CALIFORNIA COASTAL COMMISSION
NORTH COAST DISTRICT OFFICE
710 E STREET • SUITE 200
EUREKA, CA 95501-1865
VOICE (707) 445-7833
FACSIMILE (707) 445-7877

MAILING ADDRESS:
P. O. BOX 4908
EUREKA, CA 95502-4908

F6a

Filed: December 13, 2006
49th Day: January 31, 2007
180th Day: June 11, 2007
Staff: Melissa B. Kraemer
Staff Report: March 29, 2007
Hearing Date: April 13, 2007
Commission Action:

STAFF REPORT: REGULAR CALENDAR

APPLICATION NO.: **1-06-049**

APPLICANT: **Humboldt County Department of Public Works**

PROJECT LOCATION: Rocky Gulch at Old Arcata Road, approximately one mile upstream of the confluence of Rocky Gulch and Humboldt Bay (Arcata Bay) and along approximately 540 feet of channel at and around 3261 Old Arcata Road (Hassrick property), Bayside area, Humboldt County (APN 501-261-013).

PROJECT DESCRIPTION: Implement the "Rocky Gulch Culvert Replacements and Stream Channel Rehabilitation Project," which includes the following: **(1)** removal and replacement of two 3-ft diameter concrete culvert pipes under Old Arcata Road (OAR) with one 16-ft wide by 5-ft high by 56-ft long aluminum box culvert; **(2)** removal and replacement of two 3-ft diameter concrete culvert pipes approximately 105 feet downstream of OAR with one 16-ft wide by 5-ft high by 28-ft long aluminum box culvert; **(3)** approximately 550 feet of stream channel excavation to remove fine sediment and re-establish the channel at a 0.63% grade; the excavated channel will be approx. 10- to 15-ft wide (at top of bank) to 4-ft deep; **(4)** placement of 51 cubic yards of ¼- to ½-ton rock slope protection to protect culverts, as grade control to create pool riffle systems, and to armor the banks intermittently; **(5)** placement of excavated soil material on the adjoining residence's back yard grass area to build up the existing low spot approximately 1-2 ft; and **(6)** removal,

salvage, and replacement of an existing 25-ft long by 8-ft wide wooden footbridge approx. 30 ft below the downstream culvert site.

LOCAL APPROVALS RECEIVED: N./A.

OTHER APPROVALS RECEIVED:
1) California Department of Fish & Game (CDFG) Streambed Alteration Agreement (File No. R1-06-0660)
2) NOAA Fisheries Endangered Species Act Section 7 Formal Consultation/Programmatic Biological Opinion (File No. 151422SWR03AR8912 dated May 21, 2004)
3) U.S. Fish and Wildlife Service Endangered Species Act Section 7 Formal Consultation/Programmatic Biological Opinion (File No. 1-1-03-F-273 dated August 17, 2004)
4) U.S. Army Corps of Engineers Regional General Permit No. 12 for the CDFG Fisheries Restoration Grant Program (Corps File No. 27922N)
5) State Water Quality Control Board Programmatic Section 401 Water Quality Certification for the CDFG 2006 Fisheries Restoration Grant Program (dated July 28, 2006)

SUBSTANTIVE FILE DOCUMENTS:
1) Initial Study and Final Mitigated Negative Declaration for 2006 Fisheries Restoration Grant Program in Del Norte, Humboldt, Los Angeles, Mendocino, Monterey, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, Siskiyou, Sonoma, Trinity and Ventura Counties (prepared by California Department of Fish and Game)
2) Agreement #P0510306 – Rocky Gulch Culvert Replacement, Exhibit A: Statement of Work
3) Analysis of Water Diversion on Threatened Fish Species (amended, dated March 2007; prepared by the Humboldt County Department of Public Works)
4) A Cultural Resources Investigation of the Rocky Gulch Culvert Replacement Project Located in Humboldt County, California; California Department of Fish and Game Project #137-R-1 (dated January 2007; prepared by Kristin Pitsenbarger and Don Verwayen, Cultural Resources Facility, Center for Indian Community Development, Humboldt State University Foundation)

5) Rocky Gulch Culvert Replacement Project Humboldt County Sensitive Plant Survey Results (dated February 5, 2007; prepared by contracting botanist Jennifer Kalt for the California Department of Fish and Game)

6) Rocky Gulch at Old Arcata Road Channel and Floodplain Modification: Conceptual Design; Grant Agreement # 205300; Final Report (dated July 24, 2006; prepared by McBain & Trush, Arcata, CA)

7) Humboldt County Local Coastal Program

SUMMARY OF STAFF RECOMMENDATION

Staff recommends that the Commission approve this application with special conditions.

The applicants are seeking authorization to implement the "Rocky Gulch Culvert Replacements and Stream Channel Rehabilitation Project," which is funded through the California Department of Fish and Game's (CDFG) Fisheries Restoration Grant Program. The project area is located in Humboldt County, near the town of Bayside, between Eureka and Arcata, at and around Old Arcata Road. The project area is located approximately one mile upstream of the mouth of Rocky Gulch at Arcata Bay.

The primary purpose of this project is to re-establish access to spawning, rearing, and refuge habitat for anadromous salmonids in approximately 1.7 miles of Rocky Gulch, which historically supported strong runs of coho salmon *(Oncorhynchus kisutch)*, steelhead *(O. mykiss)*, and coastal cutthroat trout *(O. clarki clarki)*. The subject culverts have been identified as velocity barriers to fish during migration flows. Rocky Gulch has been the subject of habitat restoration activities immediately downstream of the project site, approved by the Commission under CDP No. 1-05-009, and since those improvement were implemented in 2005, young salmonids have been documented using the restored habitat. This project will extend habitat restoration activities upstream along on an additional 540 feet of Rocky Gulch channel. Another project objective is to alleviate seasonal flooding on Old Arcata Road and on the property of 3261 Old Arcata Road (the old Williamson Ranch). The flooding is a result of excessive sediment in the channel and the existing culvert pipes being undersized and plugged.

