



Phase I- Complete: Plan Design, Compliance and Baseline Monitoring

Audubon and San Pablo Bay National Wildlife Refuge (Refuge) staff completed approximately 2 years of pre-construction monitoring including water and shore bird, upland bird and vegetation surveys. Approved staff of the Refuge completed pre-construction salt marsh harvest mouse, ridgway's rail, California black rail and soft bird's beak endangered/threatened species surveys. All necessary permits were acquired, engineering specifications were designed and approved and contractors hired.

Phase II: Construction (See Appendix 1 for figures and photos)

Summary of Work Completed

Construction of the Sonoma Creek Tidal Marsh Enhancement Project began July 27, 2015. By November 30th, 2015, Audubon's contracted construction crew, Hanford ARC (Hanford), constructed a 5,000ft long, permeable access road along the central channel alignment, excavated over 40,000 cubic yards of saturated marsh material to create a 4,560ft long drainage channel, and built 22 high tide refuge marsh mounds and a 9 acre transition ramp with the excavated material.

Channel Excavation

By October 30th Hanford had excavated the southern half of the channel over 2,300ft from the channel southern endpoint to channel midpoint (Figure 1), excavating and transporting material simultaneously as access road material was removed. Before excavating the northern segment of the channel from Sonoma Creek back to the midpoint, a turbidity curtain was installed to catch free floating sediment and discourage entrance of marine wildlife. In 3 days, Hanford excavated the channel mouth 50ft wide to a depth of -1 NAVD88 and installed a 10,000 gallon temporary Aquadam to inhibit wildlife access to the construction site. 1/32 inch mesh screen was installed over preexisting channels connected to the construction site to prohibit the entrance of fish and marine wildlife into the construction site. The remaining 2,260ft of main channel alignment was excavated and material was placed in high tide refuge (i.e. marsh mounds and transition ramp). After the main channel excavation was complete, and northern and southern sections joined, Hanford precut a small channel to drain the access road depression, and removed the Aquadam and turbidity curtain from the channel mouth to reinstall it at the access road connection channel point to discourage wildlife entrance while the access road channel was being excavated. All mesh screens and wildlife prohibiting material were removed by 11/30/2015, and wildlife now have full access to the main channel alignment.

High Tide Refugia

In addition to the main channel's development, Hanford built 22 high tide refuge marsh mounds and deposited soil in approximately 2,600 linear feet of the transition zone. The 18 marsh mounds are built no more than 20 ft from the channel alignment edge along the length of the entire channel. They are approximately 25ft width because of excavator reach limitations and are varying length up to 100ft long, together totaling approximately 1.25 acres off marsh interior high tide refuge for wildlife. The high tide refuge transition zone or ramp, is estimated at approximately 8.5-9 acres. Because Hanford finished construction of the original bid 2 weeks ahead of time (mid November 2015), they were able to move forward with work projected for 2017. Using the heavy machinery they already had on site, Hanford spread the transition ramp material to an unprecedented 40ft L: 1ft H (40:1) slope, creating a 2,600 ft long x 120 ft wide gently sloping ramp for wildlife use in high tide and storm events and sea level rise. Hanford returned the access road rock material back to the staging zone, laid excess excavated material on tops of the levee separating marsh from adjacent farm, restructured levee access points to original slopes and created a drainage ditch on the farmland side of the levee to assist the farmer in removing saltwater seepage from his fields.

Summary to Date:

Phase	Project Specs.	Percent Completion (%)
Phase I: Pre Construction Monitoring, Design & Permits	Complete	100%
Phase II: Construction	By 11/30/2015	
Access Road	Over 5,000ft built	100% built- pending removal
Main Channel	4,560ft excavated	100% material excavated
Marsh Mounds	22 constructed	100% constructed
Transition Zone	Material placed approximately 2,000ft long x 120 ft wide-slope avg. of 40ft L:1ft H	100% material placed, T.Z. dimensions revised, proposed shaping 2016
Phase 3: Post-Construction Monitoring	Begins 1/05/2015	0%

Appendix 1:

Figure 1. This drawing represents the completed work on the Sonoma Creek Enhancement Project as of 11/30/30/2015. This image is not drawn to scale. Blue aspects represent the main channel alignment, access road channel, and lateral starter channels that now allow natural tidal fluxuation and drain water off of the once inundated marsh. Green aspects represent high tide refuge in the form of 22 marsh mounds on the marsh and approximately 9 acres of transition ramp (only part of which is shown on the figure below) placed on the marsh from material excavated from the main channel. These elements provide habitat for wildlife in high tide and flood events and are precedential in sea level rise habitat resiliency.

