Detailed Project Description

2.0 Project Description

The proposed Project consists of the following components:

- Side Channel Restoration
  - Channel Excavation
  - Materials Sorting
  - Utility Relocation
  - Staging Areas
  - Spoil Areas
  - Access Roads
  - Floodplain Planting
- Channel Maintenance
- Recreation Enhancement and Expansion
  - Trail Expansion
  - Boat Ramp Restoration

2.1 Side Channel Restoration

East Sand Slough side channel restoration would consist of excavating two channel entrances and a new/improved channel network upstream of the Antelope Boulevard/Highway 36 Bridge, and a single channel below the bridge to provide rearing habitat for juvenile salmonids at different flow regimes on the Sacramento River. The channel was designed within the existing high-flow channel. Hydraulic modeling was performed to ensure that the velocities in the channel would be high enough to prevent deposition while avoiding scour potential around bridge piers. Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, the Project area is located within the State Designated Floodway, with the exception of Spoil Area 2.

2.1.1 Channel Excavation

The majority of channel excavation upstream of the Antelope Boulevard/Highway 36 Bridge would occur along the toe of the bank within the ordinary high-water mark (OHWM), leaving existing vegetation and trees along the bank to provide shade and canopy. Downstream of the bridge, the channel would be excavated in the barren cobble bottom of the slough. Heavy equipment would travel along the existing floodway corridor to minimize disturbance to existing vegetation and sensitive areas. Larger rocks and boulders excavated from the channel would be set aside and placed in the newly excavated channel to provide instream habitat structure. Large woody material may also be placed in the channel to provide habitat complexity.

The proposed channel design consists of excavating material from five distinct features including the main entrance, high-flow entrance, main channel, secondary channel, split channel, and 'downstream of bridge' channel. An estimated 87,500 cubic yards of material would be excavated from an area of approximately 20 acres. **Table 2 Excavation Area, Quantity, and Associated Truckloads for Each Channel Feature** summarizes the estimated amount of material that would be excavated from each channel feature and the number of truckloads required to remove the material from the channel.

Table 2 Excavation Area, Quantity, and Associated Truckloads for Each Channel Feature

Channel Feature	Area of Disturbance (acres)	Estimated Amount of Excavated Material (cubic yards)	Number of Truckloads*
Main Entrance and Upstream of Bridge Channel	2.3	11,700	585
High-Flow Entrance	0.2	1,500	75
Secondary Channel	2.2	10,500	525
Split Channel	2.9	16,800	840
Downstream of Bridge Channel	10.6	47,000	2,350
TOTAL	**18.2**	**87,500**	**4,375**

* Assuming 20 cubic yards per truckload.

Excavated material from the channel would be spoiled onsite within designated spoil areas or where contouring is needed, or hauled to pre-determined off-site locations (including an existing quarry and stockpile yard) within 5 miles of the Project area. Excavated material from the channel entrances may be spread within the slough channel if flows preclude the transport of spoil material out of the channel.

2.1.1.1 Main Channel Entrance

The main channel entrance is located along the left bank of the Sacramento River. The 20-foot-wide main channel entrance would be excavated to an elevation of about 248 feet North American Vertical Datum 88 (NAVD 88), where water in the main channel would be approximately one foot deep at a design low flow of 5,000 cfs in the Sacramento River (as measured at the Sacramento River at Bend Bridge stream gage). At the design low flow, the main channel would flow at about 15 cfs, representing less than one percent of the total flow within the Sacramento River. The side slopes of the main channel entrance would be lined with larger rock to stabilize the banks at a slope of 3:1 or greater. If suitable material is available, rock would be obtained from the excavated channel material. Otherwise, rock material that has been cleaned and is free from organic matter or other deleterious substances would be imported from an existing local quarry.