To achieve the project objectives, the undersized, concrete culvert pipes will be replaced with oversized, embedded, metal box culverts, and the stream channel will be widened, deepened, and rock-armored (at select locations) to accommodate storm flows, reduce flooding, protect the single family residence at 3261 Old Arcata Road, and lessen the potential of stranding of fish. Achieving these project objectives would have a beneficial effect on the physical and biological environments of Rocky Gulch and eventually may contribute to the recovery of coho salmon, steelhead, and coastal cutthroat trout in Humboldt County. Achieving these project objectives also would benefit public safety and welfare by reducing flooding around the residence and on Old Arcata Road itself, which is a heavily trafficked thoroughfare between Arcata and Eureka.

The majority of proposed project activities are within the coastal zone, but the upstream extent of the stream rehabilitation work as well as a roadside ditch realignment are proposed to occur inland beyond the coastal zone boundary.

As conditioned, staff believes the project is consistent with Section 30236 of the Coastal Act, because the project's primary function is the improvement of fish and wildlife habitat, and it incorporates the best mitigation measures feasible to reduce adverse impacts to Rocky Gulch, including its sensitive fish species, aquatic and riparian habitat, and water quality, as well as mitigation measures to reduce other potential impacts to wetlands and archeological resources. Staff recommends Special Condition Nos. 1 through 10 (Section III below) to ensure avoidance or minimization of impacts to sensitive species, sensitive habitat, water quality, and archeological resources as a result of project activities. As conditioned, staff believes the project is consistent with the provisions of all applicable Coastal Act Chapter 3 policies.

The Motion to adopt the Staff Recommendation of Approval with Conditions is on pp. 4-5.

STAFF NOTES

I. Jurisdiction and Standard of Review

The majority of the proposed project is located in the Commission's retained jurisdiction (a small portion of the proposed project is located outside of the coastal zone). The County of Humboldt has a certified LCP, but the site is within an area shown on State Lands Commission maps over which the state retains a public trust interest. Therefore, the standard of review that the Commission must apply to the project is the Chapter 3 policies of the Coastal Act.

STAFF RECOMMENDATION

The staff recommends that the Commission adopt the following resolution:

I. MOTION, STAFF RECOMMENDATION, AND RESOLUTION

Motion:

I move that the Commission **Approve** Coastal Development Permit No. 1-06-049 pursuant to the staff recommendation.

Staff Recommendation of Approval:

Staff recommends a **YES** vote. Passage of this motion will result in approval of the permit as conditioned and adoption of the following resolution and findings. The motion passes only by affirmative vote of a majority of the Commissioners present.

Resolution to Approve Permit:

The Commission hereby approves a coastal development permit for the proposed development and adopts the findings set forth below on grounds that the development as conditioned will be in conformity with the policies of Chapter 3 of the Coastal Act. Approval of the permit complies with the California Environmental Quality Act because feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment.

II. STANDARD CONDITIONS

See Appendix A, page 42.

III. SPECIAL CONDITIONS

1. Proof of Applicant's Interest in the Property

PRIOR TO ISSUANCE OF THE PERMIT, the applicant shall submit for the review and approval of the Executive Director, documentation that the applicant has secured all necessary property rights from the property owner of 3261 Old Arcata Road (APN 501-261-013) to perform the approved work on the subject property, as conditioned.

2. Timing of Construction

All development, as defined in Section 30106 of the Coastal Act, must be undertaken during the dry season between June 15 and November 1 or the first rainfall. All planting of seedlings and salvaged native plant material from the project site shall begin after December 1 or when sufficient rainfall has occurred to ensure the best chance of survival of the plantings, but in no case after April 1. All planting efforts shall be carried out according to the approved Revegetation Plan (see Section III-5 below). Upon project completion, all exposed soils present in and around the project site which may deliver sediment to a stream shall be stabilized within 7 days.

3. Mitigation Measures

The permittee shall undertake all stages of development in accordance with Mitigation Measure Nos. 1 – 50 listed in Section IV-D-3 below, which include measures proposed by the permittee as well as pertinent mitigation required by the Mitigated Negative Declaration, other agency approvals, and conditions of the applicant's grant funding.

4. Area of Archaeological Significance

a. The permittee shall undertake project construction in accordance with the protocols and procedures detailed in the cultural resources report (Pitsenbarger & Verwayen 2007).

b. If an area of historic or prehistoric cultural resources or human remains are discovered during the course of the project, all construction shall cease and shall not recommence except as provided in subsection (3) hereof, and a qualified cultural resource specialist shall analyze the significance of the find.

c. A permittee seeking to recommence construction following discovery of the cultural deposits shall submit an archaeological plan for the review and approval of the Executive Director.

(1) If the Executive Director approves the Archaeological Plan and determines that the Archaeological Plan's recommended changes to the proposed development or mitigation measures are *de minimis* in nature and scope, construction may recommence after this determination is made by the Executive Director.

(2) If the Executive Director approves the Archaeological Plan but determines that the changes therein are not *de minimis*, construction may not recommence until after an amendment to this permit is approved by the Commission.

5. Revegetation Plan

a. **PRIOR TO ISSUANCE OF THE PERMIT**, the applicant shall submit, for the review and approval of the Executive Director, a final revegetation plan for the entire area disturbed by grading activity. The plan shall be prepared by a qualified professional botanist or biologist with expertise in riparian and/or fish habitat restoration. The revegetation plan shall adhere to the following specifications:

(1) The plan shall demonstrate all of the following:

i) The entire disturbed area shall be replanted with habitat-specific, regionally appropriate native vegetation. The vegetation to be replanted shall be of local genetic stock, if available. No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or as may be identified from time to time by the State of California, shall be installed or allowed to naturalize or persist on the site. No plant species listed as a "noxious weed" by the governments of the State of California or the United States shall be utilized within the property. Riparian vegetation is to be planted at a minimum ratio of 2:1 (two plantings to one removed plant);

ii) Native species salvaged in the project area during construction activities for revegetation use shall be properly stored to ensure their health and vigor upon replanting;

iii) Revegetation shall achieve a standard for success of at least 80 percent survival of plantings or at least 80 percent ground cover for broadcast seeding after a period of 3 years;

iv) Rodenticides containing any anticoagulant compounds, including, but not limited to, Bromadiolone or Diphacinone, shall not be used;

v) Planting of seedlings shall begin after December 1, or when sufficient rainfall has occurred to ensure the best chance of survival of the seedlings, but in no case after April 1st of the first rainy season following completion of the channelization work

vi) The species used for riparian habitat enhancement/restoration shall include a variety of habitat-specific, regionally appropriate native species, including both woody and herbaceous species, for a diverse community structure.

