

Final Report
Emergency Action - Castlewood Broken Concrete Debris Removal

1. Project Purpose

Zone 7 of the Alameda County Flood Control and Water Conservation District (Zone 7) set out to remove the detached and suspended portions of the failing in-stream concrete structure located in Arroyo de la Laguna at the Castlewood Country Club pedestrian crossing. These pieces of the failed structure presented an obstruction to channel flow, and an imminent flood threat. There was serious concern that large pieces would migrate downstream and cause a threat to public health and safety. Work was conducted by a contractor under agreement with Zone 7 to assure permit conditions are met.

The project was completed in compliance with the following:

- CDFW Routine Maintenance Agreement, 1600-2010-0201-R3
- USACE 404 authorization, File Number 2013-00347S
- RWQCB 401 certification, Regional General Permit 5 (pending)

2. Project Construction / Outcome

Construction commenced on October 1, 2013 and was largely complete within the first week, with final work and clean-up in week 2. The construction crew and all equipment was offsite by October 11, 2013. Qualified biologists were onsite during work to ensure no impacts to California Red Legged Frogs, or other species; No impacts were observed or suspected. Work commenced as described in Section 6, Proposed Action.



Post-Construction view. Note that all in-stream concrete debris has been removed while stable sections remain on either bank.

Photo date: October 10, 2013.

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3. Background

The concrete structure historically served as a protective cap for three water pipelines that formed part of the water supply system to both Castlewood Country Club and the 190 +/- residences in the immediate area. The structure had been deteriorating for some time, and the collapse of the structure in December 2012 resulted in an immediate threat to the continued supply of water to the area for potable uses and fire protection.

The domestic (or potable) water supply for the Castlewood Country Club and the residences are part of a County Service Area (CSA) known as CSA R-1961-1. The CSA is responsible for ongoing maintenance and operations for the sewer, water and road system in the CSA. The Alameda County Public Works Agency is under contract to provide these services for the CSA. In turn, the City of Pleasanton's water department is under contract with the Public Works Agency to actually provide water and sewer services to the CSA since Public Works does not have expertise in utilities. Because the CSA does not involve storm services, Alameda County Public Works Agency does not hold a Routine Maintenance Permit for these activities which are, however, within Zone 7's Flood Protection Area.

Following the collapse of the structure, the City of Pleasanton on behalf of Castlewood and the CSA put in place a temporary emergency supply system to maintain delivery of both potable water and fire service to the area (there being no backup system available west of the Arroyo), and then worked to complete a permanent solution in summer of 2013. The concrete structure no longer served to protect pipes crossing Arroyo de la Laguna. Some movement of the concrete was noted after the last rainy season, which was fairly mild, raising concern about its stability. The structure showed signs of movement over a rainy weekend in September 2013, which saw only a few hours of rainfall.

4. Pre-Construction Site Conditions

This failed concrete structure was unstable. Large sections of the concrete slab were either completely detached - or attached only along the sides but no longer supported underneath, such that typical summer flow was completely below the suspended structure. Portions had apparently been mobilized in higher flow events. In this condition, it doesn't function as an apron, grade control structure, or otherwise.

These detached and suspended sections can be divided into three "Work Areas", as described in Table 1, and identified in Figures 1 and 2.

Table 1: Work Area descriptions

Work Area	Description	Approximate size
1	Unsupported, suspended section of concrete slab; partially broken and with flow beneath	50-ft. x 18-ft. x 7-in.
2	Detached section of concrete slab mostly out of waterline	11-ft. x 7-ft. x 7-in
3	Detached section of concrete slab and grout, resting top side down, with flow beneath	35-ft. x 7-ft. x 4-ft.