2.1.1.2 High-Flow Entrance

The high-flow entrance, located about 200 feet downstream from the main channel entrance, would be excavated to an elevation of about 250 feet (NAVD 88). The 10-foot-wide high flow entrance would activate at a Sacramento River flow of 8,000 cfs at the Sacramento River at Bend Bridge stream gage. At this flow, the high-flow entrance would add about 1 cfs to the main channel.

2.1.1.3 Main Channel

The 20-foot-wide main channel would be excavated to have 2:1 side slopes for a depth of 2 feet, then would transition to a 3:1 side slope or greater. The new channel would be constructed along the toe of the existing bank to minimize disturbance to existing vegetation. The channel would meander downstream along the left bank for approximately 2,200 feet before splitting into two channels.

During excavation, existing historical bridge piers located within the main channel would remain intact and would be avoided during construction (see **Photo 2-5**). An existing demolished car would be removed and disposed of properly prior to the start of excavation.

2.1.1.4 Secondary Channel

The secondary channel would be excavated to create a 10-foot bottom width with 3:1 side slopes and would activate when flows in the Sacramento River measure 13,000 cfs at the Sacramento River at Bend Bridge stream gage. The secondary channel would meander through an existing scour channel and merge into the split channel (described below) upstream of the Antelope Boulevard/Highway 36 Bridge. The secondary channel would add approximately 4 cfs to the main channel when flows in the Sacramento River measure 13,000 cfs at the Sacramento River at Bend Bridge stream gage.

2.1.1.5 Split Channel

A portion of the flow from the main channel would travel southwesterly in an excavated 8-foot-wide channel with 3:1 side slopes or greater. The remaining flow from the main channel would continue to travel along the left bank in an excavated 12-foot-wide channel with 3:1 side slopes or greater. The split channel would be approximately 1,300 feet long and merge back into one 20-foot-wide channel downstream of the Antelope Boulevard/Highway 36 Bridge.

2.1.1.6 Antelope Boulevard/Highway 36 Bridge

Excavation would be required under the Antelope Boulevard/Highway 36 Bridge. The California Department of Transportation (Caltrans) performed an initial scour analysis of the bridge and the proposed Project design and determined that no adverse impacts to the bridge would occur. Caltrans recommended the following**:**

1. Construct engineering guide banks at the inlets and outlets for both the smaller and the larger channels to avoid any migration of the thalweg into the spans adjacent to the proposed channels.
2. Properly encapsulate all H-piles of the affected bents in order to prevent corrosion related to their contact with water, which would be expected to occur.
3. Install concrete lining (or similar revetment material) in the channel rather than a rock mattress and tie the channel bottom to the existing concrete curtain walls between the H-piles, if scour analysis indicates this is necessary.
4. Establish maintenance requirements for project-developed channels and the guide banks.

Existing slabs of broken concrete under the bridge would be removed and hauled offsite to the Tehama County landfill. The large boulders under the bridge would be removed and later placed in the channel to provide instream habitat structure. Guide banks at the inlets and outlets would consist of large rock engineered by Caltrans and installed according to Caltrans specifications. Excavation under the bridge would occur in two locations between two bridge bents and three bridge bents, respectively. Bridge bents consist of a row of H-piles with suspended concrete walls that span the width of the bridge and are spaced 22 feet apart. H-piles would be encapsulated with a marine-grade reinforced epoxy coating made of low toxicity ingredients. The channel would be over-excavated and lined with large rock, unless the Caltrans scour analysis indicates that concrete lining is necessary. If suitable material is available, rock would be obtained from the excavated channel material. Otherwise, rock material that has been cleaned and is free from organic matter or other deleterious substances would be imported from an existing local quarry. The existing suspended concrete walls between the H-piles would remain but would be lowered to the channel grade. Maintenance requirements for the channels and guide banks are discussed in *Section 2.2 Channel Maintenance*.