(2) The plan shall include, at a minimum, the following components:

i) Specified goals of the plan and performance criteria for evaluating the success of the revegetation goals;

ii) A site plan accompanied by a plant list, which together show the type, size, number, source, and location of all plant materials that will be retained or installed on the disturbed area;

iii) A maintenance plan (*e.g.*, weeding, replacement planting) and monitoring plan to ensure that the specified goals and performance criteria have been satisfied. Restoration sites shall be monitored yearly with at least one site visit during the spring or summer months for a minimum of three years following completion of the project. All plants that have died shall be replaced during the next planting cycle (generally between late fall and early spring) and monitored for a period of three years after planting.

b. The permittee shall undertake development in accordance with the approved final plan. Any proposed changes to the approved final plan shall be reported to the Executive Director. No changes to the approved final plan shall occur without a Commission amendment to this coastal development permit unless the Executive Director determines that no amendment is legally required.

6. <u>Debris Disposal Plan</u>

a. **PRIOR TO THE ISSUANCE OF THE PERMIT**, the applicant shall submit, for the review and approval of the Executive Director, a plan for the disposal of excess construction-related debris, including excess spoils from the stream channel

excavation work and culvert replacements. The plan shall describe the manner by which the material will be removed from the construction site and identify a disposal site that is in an upland area where materials may be lawfully disposed.

b. The permittee shall undertake development in accordance with the approved final plan. Any proposed changes to the approved final plan shall be reported to the Executive Director. No changes to the approved final plan shall occur without a Commission amendment to this coastal development permit.

7. "As Built" Report

Within 30 days of completion of construction, the permittee shall submit to the Executive Director "as built" plans showing placement of the salvaged footbridge in relation to the rehabilitated channel and riparian plantings in the area.

8. Submittal of Monitoring Information

The permittee shall submit to the Executive Director the monitoring information specified in Mitigation Measure Nos. 25, 27, 37, 44, and 50 and Special Condition No. 5, to demonstrate that the project has been performed consistent with the proposed mitigation measures.

9. Remediation Plan

If the final monitoring reports required by Mitigation Measure Nos. 25, 27, 37, 44, and 50 Special Condition No. 5 indicate that the "Rocky Gulch Culvert Replacements and Stream Channel Rehabilitation Project" effort has been unsuccessful, in whole or in part, based on the approved performance standards, the applicant shall submit a revised or supplemental remediation plan within 45 days of submittal of the final monitoring reports to compensate for those portions of the original plan that did not meet the approved performance standards. The revised remediation program shall be processed as an amendment to this coastal development permit.

10. Assumption of Risk

By acceptance of this permit, the applicant acknowledges and agrees to the following: (i) that the site may be subject to hazards from flooding; (ii) to assume the risks to the applicant and the property that is the subject of this permit of injury and damage from such hazards in connection with this permitted development; (iii) to unconditionally waive any claim of damage or liability against the Commission, its officers, agents, and employees for injury or damage from such hazards; and (iv) to indemnify and hold harmless the Commission, its officers, agents, and employees with respect to the Commission's approval of the project against any and all liability, claims, demands, damages, costs (including costs and fees incurred in defense of such claims), expenses, and amounts paid in settlement arising from any injury or damage due to such hazards.

IV. FINDINGS AND DECLARATIONS

The Commission hereby finds and declares the following:

A. History of Lower Rocky Gulch

In 1957, California Department of Fish and Game's (CDFG) Fisheries Manager Ralph McCormick described lower Rocky Gulch "from the mouth up to Old Arcata Road, a distance of about one mile" as "an intertidal estuary." A history of aggradation has occurred to the stream and degradation of its fisheries as a result of agricultural land uses in the lower watershed and logging operations upstream. The approximately upper half of the Rocky Gulch is located on lands managed for timber production. On December 12, 1956, Mr. John Williamson, a rancher on lower Rocky Gulch, reported to CDFG Warden John O. Finigan the following:

> *"There was a sudden rise in the creek and the abnormally heavy amount of clay silt was killing spawning salmon. These fish had been washed completely out of the creek by the sudden onrush of heavy silt. He [Mr. Williamson] further stated that the creek was so heavily silted that it didn't have the appearance of water at all, but appeared to be semi-solid, moving very sluggishly down the streambed."* (Finigan 1957)

That catastrophic environmental calamity in 1956 likely caused the expiration of anadromous salmonids in Rocky Gulch, which historically supported strong runs of coho salmon and steelhead. Compounding the logging damage to Rocky Gulch's anadromous salmonid populations was the installation of a tide gate (first reported in 1964) at the mouth of Rocky Gulch, which significantly reduced the opportunity for migrating adult anadromous salmonids to enter this stream. Despite the passage of nearly 50 years since these events occurred, CDFG's 2001-2003 surveys found no coho, steelhead, or cutthroat trout in Rocky Gulch, nor was tidewater goby observed (Laird 2005).

In 2000, an inventory of the Humboldt County road system was conducted to determine culvert barriers to fish passage. The study created a priority listing of projects to improve fish passage, and the Rocky Gulch culvert at Old Arcata Road was placed 22nd on the priority list of passage enhancement projects. The culvert was identified as a velocity barrier to salmonids through a moderate range of migration flows.

In 2001, the "Rocky Gulch Stream Assessment Project" (McBain & Trush 2002) prioritized restoration actions for Rocky Gulch necessary to restore its salmonid populations. These included the following (from McBain & Trush 2006):

- Task A: Replace the Rocky Gulch tidegate (completed in 2004)
- Task B: Enhance estuarine conditions in Rocky Gulch (initiated in 2005)
- Task C: Realign the lower Rocky Gulch channel to reduce confinement (completed in 2005)

- Task D: Set back dikes confining Rocky Gulch along Old Arcata Road (completed in 2005)
- Task E: Rehabilitate the channel around the old Williamson Ranch
- Task F: Replace the Old Arcata Road culvert
- Task G: Replace the barrier culvert upstream of the Old Arcata Road culvert (scheduled for 2007)
- Task H: Rehabilitate the stream channel surrounding the barrier culvert (scheduled for 2007)

In 2005, the Commission conditionally approved CDP Application No. 1-05-009, the "Lower Rocky Gulch Salmonid Access and Habitat Restoration Project," which was implemented by the CDFG and property owners Roger and Johanna Rodoni and which completed tasks B through D, listed above. Since those improvements were implemented, juvenile salmonids have been documented using the restored habitat (C. Whitworth, pers. comm.). Tasks E and F are proposed to be implemented under the current permit application. Tasks G and H, associated with a barrier removal project upstream of the Old Arcata Road crossing (outside of the coastal zone), are proposed to be completed this year (2007). Completion of these four remaining tasks would complete the final recommended restoration actions necessary to restore anadromous salmonid populations in the Rocky Gulch watershed (McBain & Trush 2006).