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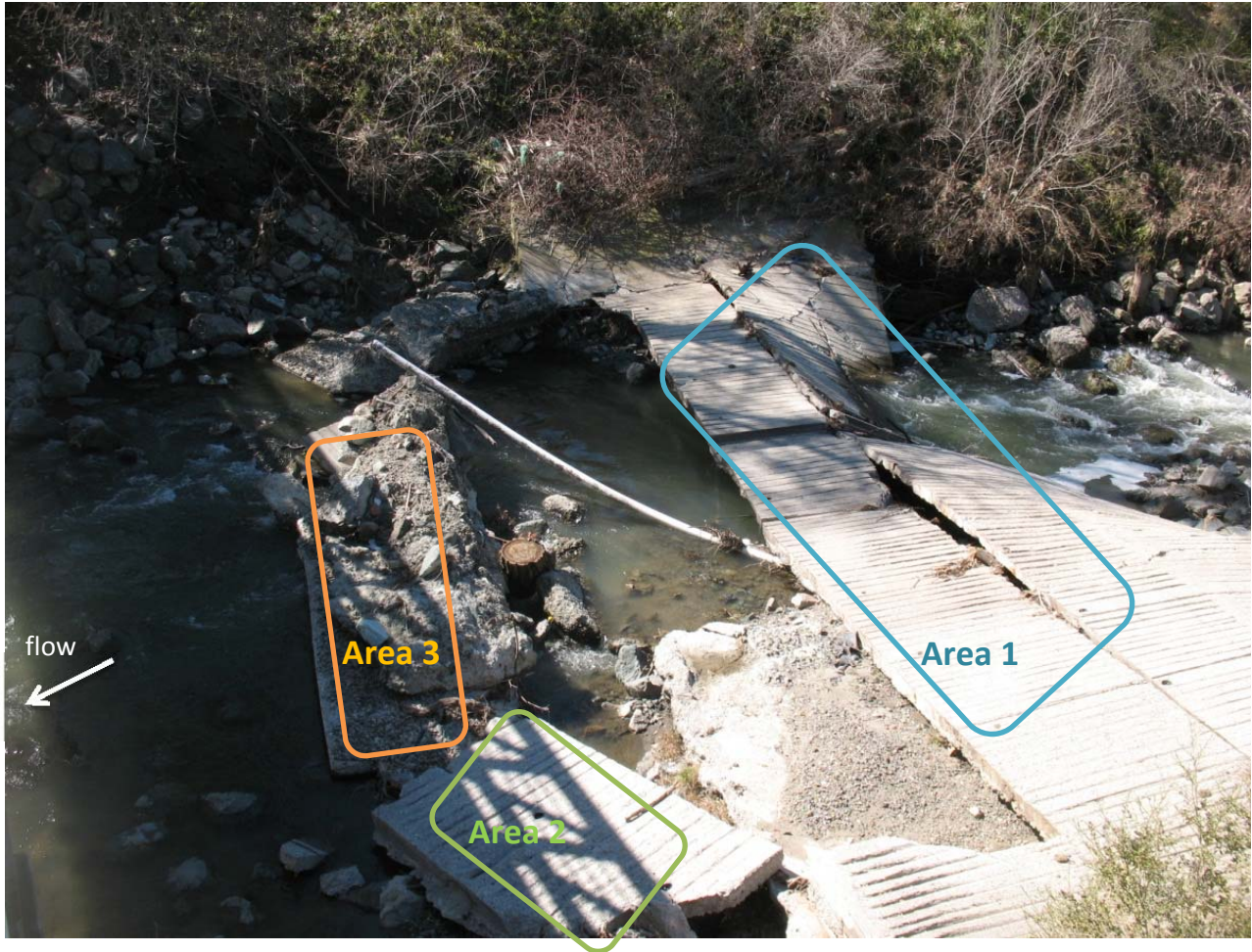


Figure 1. Castlewood Concrete Structure Proposed Work Areas
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Figure 2. Upstream View of Castlewood Concrete Structure Work Areas

Photo date: 3/20/2013

Both upstream and downstream of the concrete structure, there were significant areas of riprap and miscellaneous concrete debris concentrated along the channel banks and throughout the channel bottom (Figure 3). We expected to find similar riprap and debris along the channel bottom beneath the structure.