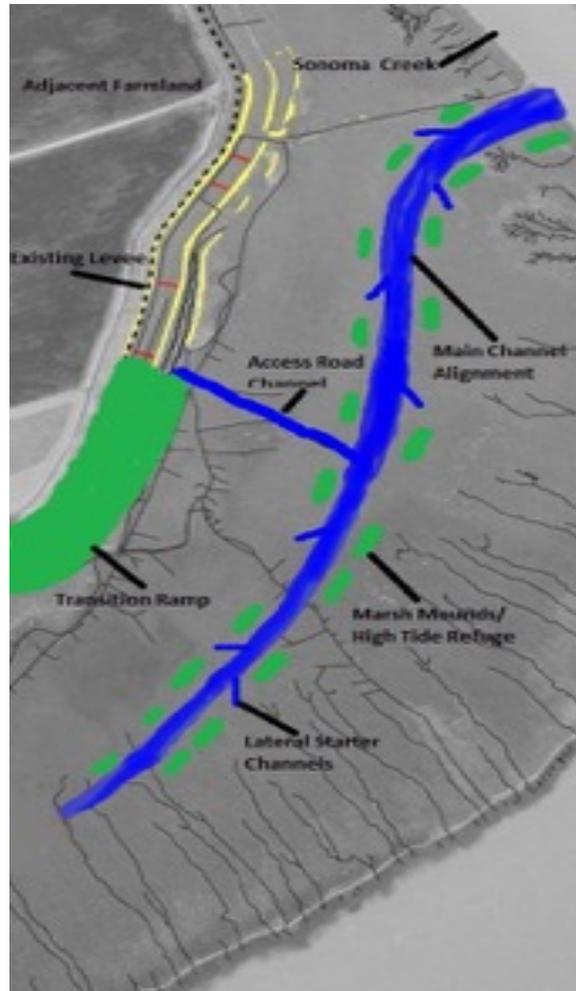


Figure 2. Pre-construction meeting and biological training were held by the San Pablo Bay National Wildlife Refuge staff to teach Hanford's construction crew. The crew learned how to identify and flush endangered and threatened species (especially salt marsh harvest mouse adults and nests) from the marsh construction zone prior to work.



Figure 3. After being trained in marsh flushing techniques for wildlife protection, the Hanford team flushed the marsh just ahead of the clearance crew which removed vegetation. This ensured that species of concern did not return to the work area as the access road was built and machinery brought in for channel construction.



Figure 4. Over 14,000 tons of drain rock was brought into the staging area by Hanford for construction of the permeable “floating” road that is used to access and excavate the channel alignment.



Figure 5. Hanford designed and constructed a 18"-24" thick, permeable access road from adjacent farmland levee to the center of the marsh and Sonoma Creek Enhancement Project Area. All road material was removed simultaneously with Hanford's excavation of the main channel.



Figure 6. Once the access road was laid, Hanford continued the road south towards the endpoint of the main channel. When completed, the access road to and along the main channel alignment reached just under 1 mile in length.



Figure 7. Hanford excavated the southern end of the main channel alignment with an approximately 16ft top width and 5ft depth. The channel top width gradually widens as the channel nears Sonoma Creek to 50 ft top width and 7.5ft depth from marsh elevation. Because of difficult construction conditions and substrate consistency, the side slopes were modified from a 1:1 to a 3:1 slope ratio to ensure channel banks do not slump more than expected.



Figure 8. 22 marsh mounds have been built from the soil material excavated from the channel. Marsh mounds will offer high tide refuge for marsh wildlife adjacent to the channel alignment.

This is one of Sonoma Creek Enhancement Projects climate change habitat resiliency modifications.



Figure 9. An exclusion curtain was placed to inhibit the access of marine wildlife such as fish and mammals into the construction zone and stop suspended sediment from entering Sonoma Creek and San Francisco Bay.



Figure 10. At its widest point, the channel mouth connection point at Sonoma Creek, the channel alignment reaches over 50ft top width and is 7-7.5 ft deeper than marsh elevation.



Figure 11. This Aquadam was installed by Hanford A.R.C. as a secondary precaution beyond the placement of the turbidity curtain. This dam moved with the tides but maintained a constant seal at the channel mouth to trap suspended sediment and inhibit access of fish and marine mammals into the construction zone from Sonoma Creek.