B. Description of Project Area

The "Rocky Gulch Culvert Replacements and Stream Channel Rehabilitation Project" is located at and around the Rocky Gulch/Old Arcata Road crossing, approximately a mile upstream of the confluence of Rocky Gulch and Humboldt Bay (Arcata Bay), including a portion of parcel APN 501-261-013 (3261 Old Arcata Road), in the Bayside area of Humboldt County (see Exhibit Nos. 1 and 2). The project site is not located between the first public road and the sea. Rocky Gulch is a 1.5 square mile watershed (960 acres) that drains into the northeastern portion of Arcata Bay, near the Arcata Marsh. The watershed originates near the Kneeland summit and drops moderately in grade from 1,200 feet to 10 feet in elevation over a distance of 16,370 feet.

The portion of the overall project area that is within the coastal zone is within an area of the Commission's retained jurisdiction. The coastal zone boundary in this location follows the inland boundary of the Old Arcata Road right-of-way. The subject parcel is immediately upstream of the "Lower Rocky Gulch Salmonid Access and Habitat Restoration Project" area described above in Section IV-A.

The majority of the area immediately surrounding Rocky Gulch in the project area consists of the residential private property of 3261 Old Arcata Road (referred to as the old Williamson Ranch). FEMA inundation mapping identifies the project and the surrounding area to be within the 100-year floodplain.

The greater project vicinity includes agricultural pasture land and rural residential neighborhoods, with commercial timberlands (redwood forest) upslope from the project site. The creek corridor in the lower Rocky Gulch watershed (downstream of Old Arcata Road) has been realigned and channelized several times in the past to follow property lines and to maximize grazing lands. Riparian canopy is limited in the project vicinity due to this traditional land use. The habitat in the upper watershed (upstream of OAR) is considered excellent for salmonids due to good riparian canopy and well-graded gravels. The Rocky Gulch watershed contains suitable habitat for coho and Chinook salmon and steelhead and cutthroat trout.

A single family residence and adjacent open grassy yard with scattered trees and landscaped plants are located on the east side of the project area. Several woody and herbaceous native and nonnative plants installed by the property owner (or previous owners) line the eastern edge of the creek, along with many naturally occurring, native and nonnative species, many of them wetland-oriented. These include, among others, cypress trees (*Cupressus* sp.), red alders (*Alnus rubra*), rushes (*Juncus effusus*), smallflower bulrush (*Scripus microcarpus*), creeping buttercup (*Ranunculus repens*), and various garden and landscaping plants. A wooden footbridge spans the creek in the lower project reach, enabling access for the property owner to the open pasture on the west side of the creek that harbors at least one horse. Another access point on the creek is at the culverts located approximately 105 feet downstream from Old Arcata Road (and upstream from the footbridge). This grassy creek crossing allows walking access to a second residence on the property.

Old Arcata Road, which runs through the proposed project area, is a County-maintained, paved public road approximately 24 feet wide within a 50-ft right-of-way. The road, which lies approximately a half mile east of and roughly parallel to State Highway 101, ultimately connects the cities of Arcata and Eureka, spanning rural residential neighborhoods and serving as an access road to the east-lying communities of Freshwater and Kneeland.

Certain project activities, including stream rehabilitation work and a roadside ditch realignment that are proposed upstream of Old Arcata Road are located outside of the coastal zone on APNs 501-290-008 and -009, on the east side of Old Arcata Road (the coastal zone boundary extends to the inland, or eastern, road right-of-way). These proposed activities outside of the coastal zone are not addressed further in this report (except to note that the applicant is exempt from having to obtain a grading permit from the County Building Department for the proposed stream work, and the ditch realignment work is proposed to occur entirely within the County's road right-of-way).

A rare plant habitat assessment and survey of the proposed project area was conducted by a qualified botanist under contract with the Department of Fish and Game on February 7, 2007 (see Exhibit No. 8). No sensitive plant species, sensitive plant habitat, or sensitive plant communities were found in the area, and no further surveys were recommended.

C. Description of Proposed Project

The "Rocky Gulch Culvert Replacements and Stream Channel Rehabilitation Project" proposes to provide unimpeded adult and juvenile fish passage for coho salmon, steelhead, and coastal cutthroat trout on Rocky Gulch, a tributary to Humboldt Bay (Arcata Bay). This goal would be accomplished by removing four undersized culverts at two locations and replacing the pipes with two over-sized structural plate box culverts. The culverts would be countersunk below stream grade to provide sufficient room for a natural bottom. The objective is to provide access to approximately 1.7 miles of habitat, to increase spawning habitat for adult salmonids and rearing habitat for juvenile salmonids. In addition to culvert replacements, approximately 540 feet of the existing stream channel is proposed to be widened, deepened, and rock armored (where necessary) to provide hydraulic capacity to match that of the culverts while also reducing flooding and lessening the potential of fish stranding. As discussed above, certain portions of the project are proposed to occur inland beyond the coastal zone boundary (see Section IV-B above). The applicant's proposed project description is shown as Exhibit No. 4. Plot plans for the proposed project elements can be found in Exhibit No. 5.