2.1.1.7 Downstream of Bridge Channel

The 20-foot-wide channel would continue downstream of the Antelope Boulevard/Highway 36 Bridge for approximately 6,000 feet before flowing back into the Sacramento River. The landscape below the Antelope Boulevard/Highway 36 Bridge is a wide and barren flood channel that provides significant opportunities for floodplain development. Excavation within this section of the channel was designed to create 2:1 side slopes for a depth of 2 feet and then gentle slopes of 6:1 and greater for floodplain habitat. Because test pit results indicate that portions of the channel consist mostly of sand, the channel would need to be over-excavated and backfilled with existing gravel.

2.1.2 Materials Sorting

An estimated 87,500 cubic yards of material would be excavated during construction (see **Table 2 Excavation Area, Quantity, and Associated Truckloads for Each Channel Feature**). For the purposes of the environmental impact analysis (see Chapter 3.0 Environmental Checklist), it is assumed that up to 100,000 cubic yards of material would be excavated from East Sand Slough. Of that amount, approximately 5 to 10 percent of the material would consist of overburden such as plant material that would be disposed of. The remaining approximately 90,000 cubic yards of material would consist of sand and gravel and would be sorted using a Chieftain 2100 powerscreen or equivalent. Gravel typically weighs 2,800 pounds per cubic yard, and 90,000 cubic yards of gravel weighs approximately 126,000 tons. Depending on feed size, mesh size, and material type, the powerscreen can process up to 600 tons per hour. Assuming 90,000 cubic yards of gravel for the purpose of estimating the maximum processing time and considering that processing would be limited to 8 hours per day, it would take approximately 30 days to process the excavated material.

Gravel would be processed onsite in a designated spoil area, staging area (described below), or portion of the slough channel. Suitable larger rock and boulders would be placed along the side slopes at the main channel entrance and within the Antelope Boulevard/Highway 36 Bridge section of the channel to eliminate any potential for erosion or scour. Downstream of the Antelope Boulevard/Highway 36 Bridge, the remaining gravel/cobble would be used to line the channel bottom. Sand and silt may be used for planting.

The remaining material would be disposed of in designated spoil areas or hauled to pre-determined offsite locations within 5 miles of the Project area.

Test pit results indicate that excavated material would yield enough rock to meet the Project's needs. However, if additional material is needed, it would be imported from an existing stockpile location located on USFWS land approximately 8.5 miles from the Project area.

2.1.3 Utility Relocation

There are five utilities lines within the Project area**.** The utility lines, which include a water main, sewer main, gas line, electric line, and telecommunications line, are described below.

2.1.3.1 Water Main

An underground City of Red Bluff 16-inch C-905 PVC water main crosses East Sand Slough. The water main is located upstream of the Antelope Boulevard/Highway 36 Bridge and is approximately 7 feet below proposed post-Project finish grade. Although there is sufficient cover, trench plates would be placed over the water main as a precaution to ensure that the heavy machinery will not adversely affect the pipe.

2.1.3.2 Sewer Main

A City of Red Bluff 6-inch steel sewer main is located immediately downstream of the Antelope Boulevard/Highway 36 Bridge and was originally placed 4 feet below existing ground level. Scour has occurred over time and the pipe's depth now varies. The sewer line is exposed along the right bank of East Sand Slough; concrete has been poured on top of this portion of the line to stop a leak. At this location, the proposed Project design would require 7 to 8 feet of channel excavation to finish grade. The sewer line would therefore need to be lowered 10 or more feet. During this process, flow to the line would be temporarily stopped, sewage would be pumped from the line, and the site would be excavated around the line. All excavated materials would be stockpiled onsite. The line would be cut, and excavation would continue to a minimum of three feet below the bottom of the new side channel. New pipe would be installed and tested, and flows would resume. Once the new pipe is confirmed to be free of leaks, the site would be backfilled with the excavated material. All contaminated soil and sewer pipe would be hauled to a pre-determined location permitted to handle contaminated construction debris.

