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Subject: Conceptual Plan and Cost estimate for Removal of Fish Passage Barrier at Cecchetti Road, Arroyo Grande, and Replacement with 180-Foot Bridge

## **INTRODUCTION**

This letter report presents the results of our analysis of the existing conditions for the creek crossing at Cecchetti Road on Arroyo Grande Creek, and includes preliminary design recommendations and a conceptual design and estimate of probable costs for improvement of the partial fish passage barrier at this site. The purpose of this project is to remove the existing concrete crossing and pipe culvert and replace them with a three-span concrete bridge in compliance with San Luis Obispo County Roadway Specifications and Ordinances. A previous 2006 Questa study described floodplain conditions and design considerations used for determining the structure type, and included geotechnical, hydraulic, and bridge scour analysis. The existing topography of the site was ground-surveyed by EDA, of San Luis Obispo, California, in September 2005. This report is a follow up to the preliminary hydraulic and engineering analysis completed for this creek reach by Questa Engineering.

## **SITE LOCATION**

The Cecchetti Road site is accessed from Lopez Drive, approximately 3 miles northeast of the town of Arroyo Grande, in San Luis Obispo County, as shown on **Figure 1**. Cecchetti Road is south of Lopez Road just east of its intersection with Corralitos Road. There are approximately 4.5 miles of good quality stream habitat upstream of the site along Arroyo Grande Creek, to just below Lopez Lake Dam.

## **FISH PASSAGE BARRIER ID**

Passage ID 142  
Barrier ID 700030

## **EXISTING CONDITIONS AND FISH PASSAGE BARRIER CONSTRAINTS**

The Cecchetti Road crossing of Arroyo Grande Creek consists of an existing concrete roadway over a 72-inch diameter corrugated metal pipe (CMP) culvert, as shown on

**Figure 1.** Cecchetti Road is a public road maintained by the County of San Luis Obispo. The project investigated an approximately 600-foot long reach of Arroyo Grande Creek. The existing roadway surface is located about 10 feet above the creek bed within a narrow, depressed floodway of Arroyo Grande Creek. The elevation of the floodway surface adjacent to the creek appears to be at an elevation at or just below the 10-year flood event, and is therefore periodically closed due to flooding. A second higher terrace borders the 10-year floodplain, but is still within the 100-year floodplain of Arroyo Grande Creek. Adjacent houses are located on a higher, older alluvial terrace, above the 100-year floodplain. According to Federal Emergency Management Agency (FEMA) floodplain maps, and verified by site observations and topographic maps, the 100-year floodplain is approximately 180 feet wide in the vicinity of Cecchetti Road.

The existing culvert pipe crossing represents a partial barrier to juvenile salmonid passage up Arroyo Grande Creek. There are two main reasons to consider replacing the existing culvert:

- 1) The culvert has a steep entrance ramp which creates high flow velocity at mid summer base flows and prevents juvenile passage.
- 2) The culvert traps sediment, disrupts bank full geomorphic response, and clogs easily with debris, and thus, has the potential to increase the frequency of roadway flooding.

## **HYDRAULIC ANALYSIS**

Hydraulic analysis completed by Questa consisted of modeling the flow regime through the investigated channel reach. Surveyed cross-sections were imported into HEC-RAS (Hydrologic Engineering Center River Analysis System version 3.1, 2002) hydraulic modeling software developed by the U.S. Army Corps of Engineers. The hydraulic model predicts flow velocity, water surface elevations, and water depths, among other hydraulic parameters. The geometries of the existing roadway crossing and 72-inch CMP culvert (at River Station 12+75) are also included in the model.

A series of peak discharges were used in the hydraulic modeling. The flow data are available for Arroyo Grande Creek at Huasna Road, approximately 1.5 miles downstream of Cecchetti Road., in the FEMA Flood Insurance Study (FEMA, 2004). These discharge numbers, representative of the peak flows at Cecchetti Road, are listed in **Table 1** below.

Using a simple graphical regression of these numbers, the 1.5- to 2-year flow falls around 150 cubic feet per second (cfs). This is the anticipated flow with a 50% chance of occurring any given year, and typically represents the scour line within the channel. Field measurements through the channel reach and upstream indicate that the scour line varies from 20 to 25 feet wide, with depth of around 2.5 feet. The hydraulic model indicates that the 1.5- to 2-year flow creates this width and depth characteristic. The model also predicts that the existing culvert will allow flows below 250 cfs to pass

without overtopping the roadway crossing. The model predicts that the existing roadway crossing will flood during a 10-year storm event.

**Table 1. FEMA Peak Discharges and WSE at Huasna Road.**

Recurrence Interval	Peak discharge (cfs) <sup>1</sup>	Area (sq. mi.)	WSE <sup>2</sup> at Cecchetti Rd (NAVD88 <sup>3</sup> , ft)
2-year <sup>2</sup>	150	82.5	212.55
10-year	1,100	82.5	216.93
50-year	5,100	82.5	222.81
100-year	8,700	82.5	225.85
500-year	25,800	82.5	237.78

1. cfs = cubic feet per second
2. WSE = Water Surface Elevation
3. NAVD88 = North American Vertical Datum of 1988
4. 2-year discharge from regression analysis

Based on San Luis Obispo County design guidelines, new bridges must be designed to have a minimum 2 feet of freeboard between the calculated water surface elevation during a 100-year event and the bottom chord of the bridge. The modeling results predict the water surface elevation at Cecchetti Road is 223.7' at the 50-year peak discharge and an elevation of 225.85' at the 100-year peak discharge. Therefore the low chord elevation of the bridge must be designed to be above 227.85', or approximately 228'.