1. Summary of Proposed Construction Activities

Construction is proposed to occur between June 15th and November 1st (or the first rainfall), 2007, when stream flow and the chance of a precipitation event are lowest. Four undersized culverts at two locations are proposed to be removed and replaced with two oversized structural plate box culverts. The culverts would be countersunk below stream grade to mimic natural stream bottom conditions, and imported river-run gravel would be placed inside the culverts to further enhance stream bed habitat. One-half to 2-ton rock slope protection would be placed at the culverts inlets and outlets to prevent scour and for protection. In addition to culvert replacement, stream channel widening and deepening would be implemented on an additional ~540 feet of the stream upstream and downstream of the culvert replacement sites to provide hydraulic capacity to match that of the culverts while also reducing flooding and lessening the potential of fish stranding. Some in-stream structures consisting of root wads and/or stumps would be anchored into the channel banks to further enhance salmonid habitat. A wooden footbridge spanning the creek near the downstream end of the project area would be temporarily removed during construction activities, then salvaged and replaced when construction is complete. The entire project area would be revegetated, including seeding the area with a mix of fast growing native grasses and planting a variety of regionally appropriate native trees, shrubs, and herbaceous plants along the stream banks. No work would be done in the flowing stream channel, but rather stream flow would be diverted through the project area by means of temporary diversion dams. Diversion would consist of a cofferdam at the upstream end of the project area (outside of the coastal zone) and approximately 540 feet of 12- to 18-inch diameter pipe to convey water to a point below the project area. A traffic detour,

consisting of a temporarily placed railroad flatcar bridge and controlled one-way traffic through the detour, would be necessary on Old Arcata Road for the duration of construction activities. Table 1 below summarizes the excavation and fill quantities proposed by the applicant.

Table 1. Summary of excavation/fill quantities for the "Rocky Gulch Culvert Replacements and Stream Channel Rehabilitation Project" (all quantities shown are approximate volumes in cubic yards). Note that item letters refer to detailed project activities described in Section IV-C-2 below. See Exhibit Nos. 4-5 for more details.

	Location	Excavation	Structural Fill	Embankment Fill	Rock Slope Protection	River-Run Gravel	Net Loss/Fill
a	OAR Culvert	431	154	189	26	17	-45
b	Downstream Culvert	212	77	54	25	34	-22
c	Stream Channel Restoration	381	0	43	0	49	-289
	TOTALS	**1024**	**231**	**286**	**51**	**100**	**-356**

2. Detailed Proposed Construction Activities

The following activities have been proposed by the applicant:

(a) Old Arcata Road (OAR) Culvert

The existing culvert crossing at OAR consists of two, side-by-side, 3-ft diameter concrete culvert pipes. The culvert pipes are proposed to be removed by an excavator. Approximately 431 yds^3 of overburden material would be excavated to remove the pipes. Excavated material determined appropriate for backfill would be stockpiled at the site for re-use. The remaining spoils material would be transported to an off-site, approved disposal facility. One foot of aggregate base (with a minimum bearing pressure of 4,000 lbs/ft^2) would be placed in the excavated area. A 16-ft wide x 5-ft high x 56-ft long aluminum box culvert would then be placed on top of the base at a 0.63% grade. The culvert would be countersunk a minimum of 2 feet into the stream bottom to provide sufficient room for a natural bottom. Structural backfill would be placed around the culvert, followed by embankment backfill (totaling ~343 yds^3). Approximately 17 yds^3 of imported river-run gravel, approximately ¾- to 4-inches in diameter and 6 inches deep, would be placed inside the culvert, and 1/4- to ½-ton rock slope protection (RSP, 26 yds^3) would be placed at the inlet and outlet to prevent scour and to protect the culvert. Finally, the road would be re-established with Class 3 aggregate base (~63 yds^3) and 40 tons of asphalt concrete. See Exhibit No. 5 for details.

(b) Downstream Culvert

The culvert crossing approximately 105 feet downstream of OAR also consists of two parallel 3-ft diameter concrete culvert pipes. This crossing allows direct access from the main house on the property to a second house on the opposite side of the creek. The culvert pipes are proposed to be removed and replaced with a 16-ft-wide x 5-ft-high x 28-ft-long aluminum box culvert. The culvert would be countersunk a minimum of 2 feet into the stream bottom to provide sufficient room for a natural bottom. The procedure used would be similar to that for the OAR culvert, minus the road base and paving. Excavated fill resulting from culvert removal would total ~212 yds^3. Structural and embankment backfill would total ~131 yds^3. The application proposes placement of approximately 34 yds^3 of river run gravel on the culvert floor (approximately ¾- to 4-inches in diameter and 24 inches deep) to simulate natural streambed conditions. One quarter- to ½-ton RSP (25 yds^3) would be placed at the inlet and outlet to prevent scour and protect the culvert. See Exhibit No. 5 for details.

(c) Stream Channel Excavation/Re-Establishment

Due to the undersized culverts and their condition, the stream channel in the project reach (from approximately 175 feet above the OAR culvert to approximately 230 feet below the downstream crossing) is severely aggraded with fine sediment. The project proposes to excavate fine sediment from this reach to restore the channel to its original width, depth, and slope (0.63% grade), thereby recreating natural channel morphology. Channel excavation and restoration work is proposed to mimic work down downstream in 2005.

Working from the top of bank, and excavator would scoop sediment from the stream channel and deposit it into dump trucks, which would transport the sediment to an approved, off-site disposal facility. The newly excavated channel would be approximately 10- to 15-ft wide (at top of bank) x 4-ft deep. Side slopes would be treated to match original contours above and below the road (not to be steeper than 1 to 1), and a floodplain bench would be constructed. One quarter- to ½-ton RSP would be used as grade control to create pool-riffle systems and to armor the banks intermittently. Imported river-run gravel (¾- to 4-inches in diameter; totaling 49 yds^3) would be placed on the stream bed behind and retained with the larger boulder matrix for enhancing stream habitat complexity. The total length of stream channel subject to culvert replacement and channel restoration would be approximately 540 feet. See Exhibit No. 5 for details.

(d) Addition of In-stream Structures

In-stream structures consisting of several root wads and/or stumps are proposed to be anchored into the channel banks at select locations to further enhance fish habitat (Exhibit No. 5). The number and location of structures is proposed to be determined during project construction under consultation with the on-site CDFG Fish Habitat Specialist.

(e) Footbridge

An existing 25-ft-long x 8-ft-wide wooden footbridge spans Rocky Gulch approximately 30 feet below the downstream culvert. The footbridge allows access from the main house to an open pasture across the creek. The footbridge is proposed to be removed during stream channel restoration work, salvaged, and reinstalled when work at the site is complete. As reinstalled, the bridge would still completely span the channel without the need for supporting piles or other needed fill. See Exhibit No. 5 for details.