Figure 3. Upstream (left) and Downstream (right) Surroundings. Notice the abundant rip rap and concrete material in stream that is not associated with this concrete structure.

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5. September 21, 2013 Storm Effects

The short rainfall on Saturday, September 21 resulted in some changes to the failed structure, confirming that these slab pieces are unstable and could be mobile during storm flows. See Figures 4 and 5.



These changes occurred as a result of a slight increase in flow.

For reference, flow in Arroyo de la Laguna peaked at 429 cfs on September 21; a two-year storm event would be about 4,200 cfs.

Figure 4. New crack in slab. In Work Area #1, the downstream side of this section has dropped or shifted. Photo date: 9/23/2013



Figure 5. Woody debris jam. Side view (left) and upstream view (right) of Work Area #3, where four trees or limbs have become wedged and could cause a beaver dam effect. Photo on right further demonstrates how water is able to maneuver underneath the slab likely due to rip rap on channel bottom. Photo date: 9/23/2013

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6. Proposed Action

Zone 7 proposes the following activities and conditions as part of this maintenance work:

- i. Work will be limited to the removal of detached and/or unsupported concrete pieces in the channel (see limits of work shown Figure 6). Areas with intact and stable concrete, particularly along the banks, will be avoided so as to preserve any stabilization benefits those sections of concrete may have.
- ii. Survey 100-ft upstream and 100-ft downstream of the work area, both before and after work, to document that the channel bed has not been altered by this maintenance work.
- iii. No vegetation removal will occur.
- iv. Per the conditions in our routine maintenance permit with California Department of Fish & Wildlife, no work will occur in a flowing stream; water will be temporarily diverted around the job site (although this work is feasible in both wet or dry channel conditions) .
- v. The concrete pieces will be sawcut into manageable sizes and then removed from the creek by an excavator and placed on top of bank.
- vi. A backhoe will load pieces into trucks for off-hauling to a local concrete recycling facility.
- vii. Work is expected to take about 2 weeks, approximately October 1-15.

7. Creek Response, Contingency, and Future Monitoring

Flow has been able to meander underneath the suspended structure for nearly a year, and presumably these forces have allowed the channel grade to gently re-set to a new elevation throughout this reach. Because the proposed action did not entail removing embedded or structural elements in the channel, the action was not expected to impact grade or flow, or cause head cutting upstream.

Given this, no contingency plan was proposed for maintaining grade control. As needed, Zone 7 would collaborate with Castlewood (the landowner) and with the City of Pleasanton (the immediate upstream landowner) on a course of action.

More extensive monitoring of the project area following removal of the structure may yet be incorporated into an agreement with Castlewood.

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Figure 6. Limits of Work. The attached, stable areas of concrete on either bank will not be removed or altered.
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8. Additional Photos (Pre-Construction)



Figure 7. Additional perspective on Work Area #1. Notice how the section is suspended above the waterline. The PVC pipes in view are no longer in use.

Photo date: 9/12/2013



Figure 8. Additional perspective on Work Area #1, looking upstream. Notice how the section is suspended above the waterline and that there is little grade difference immediately upstream and downstream of the structure.

Photo date: 9/12/2013

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Figure 9. Additional perspective on Work Area #1, looking downstream. Notice that the uppermost part of this suspended section has broken apart midway due to lack of support underneath.

Photo date: 2/25/2013



Figure 10. View across the channel. Flow is from right to left in this view, and notice that summer flow passes underneath the main structure.

Photo date: 2/25/2013



Figure 11. View of Work Area #2. Notice that this slab is fully detached from the main structure and resting at an angle upon other materials, above the channel bottom and above the water line.

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Figure 12. View of Work Areas #2 and #3. Notice that this slab (work area #3) was overturned by the force of the channel flow last winter, and its mostly resting atop sediment and other rocks.

Photo date: 9/12/2013