

# ENTRIX

MEMO

**ENTRIX, Inc.**  
2140 Eastman Avenue, Suite 200  
Ventura, CA 93003  
(805) 644-5948

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**To:** Kate Rees, COMB  
Mary Larson, CDFG

**From:** Chip Blankenhorn

**Date:** April 14, 2004

**Re:** **As-Built Project Information**  
Jalama Road Fish Passage Enhancement Project  
Salsipuedes Creek, California

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This memo has been prepared to present the as-built project drawings and photographs for the Jalama Road Fish Passage Enhancement Project and monitoring data collected in 2004 following project construction. The objective of the project is to enhance passage for steelhead/rainbow trout immediately downstream of the Jalama Road bridge crossing along Salsipuedes Creek (Figure 1). Prior to the project, a concrete/bedrock grade control structure, which is situated approximately 70 feet downstream of the Jalama Road bridge crossing, acted as a physical barrier to steelhead/rainbow trout passage under low flow conditions due to the difference in height between the water surface in the downstream pool and the crest of the structure which is approximately 5 feet. The project enhances passage over the structure through the construction of 3 step-pools in the bedrock outcrop situated adjacent to the grade control structure along the right streambank (facing downstream). The step-pools provide a passage corridor for steelhead/rainbow trout by reducing the existing vertical barrier to a series of four 0.90-foot (maximum jump height) jumps and concentrating streamflows into the structure during periods of low flow. During high flows, a portion of the streamflow continues to flow through the project area as well as over the crest of the grade control structure and passage is provided through the structure and/or over the grade control structure depending on the magnitude of the flow.

The project construction information and monitoring data are presented in the following sections.

## **Project Construction and As-Built Information**

The project was constructed between November 18, 2003 and January 30, 2004 by C.A. Larsen, Company in accordance with the permit conditions provided in the following:

- Streambed Alteration Agreement #R5-2003-0037 issued by the California Department of Fish and Game;
- 401 Water Quality Certification issued by the Central Coast Regional Water Quality Control Board on November 5, 2003;

- Section 7 Consultation letter issued by NOAA Fisheries on October 30, 2003;
- Biological Opinion (1-8-03-F-39) issued by the U.S. Fish and Wildlife Service; and,
- Nationwide Permit Number 200300517-MWV issued by the U.S. Army Corps of Engineers.

With the exception of two modifications, the project was constructed in accordance with the final project design provided in the document entitled *Salsipuedes Creek – Final Design of Fish Passage Enhancement Project Downstream of the Jalama Road Crossing* dated October 31, 2003. The first modification involved the angle of the separator wall situated along left side (facing downstream) of the structure at the exit. In the final design drawing, the wall is angled at approximately 30 degrees toward the right bank (facing downstream) with respect to the downstream step-pool wall. During construction, the orientation of the wall was modified so that it is at the same orientation as the downstream step-pool wall. This modification was made to provide an unobstructed pathway for upstream migrants. The purpose of the separator wall is to provide a velocity shadow with respect to overall flow within the creek at the exit in order to minimize potential fallback of upstream migrants. The as-built design serves the same purpose as it will physically separate flows being conveyed over the grade control structure and through the structure at the exit. The area between the exit of the structure and the pool upstream consists of a straight, approximately 5-foot long run with a minimum depth of 1.5-feet at low flows.

The other modification involved the placement of concrete along the right bank (facing downstream) at the edge of the structure which was not specified in the original design. The concrete was placed within a bedrock depression to enhance the integrity of the structure and prevent the potential for stranding within the depression. The concrete is sloped toward the stream channel to direct flows into the structure.

The final pool dimensions and depths are provided in Table 1 and a pool control weir rating table is presented in Table 2. The as-built project layout and sections are presented in Figures 2 and 3. Photographs of the project including pre- and post-project photos are presented in Attachment A.

### **Monitoring Data**

In order to assess the project under different flow conditions, monitoring data was collected on January 29, 2004 at a flow of 1.80 cfs, on February 26, 2004 at a flow of approximately 54-63 cfs, and on February 28, 2004 at a flow of approximately 7.30 cfs. The following data was collected during each monitoring event:

- the jump height between the step-pools;
- the jump height between the downstream pool and the grade control structure;
- the stage over pool control weirs;

- the stage over the grade control structure; and,
- a qualitative description the hydraulic conditions within the pools and sediment deposition within the pools.