(f) Stream Flow Diversion

Because Rocky Gulch is a perennial stream, stream flow is proposed to be diverted through the project site during construction. The stream flow diversion would consist of a cofferdam at the upstream end of the project area and approximately 550 feet of 12- to 18-inch diameter pipe to convey water to a point below the project area. First, fish exclusion fencing would be installed above and below the project reach. Fish and other aquatic organisms found in the project area would be relocated by a qualified biologist according to agency protocols. Then, a cofferdam consisting of sand bags and filter fabric would be constructed at the upstream end of the project area (see Sheet 6 of Exhibit No. 5). Stream flow would be conveyed through a 12- to 18-inch diameter pipe, which would be laid on the streambed. The pipe would be moved around as necessary to accommodate construction activities. At the downstream end, the pipe outlet would be placed on a small temporary splash pad of rock and gravel to minimize the possibility of scour from the daylighting flow. The outlet would be located immediately above the downstream fish exclusion fencing to avoid impacts to fish below the project. The diversion would be removed as soon as work below ordinary high water was completed. Stream flow diversion would be limited to the minimum amount of time necessary to complete work in the stream channel. The length of the diversion would be the shortest possible while still minimizing effects to water quality and not encroaching on construction activities. Diversion structures would be constructed and removed according to the mitigation measures outlined in Appendix B of the Final Mitigated Negative Declaration. Electrofishing, if necessary, would

be conducted by a qualified fisheries biologist according to CDFG and NOAA-Fisheries guidelines.

(g) Traffic Detour

During construction, it would be necessary to control traffic along Old Arcata Road through the site with the use of a temporarily-placed railroad flatcar bridge. Pre-cast concrete grade beams are proposed to be placed north and south of the culvert crossing, and small ramps constructed at the approaches. The flatcar bridge would be placed across the existing OAR culvert crossing at approximately the centerline of the roadway. Work would proceed around and underneath the temporary bridge. Several traffic control signs placed by the project engineer north and south of the construction area are proposed to warn approaching motorists and bicyclists of the road work and the reduction to a one lane road. See Exhibit No. 5 for details.

The temporary flatcar bridge detour would accommodate one-traffic with short delays. The applicant proposes that it might, at times, be necessary to completely close the project area to traffic. When construction at the site is complete, the detour would be removed.

As an alternative to controlled traffic through the construction site, the applicant proposes that Old Arcata Road could be temporarily closed to regular traffic for the duration of construction activities. Extra signage and barriers than those shown in Exhibit No. 5 would be necessary.

D. Development Within Coastal Rivers & Streams

Section 30236 of the Coastal Act provides that:

> *Channelizations, dams, or other substantial alterations of rivers and streams shall incorporate the best mitigation measures feasible, and be limited to (1) necessary water supply projects, (2) flood control projects where no other method for protecting existing structures in the floodplain is feasible and where such protection is necessary for public safety or to protect existing development, or (3) developments where the primary function is the improvement of fish and wildlife habitat.* [emphases added]

Section 30236 sets forth a number of different limitations on what development may be allowed that causes substantial alteration of rivers and streams. For analysis purposes, a particular development proposal must be shown to be for one of the three purposes listed above. In addition, the development must incorporate the best mitigation measures feasible.

1. Permissible Uses for Dams, Channelizations, and Substantial Alteration of Streams

The first test set forth above is that any proposed dam, channelization, or other substantial alteration of a river or stream may only be allowed for the three purposes enumerated in Section 30236, which include projects that are "primarily for fish and wildlife habitat improvement." In general terms, the proposed development entails the replacement and upgrade of culverts and the excavation and rehabilitation of the Rocky Gulch channel for the primary purposes of allowing unimpeded access to the upper Rocky Gulch watershed by migrating salmonids and improving fish habitat in the project reach (through the placement of gravel and instream structures to mimic natural stream conditions) while also creating a deeper and wider channel to accommodate higher flows and alleviate flooding of the road and residential property. As described above, these activities involve many components, including the following:

(a) Culvert replacement at Old Arcata Road (OAR);

(b) Culvert replacement downstream of OAR;

(c) Restoration of Rocky Gulch channel capacity, prevention of inundation of the residential property and OAR, and installation of fish habitat enhancement structures;

(d) Installation of fish barriers, relocation of fish and other aquatic organisms, installation of flow barriers, and diversion of stream flow;

(e) Post-construction site remediation (*e.g.*, removal of fish barriers, flow barriers, and silt fencing);

(f) Site revegetation and installation of enhancement plantings;

(g) Traffic control measures for the duration of construction activities; and

(h) Removal, salvage, and replacement of the wooden footbridge that allows access to the residential property on either side of the creek.

The primary objective of the majority of the actions encompassed in the development components listed above are for fish and wildlife habitat improvement, as set forth in Coastal Act Section 30236(3).

Development activities (a), (b), and (c) above encompass the "bulk" of the project and involve replacing/upgrading culverts and excavating and aggraded channel reach to re-establish access to the upper watershed for anadromous salmonids and to improve fish habitat in the project area reach. Development activity (d) above serves to prepare the site for the main fish habitat improvement activities (a, b, and c described above) and hence has the same primary purpose of fish and wildlife habitat improvement.

The primary objective of development activities (e), (f), and (g) also are the improvement of fish and wildlife habitat because the activities are an integral component to the main fish habitat improvement activities (a, b, and c). Activity (e) involves the removal of the temporary fish barriers, flow barriers, and stream diversions placed in the creek. As a result of their removal, stream flow would be restored to the channel, and fish and other aquatic organisms will be given access to a creek with an enhanced water flow capacity and enhanced riparian habitat. Activity (f) involves not only reseeding all disturbed areas with native, regionally appropriate grasses to minimize the risk of erosion of bare soils into the newly restored creek, but also installing riparian plantings along the length of the creek banks in the project area both to minimize the risk of erosion and to enhance fish habitat. Activity (g), the one-way traffic detour along Old Arcata Road, also is integral to the project because it allows for development activities (a) and (c) above.

Thus, for all the above reasons, the proposed development activities (a) – (g), as listed above, are for an allowable purpose for substantial alteration of a river or stream pursuant to Section 30236(3). Section 30236 of the Coastal Act does not apply to development associated with activity (h).