2.1.3.3 Gas and Electric Lines

A Pacific Gas and Electric (PG&E) gas line and electric line are located downstream of the Antelope Boulevard/Highway 36 Bridge**.** The gas line is a 6-inch diameter steel pipe. The 12-kilovolt electric line runs through a 5-inch ABS pipe. Both utility lines would be lowered by PG&E. Electricity would be turned off and the gas line blocked off on both sides of the line to isolate the work area. Gas within the line would then be removed. An excavator or vacuum truck would excavate down to the gas and electric lines and all excavated materials would be stored onsite. PG&E personnel would remove the electrical conduit/line and the gas pipe. PG&E crews would continue excavation down at least three feet below the bottom of the new side channel. New electrical conduit would be installed, and the lines replaced. New steel gas line would be installed, and all replaced utility infrastructure tested. Once the function of the utilities is confirmed, the

site would be backfilled with the excavated materials. The excavated materials would then be replaced and compacted back to existing ground level.

2.1.3.4 Telecommunications Line

An AT&T 12-duct telecommunications line crosses East Sand Slough upstream of the Antelope Boulevard/Highway 36 Bridge. The 12-duct system consists of twelve 4-inch diameter pipes that hold fiber optics and copper wire. Only six ducts are in use. The line would either be lowered by AT&T using one of two methods. The first method would use an excavator to unearth the line in two locations. The unused six ducts in the line would be spliced and extended, then lowered a minimum of 3 feet below the proposed channel bottom. Approximately 1,000 feet of new line would be pulled through the lowered 6-duct line; the lowered line would become the active line. The formerly active 6-duct line would then be removed. The second method would consist of replacing the entire line from one existing manhole to another at opposite edges of the slough either by directional boring or excavation. Where excavation is required, the site would be backfilled with excavated material and regraded to existing ground level.

2.1.4 Staging Areas

Two areas have been identified for staging. Staging Area 1 would be located on Forest Service managed land outside of the floodway in an area adjacent to an existing small parking lot along Sale Lane. This 1.4-acre area would primarily be used to refuel equipment, store equipment and construction supplies, and stockpile excavated material, if needed. Staging Area 2 would be located within the slough just upstream of the Antelope Boulevard/Highway 36 Bridge. Staging Area 2 would be approximately 0.8 acres in size. Disturbed areas would be planted and/or hydroseeded following project construction.

2.1.5 Spoil Areas

Two spoil areas would be developed on lands managed by USFS. Material spoiled in these areas would be spread outside of the dripline of existing trees and elderberry shrubs.

Spoil Area 1 would be just under 8 acres and located within the floodway. Spoil Area 1 would be used as both a stockpile and spoil location. A temporary access road connected to Sale Lane would be created within Spoil Area 1 to allow dump trucks direct access to stockpile materials for loading. An existing fence along Sale Lane would be altered to allow direct access and would be restored to pre-Project conditions following completion of truck haul activities. Approximately 12,500 cubic yards of material could be permanently placed in Spoil Area 1. Modeling results confirm that spoils in this area would not impact the 100-year flood elevation. Up to 3 feet of spoils would be placed in this area to an elevation of 262 feet with 2:1 side slopes.

Spoil Area 2 would be located along Interstate 5 (I-5). This spoil area would be approximately 1.6 acres in size and located outside the floodway. Within this spoil area, approximately 17,000 cubic yards of material could be placed along the existing bank to an elevation of 268 feet with 3:1 side slopes.

Both spoil areas would be planted and/or hydroseeded with vegetation that is compatible with the spoil material following construction.

The remaining approximately 60,500 cubic yards of spoil material would be hauled to pre-determined offsite locations within 5 miles of the Project area.