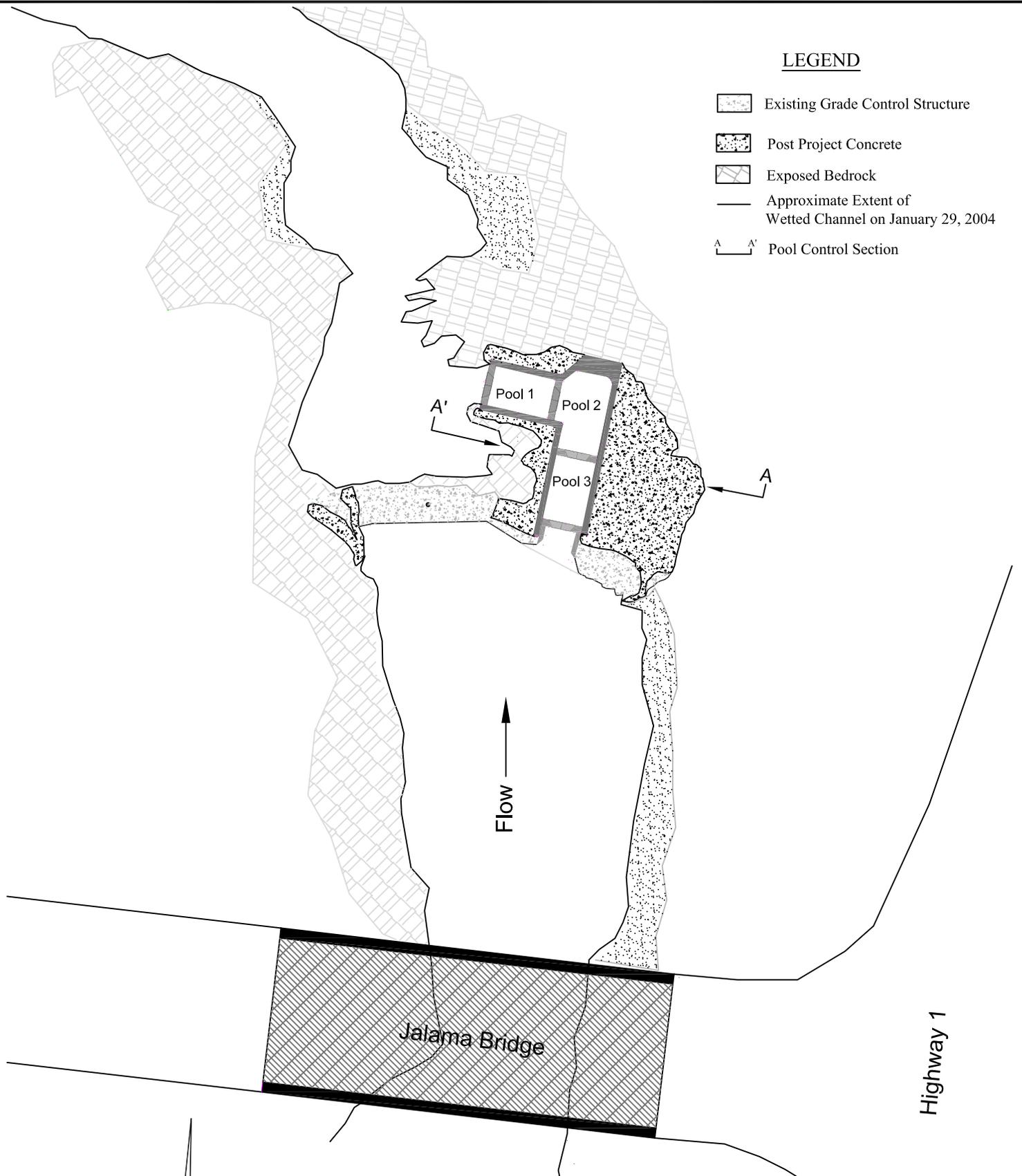
A summary of the jump height data and a description of hydraulic conditions and deposition within the pools is presented in Table 3, and a summary of the stage and flow information is presented in Table 4.

cc: Scott Engblom, COMB  
Allen Larsen, C.A. Larsen, Co.  
Justin Campbell, ENTRIX  
Kindra Loomis, ENTRIX

## **FIGURES**

**LEGEND**

-  Existing Grade Control Structure
-  Post Project Concrete
-  Exposed Bedrock
-  Approximate Extent of Wetted Channel on January 29, 2004
-  Pool Control Section