The removal, salvage, and replacement of the wooden footbridge, activity (h), as listed above, does not conflict with the Chapter 3 policies of the Coastal Act (Sections 30231, 30233, 30236, or 30240) since no structural support or fill for the bridge replacement is proposed to be placed in the creek or in any wetlands or environmentally sensitive habitat areas (ESHA). Instead, the bridge reinstallation will span the creek entirely, as it does presently, being replaced atop grassy, upland areas above the top of bank.

2. Availability of Other Feasible Methods for Enhancing Fish Habitat in Rocky Gulch

Rehabilitation of fish habitat on lower Rocky Gulch is not achievable through methods less environmentally damaging than those proposed in the proposed project. The existing culverts, both at the Old Arcata Road crossing and downstream in the project area, act as velocity barriers to adult migrating salmonids. The culverts are severely undersized, and stream flow through the culvert pipes is too fast for fish attempting to migrate upstream to suitable spawning ground, as salmonids typically require frequent pools in which to rest between upstream swimming spurts. Unless flow velocity is slow enough within a culvert, or unless baffles are installed within a culvert to allow for periodic resting points throughout the culvert, fish are unable to pass through the culvert velocity barrier. As the existing culverts both at OAR and downstream in the project area are undersized and doubled, flow velocity through the relatively small culverts is even greater than it would be if only a single, larger culvert were installed at each location. Doubled culverts allow for the additional risk of entrapping woody debris flowing down the stream between culverts and in front of culvert inlets, further reducing culvert functionality and passage ability for migrating salmonids. Because the existing

culverts are undersized for the drainage regime of the creek and are chronically plugged with sediment (especially at the OAR crossing), installing baffles in the existing culverts to slow down flow velocity would not rectify the problems associated with fish passage and regular flooding.

The applicant proposes the least environmentally damaging way to rectify the problems associated with the undersized, doubled culverts at OAR and downstream in the project area. Replacing the existing pipes at each location with a single embedded box culvert over 2.5 times the width of the existing doubled pipes would allow for unimpeded salmonid passage during migration flows while simultaneously relieving the periodic flooding on Old Arcata Road and on surrounding pastureland. With the present undersized and plugged culverts, high flows overtop the right bank of Rocky Gulch and collect either in the inboard ditch on the east side of OAR or – in 5+ year flood events – on OAR itself (McBain & Trush 2006). Installing larger culverts both at OAR and downstream would slow down flow velocity through the culverts sufficiently to accommodate fish passage ability. To further aid the ability of fish to pass through the culverts, the applicant proposes to place imported river-run gravel on the culvert floors, which, if sufficiently proportioned and properly sized, would remain in the culverts at high velocity flows to provide habitat complexity within the culverts and further slow water velocity at migration flows.

The applicant's proposal would not only improve fish passage by replacing undersized, velocity-barrier culverts, thereby allowing salmonids to access additional spawning, rearing, and refuge habitat upstream, but also it would reduce flooding in the area and therefore the potential for fish stranding. The only way to rectify this problem is to replace the existing undersized pipes with larger culverts, as is proposed in the proposed project.

With the installation of larger culverts, excavation of the stream channel width is necessary in the project area, as proposed, to accommodate the larger culverts (over 2.5 times as wide as the existing doubled culverts). Excavation of stream channel depth, as proposed, is necessary to remove the accumulated sediment lining the stream that has resulted primarily from a history of logging operations in the upper half of the watershed. The stream channel downstream of OAR in the project area is "severely undersized" and thoroughly scoured of most coarse sediment (McBain & Trush 2006). As discussed above, this stream channel excavation work would both restore fish habitat and alleviate problematic flooding, which can lead to fish stranding. The applicant's proposal to place rock slope protection (RSP) at culvert inlets and outlets is necessary for protection and stability. The applicant's proposal to place imported river-run gravel and in-stream structures at select locations in the project reach is necessary to provide stream habitat complexity for fish habitat enhancement purposes.

An alternative to the proposed project could be the "no project" alternative. This alternative would continue the *status quo* on the subject reach of Rocky Gulch,

which is characterized by fish passage impediment during salmonid migration flows, a lack of fish (caused by elevated channel sedimentation and aggradation), and a risk of fish stranding during periodic seasonal flood events. Thus, the Commission finds no other feasible measures exist for restoring fish and wildlife habitat in the subject reach of Rocky Gulch.

3. Incorporation of the Best Mitigation Measures Feasible

The second test set forth by the stream alteration policy of the Coastal Act is whether the best feasible mitigation measures have been provided to minimize the adverse environmental impacts of the subject channelization, damming, and/or substantial alteration of rivers or streams.

The proposed project would be conducted in riverine and riparian wetlands and could have potentially significant adverse effects on a number of threatened, endangered, and special status species that depend on the aquatic environment of Rocky Gulch and/or their habitats. Based on the biological assessment for the proposed project (prepared by the applicant – see Exhibit No. 6), the following rare, threatened, or endangered species have the potential to inhabit the project area:

- S.OR / N. CA Coho Salmon *(Oncorhynchus kisutch)*
- Northern California Steelhead *(O. mykiss)*
- Coastal Cutthroat Trout *(O. clarki clarki)*
- California Chinook Salmon *(O. tshawytsha)*
- Western lily (*Lilium occidentale*)
- Lyngbye's sedge (*Carex lyngbyei*)
- Osprey *(Pandion haliaetus)*

Additionally, the project could impact the sensitive habitats associated with these species, such as the removal of riparian vegetation and impacts to water quality from erosion associated with channel excavation and potential spills from the use of heavy equipment in and adjacent to the channel.

As discussed above, a rare plant habitat assessment and survey of the proposed project area was conducted by a qualified botanist under contract with the CDFG on February 7, 2007 (Kalt 2007). No sensitive plant species, sensitive plant habitat, or sensitive plant communities were found in the area, and no further surveys were recommended.

As discussed in the biological assessment, no nesting or roosting habitat for osprey occurs in the project area. Osprey may forage in the greater project vicinity, and noise from construction activities may disturb osprey and affect their activities as construction will occur during daylight hours and take up to four months to

complete. The applicant anticipates that any osprey in the area will avoid the project area during construction activities and return to using the area for regular activities once the project is complete.