2.1.6 Access Roads

The Project area would be accessed via I-5, Antelope Boulevard, and Sale Lane. Four temporary access roads would also be used. The upper access road would be constructed to extend an existing road from Durango RV Park (under the I-5 Bridge) to just upstream of the Antelope Boulevard/Highway 36 Bridge. This road would be accessed via Antelope Boulevard to Belle Mill Road to East Avenue to Lake Avenue. The road would be accessed via the Durango RV Park during utility relocation, but otherwise would only be used on occasion by small vehicles transporting construction management personnel to the upper portion of the Project area. During channel excavation, the access road would also be used, but would be accessed via the slough rather than through the Durango RV Park.

The middle and lower access roads would be 12 feet wide and would be used for heavy equipment access. The middle access road, which would be accessed from Sale Lane, would consist of an existing 400-foot-long dirt road located on private land and lands managed by USFS. Use of this access road would be contingent upon landowner permission.

The two lower access roads would also be accessed from Sale Lane. The first lower access road, as described in *Section 2.1.5 Spoil Areas*, would be created within Spoil Area 1 to allow dump trucks direct access to stockpile materials for loading. An existing barbed wire fence that parallels Sale Lane would be cut in two locations and temporary access roads would be created to allow access into the spoil area. The fence would be repaired once construction is completed. The second lower access road would consist of an existing 2,000-foot-long dirt road located on lands managed by USFS. The existing dirt road crosses a hiking trail before dropping down into East Sand Slough. Minimal grading may be required in this area to access the slough. Little to no earthwork would otherwise be needed to make these access roads suitable for construction equipment. Any disturbed areas associated with use or slight modification of the access roads would be planted and/or hydro-seeded as appropriate once construction is completed.

2.1.7 Floodplain Planting

The newly created channel downstream of the Antelope Boulevard/Highway 36 Bridge would have gentle side slopes of 6:1 or greater, creating areas of floodplain habitat for planting. Floodplain planting would consist of native, flexible-stemmed plant species that would not impede flood flows. Suitable plant species could include sandbar and arroyo willows, mule fat, California rose, and numerous perennial herbaceous species. Planting would be implemented where the resulting floodplain substrate and depth to water after excavation are appropriate to establish and maintain the plantings. Irrigation is not anticipated to be necessary; however, if plantings demonstrate signs of water stress during the growing season, irrigation water may be drawn from the slough and applied via portable water pump or small water truck until the plantings develop root systems that can access the water table. If necessary, irrigation may occur for up to three years. Willow plantings would consist of cuttings collected onsite; potted stock and/or plugs would be used for other plant species.

2.1.9 Construction Sequencing

Channel excavation activities would occur in three phases. During Phase I, the underground sewer line, electrical line, gas line, and telecommunications line would be lowered. These activities are anticipated to begin September 2019 but are dependent on permit acquisition. If September 2019 is not feasible, these activities are anticipated to begin June 2020.

During Phase II, the East Sand Slough channel bottom would be excavated to a rough grade starting 100 feet from the terminus of the slough to 100 feet from the entrance to the slough. Construction activities associated with bridge protection under the Antelope Boulevard/Hwy 36 Bridge would also be completed. Phase II construction is anticipated to occur under dry conditions from August through October 2020. Excavation of the lower channel downstream of the Antelope Boulevard/Highway 36 Bridge may occur as early as June or July 2020 in areas where vegetation is sparse and sensitive biological resources have not been identified.

During Phase III, final construction would occur. The secondary channel, which is designed for a higher flow, would be excavated all the way to the entrance. Once excavation of this channel is complete, the remaining 20 yards at the proposed outlet would be removed. The main channel entrance would be the last area excavated. Once excavated, the water depth would be shallow enough to allow heavy equipment to drive out of the channel. Phase III construction is anticipated to occur during the dry period and would begin September 2020. Final excavation of the channel outlet and channel entrances would occur between October 1st and March 1st when flows within the Sacramento River are reduced. Truck hauls associated with the transport of spoil material from Spoil Area 1 may also continue through March 1st. Floodplain plantings would be installed following Phase III construction during the season appropriate for installation of plantings and cuttings, typically in late winter/early spring.