**ENTRIX**

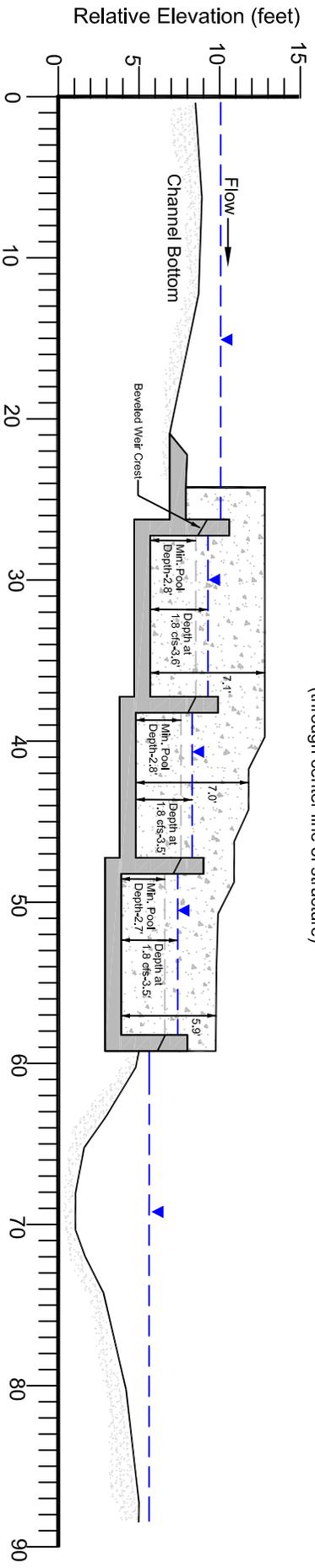
**FIGURE 2  
AS-BUILT  
SITE PLAN**

Cachuma Operations and Maintenance Board  
Salsipuedes Creek Fish Passage Enhancement Project  
Santa Barbara County, California

Project # 3080802    CK: JLC    DATE: 2/04

\*Note: Elevations are tied to a site-specific datum and coordinate system established by ENTRIX

SCALE IN FEET

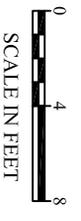
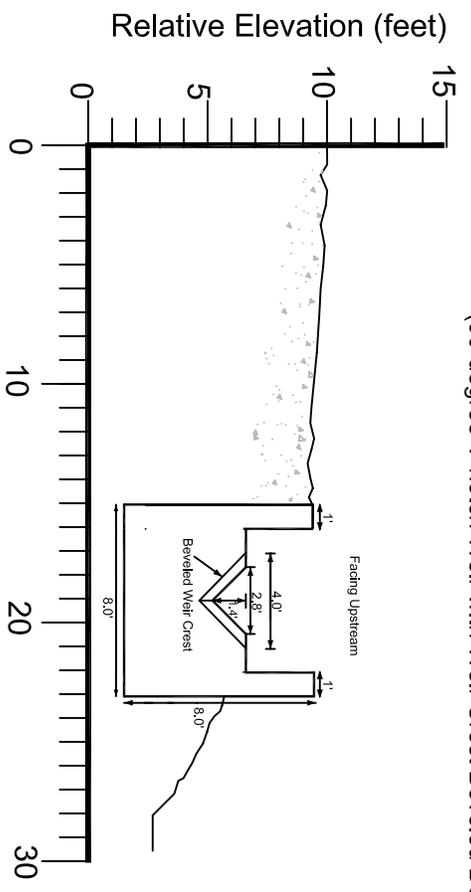


**Longitudinal Profile**  
(through center line of structure)

Note: Water surface elevations at the time of the survey on January 29, 2004. Streamflow at the time of the survey was 1.80 cfs based on gage readings at USGS Gage #11132500.



**Typical Pool Control Section**  
(90-degree V-notch Weir with Weir Crest Beveled Downstream)



**E N T R I X**

**FIGURE 3**  
**LONGITUDINAL PROFILE AND**  
**POOL CONTROL SECTION**

Cachuma Operations and Maintenance Board  
Salsipuedes Creek Fish Passage Enhancement Project  
Santa Barbara County, California

## **TABLES**

**Table 1. As-Built Pool Dimensions and Depths**

<b>Pool ID</b>	<b>Length (feet)</b>	<b>Width (feet)</b>	<b>Pool Depth at Minimum Flow (feet)</b>	<b>Pool Depth at Maximum Head on V-Notch Weir (feet)</b>
1 (most downstream pool)	9	6	2.7	4.1
2	12	7	2.8	4.2
3 (most upstream pool)	10	6	2.8	4.2

**Table 2. Pool Control Weir Rating Table**

<b>Stage Above Weir Crest (feet)</b>	<b>Estimated Flow* (cfs)</b>
0.1	0.0
0.2	0.0
0.3	0.1
0.4	0.3
0.5	0.4
0.6	0.7
0.7	1.0
0.8	1.4
0.9	1.9
1.0	2.5
1.1	3.2
1.2	3.9
1.3	4.8
1.4	5.7
1.5	6.7
1.6	8.2
1.7	10
1.8	12
1.9	14
2.0	16
2.1	19
2.2	21
2.3	24
2.4	27
2.5	30
2.6	33
2.7	36
2.8	39
2.9	42
3.0	46
3.1	49
3.2	53
3.3	57
3.4	60

\* Estimated flows for stages between 0 and 1.4 feet were calculated using the standard 90-degree V-notch weir formula and estimated flows for stages between 1.4 and 3.4 feet were calculated using a standard compound weir formula.