## CONCEPTUAL BRIDGE DESIGN

As indicated above, in order to meet the County's design criteria, and assuming a 3.0' thick bridge cord, the new bridge will have a deck elevation of 231.5', which is approximately 13.5 feet higher than the low-point of the existing concrete crossing. As a result, more than 500 feet of the existing asphalt-paved roadway approaches will need to be demolished, rebuilt and raised to meet the new, proposed bridge deck elevation and standard roadway design criteria. As the road is elevated, the base or prism will widen because of side slope requirements, and will most likely require the use of retaining walls to support the additional roadway fill. Additional roadway right-of-way may be required on both sides of Cecchetti Road.

The preliminary bridge structure recommended is a three-span, rigid frame, cast-in-place concrete box girder bridge, matching the alignment of the existing road on a raised vertical profile. The probable cost estimate is based on a cast in place bridge, although, the bridge could be constructed using pre-cast concrete girders. The proposed bridge would be 180-feet long and 28-feet wide. To maintain a minimum 2 feet of freeboard above the predicted 100-year storm peak flow elevation, the proposed bridge structure would have a deck elevation of 231.5', with a 3-foot deep chord section. Based on existing and anticipated traffic, the bridge should be designed to safely carry HS-20 rated truck traffic.

The proposed bridge foundation would consist of driven steel piles under the two abutments and under the two pier walls. A 4-foot tall bridge railing should be used to protect vehicle and pedestrian traffic on the bridge. Use of metal tube bridge railing allows for a reduced bridge width, since it is attached to the outside of the bridge deck. The remaining width of the 28-foot wide bridge would allow for two 10-foot wide traffic lanes and a 2-foot shoulder on each side. The final design will include retaining walls to support the elevated roadway approaches. The proposed preliminary design plan is shown in **Figure 2**.

All of these requirements add considerably to the expense of the design and construction of the bridge structure.

## **CONSTRUCTION IMPACTS**

Because the existing concrete crossing will be removed prior to installation of the new bridge, traffic along Cecchetti Road must be detoured during the construction. The use of a temporary detour crossing downstream of the existing crossing should be considered.

### **Noise Impact**

Noise due to vibratory pile driving averages between 80 to 90 dBA, at distance. All other construction noise averages at 50 dBA, at distance. There are few residential buildings within the vicinity of the site so the anticipated impact of construction noise is minimal.

### **Traffic Impact Considerations**

The existing 20-foot wide concrete crossing at Cecchetti Road on Arroyo Grande Creek allows for two-way traffic of mostly rural residential and farm equipment access to adjacent agricultural lands. According to residents on Cecchetti Road, as development in the area has increased, the traffic using Cecchetti Road as a short cut has increased. It is estimated that over 400 cars a day use the roadway. A problem noted by the residents and by Questa in the field is that many of these cars are exceeding safe speeds. The existing roadway configuration (i.e., a narrow dip) naturally slows down vehicles as they cross the creek. Widening and leveling the roadway will eliminate the natural speed controls and potentially increase vehicle speeds and usage of the roadway. Residents have expressed considerable concern over improvements to the roadway that would increase driver speed. Accordingly, some form of traffic calming would need to be included in the final design, which is thus included in the probable cost estimate.

## CONSTRUCTION COST ESTIMATE AND DISCUSSION OF FEASIBILITY

The cost for building a bridge structure and roadway complying with existing County criteria is estimated to be in excess of \$1,500,000. Including final design, environmental review, permitting, construction observation and mitigation costs, the total estimate approaches \$2 million. An engineer's estimate of probable costs is shown in **Table 2**. This cost estimate does not include any right of way acquisitions, although the estimate does include a 25% cost contingency. Given increases in construction costs and the potential difficulty of obtaining increased right-of-way from the adjacent property owners, (who likely will oppose improvements that may impact traffic speed and road safety) it is likely not feasible nor cost effective to design and construct a replacement bridge to County standards using only fish habitat restoration grant funds.

Additional public road capital improvement funds would likely be necessary to implement the proposed bridge replacement alternative. Currently, replacing this crossing with a fully compliant bridge is not on the County's capital improvement list, and there is apparently little or no current interest on the part of the County in replacing this crossing with a bridge in the near future. Therefore, an additional source of funding will more than likely need to be developed for removal of this fish barrier. One potential solution previously discussed was a design standard exemption from the County to allow a significantly less-expensive replacement structure, such as an open-bottom, arched-culvert capable of passing a 10-year flood event. However, preliminary communications with the County indicate that a full compliance bridge would be required for this site

Should you have any questions on this, please do not hesitate to contact me at (510) 236-6114 Ext. 206.

Questa Engineering Corporation

Jeff Peters,  
Principal

Attachments

JP/jcm

Ref. 270020 Cecchetti Road Report