field-fit as approved by the Engineer or the District.

C. Where large wood is placed at side channels, place pieces along the sides of the channel. Do not place large wood in the middle of a side channel.

D. No minimum size, species, or anchoring is required. Large wood shall be placed unanchored.

E. Reuse as much of the salvaged material as practicable to minimize off-Site disposal.

3.3 FIELD QUALITY CONTROL

A. Obtain the approval of the Engineer or the District of large wood placement locations and configurations before final placement.

END OF SECTION

SECTION 41 11 01

GRAVEL PROCESSING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Screening, washing, and stockpiling of gravel processed from material excavated on the Site.
   2. Pumping of Mokelumne River water for gravel washing.
   3. Construction, use, and capping of sedimentation/washing basins.
   4. Placement of processed spawning gravel to construct the in-stream riffles and to fill the existing backwater pond at the Colburn Upstream Site, as shown on the Drawings.

B. Related Sections:
   1. Section 01 11 00 (Summary of Work)
   2. Section 31 20 00 (Earth Moving)
   3. Section 31 23 19 (Control of Water)
   4. Section 32 92 19 (Seeding)

1.2 ADMINISTRATIVE REQUIREMENTS

A. Perform in-channel gravel placement during periods of reduced or no flow release from Camanche Dam, coordinated with the District in accordance with Section 31 23 19 (Control of Water), and within the construction window specified in Section 01 11 00 (Summary of Work).

B. Special-status fish species occur in the Mokelumne River. Implement the protective measures in the Project permits, as specified in Section 01 11 00 (Summary of Work).

C. Implement the Storm Water Pollution Prevention Plan (SWPPP) required by Section 01 11 00 (Summary of Work) during gravel processing and placement.

1.3 SUBMITTALS

A. Site Quality Control Submittals:
   1. Gradation test results for processed spawning gravel, verifying compliance with Part 2.
   2. Turbidity monitoring data, as specified in Part 3.
   3. Pumping records sufficient for the District to complete the State Water Resources Control Board Division of Water Rights Initial Statement of Water Diversion and Use, including a description of the diversion works, diversion flow rates, total volume diverted, and maximum diversion rate per month.
   4. Proposed locations of sedimentation/washing basins, shown in the Grading and Access Plan required by Section 31 20 00 (Earth Moving).

PART 2 PRODUCTS

2.1 MATERIALS

A. Spawning Gravel Mix: Processed on-Site excavated material meeting the following gradation:

Particle Size (in)	% of Total
2.5–5	20
1.25–2.5	35
0.625–1.25	30
0.3125–0.625	15
D_{84}	2.9 in
D_{50}	1.4 in

B. Wash Water: Water pumped from the Mokelumne River through a screened intake. The pump intake shall meet the following criteria to avoid impacts to juvenile salmonids and other sensitive species:

1. Wetted surface area of the screen or fish-exclusion device shall be proportional to the pump rate so that water velocity at the screen surface does not exceed 0.33 ft/second.
2. Sweeping velocity shall be greater than the approach velocity.
3. Screen openings shall not exceed 3/32-inch mesh for round or square openings, or 1/16-inch mesh for slotted openings.
4. Pumping shall be limited to one hour before sunrise through one hour after sunset.
5. Pumping rate shall not exceed 350 gpm.
6. Pumping shall not exceed 10 percent of stream flow.
7. Intake screen surface area shall be at least 2.5 square feet.
8. Intake shall be located where water is deep and flowing.
9. Intake fish screen shall be placed parallel to flow.

C. Secure pumping equipment to prevent theft or vandalism, and check it daily for presence and operation.

PART 3 EXECUTION

3.1 SOURCING AND STOCKPILING

A. Source spawning gravel on-Site from floodplain and channel excavation under Section 31 20 00 (Earth Moving). Give priority for processing to suitable material excavated for feature construction. During excavation, note the relative composition of excavated sediments, and stockpile material with high percentages of the required gravel sizes for processing.

B. Stockpile material for processing and processed gravel within the spoils areas shown on the Drawings, separate from other excavated materials, brush, litter, and other materials that would interfere with use of the material for gravel augmentation, in accordance with Section 31 20 00 (Earth Moving).

3.2 PROCESSING

A. Sieve excavated material using bar screens or equivalent methods to separate fines from gravel meeting the gradation specified in Part 2.

B. Construct sedimentation/washing basins within the spoils areas shown on the Drawings, at locations approved by the District.

C. Wash sorted gravel in the sedimentation/washing basins to remove remaining fine sediment. Processed and washed gravel shall be clean and free of sand, silt, clay particles, and coatings.

D. Divert wash water effluent into the sedimentation basins and allow fine material to settle before any discharge.

E. Control dust during processing in accordance with the Project permits.

F. Upon completion of gravel processing, cap the sedimentation/washing basins with clean on-Site soil, and seed and hydromulch them in accordance with Section 32 92 19 (Seeding).

3.3 GRAVEL PLACEMENT

A. Place processed spawning gravel to construct the in-stream riffles at each Site and to fill the existing backwater pond at the Colburn Upstream Site, to the lines, grades, and profiles shown on the Drawings.

B. Equipment may operate within the wetted channel during in-channel gravel placement, subject to the Project permits. Minimize disturbance of the channel bed outside the placement footprint.

C. Place gravel so as to minimize turbidity. Do not place gravel that does not meet the gradation and cleanliness requirements of this Section.

D. Tolerance for placed gravel surfaces shall be plus or minus 0.5 foot.

3.4 TURBIDITY AND DISCHARGE CONTROL

A. Do not discharge wash water or sediment-laden water directly to the Mokelumne River. Route all wash water and process water through the sedimentation basins and allow sediment to settle before any discharge.

B. Monitor turbidity in accordance with the Project permits, and adjust processing and placement operations as necessary to prevent turbidity increases in the River.

3.5 FIELD QUALITY CONTROL

A. Verify that placed gravel meets the lines, grades, and profiles shown on the Drawings. The District will verify placement for acceptance of the Work.

END OF SECTION