2.2 Channel Maintenance

The proposed channel is located within a regulatory floodway. A regulatory floodway is designed to carry flood flows during high flow events to reduce the chance of flooding in the surrounding area; it is therefore important to maintain the channel as a floodway. If natural recruitment of vegetation within the slough is so successful that it impedes flood flows, vegetation clearing would be required in some areas so that the floodway can continue to function as designed. Vegetation removal would not occur between March 1 and August 31.

The entrances and exit of the channel have the greatest potential to require future maintenance. The velocity in the channel entrance would be much lower than the velocity in the mainstem Sacramento River. As flood flows recede, the suspended sediment in the mainstem could settle out in the entrances to the side channel due to lower velocities in the channel. At the exit of the channel, the Sacramento River widens and velocities are greatly reduced. These flow conditions could potentially cause deposition at the channel exit. If maintenance is required to convey design flows into East Sand Slough, maintenance would consist of excavating the entrances, exit, and/or channel to the design grade. Excavation would occur between October 1st and March 1st when flows within the Sacramento River are reduced.

Maintenance under and around the Antelope Boulevard/Highway 36 Bridge may also be required. If the guide banks shift, the large rocks would be repositioned as designed. If the epoxy/concrete encapsulation on the bridge bents peels or becomes damaged, the epoxy/concrete would be reapplied. If required, bridge maintenance is anticipated to occur during September. Caltrans would continue to be responsible for debris removal along the bridge bents.

2.3 Recreation Enhancement and Expansion

The construction details associated with the Recreation Enhancement and Expansion component are described below.

2.3.2 Trail Expansion

A 2,500-foot extension of an existing 8-foot-wide bicycle and pedestrian trail would be constructed from the trail's northerly terminus (located approximately 1,200 feet south of Gilmore Ranch Road) to an existing overlook area along Sale Lane (located approximately 250 feet south of Gamay Court). The trail expansion would require minor grading, compaction, and installation of the road base, and would disturb approximately 25,000 square feet (8-foot-wide pavement, 1-foot-wide road base shoulders). The road base would be covered with either concrete or a synthetic polymer mixed with aggregate. The trail expansion area would include interpretive and wayfinding signage and would comply with the Americans with Disabilities Act. A small amount of herbaceous vegetation would be removed during construction of the trail; disturbed areas adjacent to the trail alignment would be stabilized and seeded with native grasses following construction.

2.3.3 Boat Ramp Restoration

An abandoned 6,800-square-foot concrete boat ramp located adjacent to an existing parking lot would be removed and planted with native grasses.

2.3.5 Construction Sequencing

Proposed trail expansion would not be implemented until channel excavation is complete. The boat ramp restoration component could be implemented concurrently with channel restoration.

2.4 Anticipated Construction Equipment

A variety of vehicles and equipment would be used during project construction. Proposed project implementation is anticipated to require the use of the following equipment:

(2) scrapers
(4) excavators
(2) 35-ton dump trucks
(2) dozers
(2) roller screens
(1) concrete truck
(1) motor grader
(2) loaders
(1) gravel sorter
(1) 7,000-gallon off-highway water truck
(1) 4,000-gallon on-highway water truck
(4) walk-behind power trowels
(1) end dump truck
(1) float tractor

2.5 Environmental Commitments

Preventative measures were incorporated into the proposed Project's design to avoid or minimize potential adverse effects to the environment during construction. The boundary of Spoil Area 2 was revised to avoid a forested riparian wetland. Channel alignments were designed to avoid trees and bank vegetation, and construction activity areas were delineated to avoid elderberry shrubs. Construction sequencing was designed to avoid or minimize potential effects to the Sacramento River and existing roads were incorporated as access roads to minimize disturbance. Planting/seeding of disturbed areas post-construction was also incorporated into the Project design to minimize ground disturbance. During proposed Project construction, all construction activities would comply with required permits.