**Table 3. Summary of Jump Height Information Collected During 2004 Monitoring Events**

<b>Date</b>	<b>Flow recorded at USGS Gage #11132500<sup>(1)</sup> (cfs)</b>	<b>Estimated Jump Height Between Step Pools<sup>(2)</sup> (feet)</b>	<b>Estimated Jump Height over Grade Control Structure<sup>(3)</sup> (feet)</b>	<b>Comments</b>
1/29/2004	1.8	0.2	4.8	No sediment observed in step-pools and plunging flow conditions present
2/26/2004	59	0.0	3.5	Minor sediment deposition present along the step-pool margins and flows appear to be at or near transition between plunging and streaming flows
2/28/2004	7.3	0.0	4.5	Minor sediment deposition observed along step-pool margins and plunging flow conditions present

Notes:

- 1) USGS Gage #11132500 is situated approximately 80 feet upstream of the project site at the Jalama Road Bridge crossing.
- 2) Estimated jump height between step pools determined by measuring the difference in elevation between the water surface in the downstream pool and the weir crest for the upstream pool control.
- 3) Estimated jump height over grade control structure determined using a hand level and stadia rod to determine the difference in elevation between the pool situated immediately downstream of the structure and the crest of the structure.

**Table 4. Summary of Stage and Flow Information Collected During 2004 Monitoring Events**

<b>Date</b>	<b>Approximate Stage over Pool Control Weir Crests within Fish Passage Structure (feet)</b>	<b>Estimated Discharge Through Fish Passage Structure<sup>(1)</sup> (cfs)</b>	<b>Approximate Stage Over Grade Control Structure (feet)</b>	<b>Estimated Discharge Over Grade Control Structure<sup>(2)</sup> (cfs)</b>	<b>Total Estimated Streamflow Based on Design Calculations<sup>(3)</sup> (cfs)</b>	<b>Flow recorded at USGS Gage#11132500<sup>(4)</sup> (cfs)</b>
1/29/2004	0.75	1.2	0	0	1.2	1.8
2/26/2004	1.90	14	0.5	46	60	59
2/28/2004	1.40	5.7	0.05	1.5	7.2	7.3

Notes:

- 1) Estimated discharge through the fish passage structure determined using standard weir formulas for 90-degree V-notch and compound weirs.
- 2) Estimated discharge over grade control structure determined using the average of the range of flows calculated using the standard Cipoletti-weir formula, standard suppressed rectangular weir formula, and Manning's equation as discussed in the document entitled *Salsipuedes Creek - Revised Fish Passage Enhancement Project Downstream of the Jalama Road Crossing* dated October 27, 2003.
- 3) Total estimated streamflow determined using the sum of the estimated discharge through the fish passage structure and the estimated discharge over the grade control structure.
- 4) USGS Gage #11132500 is situated approximately 80 feet upstream of the project site at the Jalama Road Bridge crossing.

**ATTACHMENT A  
PROJECT PHOTOGRAPHS**



**Photograph 1** – Project site in April 2003 prior to project construction (facing downstream from the Jalama Road bridge crossing).



**Photograph 2** – Project site on January 29, 2004 following project construction (facing downstream from the Jalama Road bridge crossing).



**Photograph 3** – Project site in August 2003 prior to project construction (facing upstream toward the Jalama Road bridge crossing).



**Photograph 4** – Project site in January 2004 following project construction (facing upstream toward the Jalama Road bridge crossing).



**Photograph 5** – Facing upstream toward the exit of the structure at a flow of approximately 1.80 cfs.



**Photograph 6** – Facing downstream toward the exit of the structure at a flow of approximately 1.80 cfs.



**Photograph 7** – Facing downstream toward the entrance of the structure at a flow of approximately 1.80 cfs.



**Photograph 8** – Facing upstream toward the entrance of the structure at a flow of approximately 1.80 cfs.



**Photograph 9** – Facing upstream toward the exit of the structure at a flow of approximately 7.30 cfs.



**Photograph 10** – Facing downstream toward the entrance of the structure at a flow of approximately 7.30 cfs.