The proposed habitat improvement project may affect the above-listed sensitive fish species if any are present in or below the construction area. Additionally, the project could impact the sensitive habitats associated with these species, such as the removal of vegetation and impacts to water qualify.

The following 50 mitigation measures are mitigation measures pertinent to minimizing the adverse environmental impacts of the subject project's proposed alterations of Rocky Gulch in a manner consistent with the requirements of Section 30236 of the Coastal Act that are either (1) directly proposed by the applicant (2) required by the programmatic mitigated negative declaration that is being relied upon by the applicant to satisfy the requirements of the California Environmental Quality Act (CEQA), (3) required as conditions of approval of the U.S. Army Corps of Engineers regional permit covering the project; (4) required as conditions of the California Department of Fish & Game Streambed Alteration Agreement; (5) recommended in the NOAA Fisheries Endangered Species Act Section 7 Programmatic Biological Opinion covering the project; or (6) required by the grant awarded for the project by the California Department of Fish & Game under the 2006 Fisheries Restoration Grant Program. The applicant has indicated that the County agrees to comply with all of these mitigation measures.

(a) Mitigation Measures for Construction Activities/Responsibilities:

Migrating adult coho salmon and steelhead enter coastal streams similar to Rocky Gulch from October through February. The long-term effects of the proposed project should be beneficial to the sensitive fish species and their habitat in Rocky Gulch. However, the proposed habitat improvement project may adversely affect the above-listed sensitive fish species if any are present in or below the construction area.

In addition, construction and equipment access in and over wetlands and riparian areas associated with the creek during summer/fall may compact the ground if it is saturated, and/or crush vegetative cover. Construction in Rocky Gulch itself also has the potential to adversely affect water quality in the creek.

The following mitigation measures (which include those proposed by the applicant as well as those measures required in the environmental document, project approvals, and grant described above) will reduce impacts from construction activities to less than significant levels:

1. Work around the creek is restricted to the period of June 15 through November 1 or the first rainfall. This is to take advantage of low stream flow and avoid the spawning and egg/alevin incubation period of salmon and steelhead.
2. Heavy equipment that will be used in the project shall be in good working order and inspected for leakage of coolant and petroleum products and repaired, if necessary, before work is started. All equipment shall be cleaned prior to use to remove external oil, grease, dirt, or mud. Wash sites must be located in upland locations so that dirty wash water does not flow into the stream channel or adjacent wetlands.
3. Any equipment or vehicles operated within or adjacent to the stream shall be checked and maintained daily to prevent fuel, lubricant, or coolant leaks.
4. Staging/storage areas for equipment, materials, fuels, lubricants, and solvents shall be located outside of the creek's high water channel and associated riparian area. Stationary equipment located within the dry portion of the stream channel or adjacent to the stream or a wetland shall be positioned over drip-pans. Vehicles shall be moved out of the normal high water area of the stream prior to refueling and lubricating. The contractor shall ensure that contamination of habitat does not occur during such operations.
5. The number of access routes, number and size of staging areas, and the total area of the work site activity shall be limited to the minimum necessary to complete the restoration action.
6. All activities performed in or near a stream or wetland shall have absorbent materials designed for spill containment and cleanup at that activity site for use in case of an accidental spill.
7. Equipment operators shall be trained in the procedures to be taken should an accident occur. Spill clean-up supplies must be on site for the duration of construction activities. Prior to the onset of work, the permittee shall have a prepared plan to allow a prompt and effective response to any accidental spills.
8. In the event of a spill, operators must immediately cease work, start clean-up, and notify the appropriate authorities.
9. Any areas identified as having "wet" or "soft" soils (a) shall be covered with heavy synthetic mats or other acceptable non-toxic material and gravel that can be readily laid down and immediately removed following construction, and (b) shall be the minimum width and length necessary to allow movement of equipment to and from the project site.

10. Work with heavy equipment shall be performed in isolation from flowing water, except as may be necessary to construct coffer dams to divert stream flow and isolate the work site. If there is flow when the work is done, the contractor shall construct coffer dams upstream and downstream of the excavation site and divert all flow from upstream of the upstream dam to downstream of the downstream dam. The coffer dams may be constructed with clean river gravel or sand bags, and may be sealed with sheet plastic. Sand bags and any sheet plastic shall be removed from the stream upon project completion. Clean river gravel may be left in the stream, but the coffer dams must be breached to return the stream flow to its natural channel.

11. Any fish and other aquatic organisms (*e.g.,* amphibians) in the project area shall be relocated before construction commences as described in Mitigation Measure No. 27 below.

12. Streambank modifications to facilitate project construction operations shall be performed in a manner that will not cause negative impacts upstream and downstream in the stream channel, such as accelerated bank erosion or loss of vegetation.

13. The disturbance or removal of vegetation shall not exceed the minimum amount necessary to complete operations.

14. Suitable large woody debris removed from fish passage barriers that is not used for habitat enhancement shall be left within the riparian zone so as to provide a source for future recruitment of wood into the stream.

15. The contractor shall ensure that the spread or introduction of invasive exotic plants shall be avoided to the maximum extent possible. When practicable, invasive exotic plants at the work site shall be removed.

16. Any sediment-laden water created by construction activity shall be filtered before it re-enters the stream or disposed of in an upland location where it will not drain directly into any stream channel.

17. Effective erosion control measures shall be in place at all times during construction. Construction must not commence until all temporary erosion control devices (*e.g.*, straw bales, silt fences, *etc*.) are in place downslope or downstream of the project site. A supply of erosion control materials shall be maintained on site to facilitate a quick response to unanticipated storm events or emergencies. Erosion control measures shall be maintained throughout the construction period. If continued erosion is likely to occur after construction is completed, then appropriate erosion prevention measures shall be implemented and maintained until erosion has subsided.

18. Erosion controls (*e.g.*, silt fences, berms of hay bales, plastic sheeting held down with rocks or sandbags over stockpiles, *etc*.) shall be used

to protect and stabilize stockpiles and exposed soils to prevent movement of materials.

19. If operations are not adequately containing sediment, the activity shall cease. Turbid water shall be contained and prevented from being transported downstream in amounts that are deleterious to fish or could violate state pollution laws.

20. Work sites shall be winterized at the end of each day when significant rains are forecast that may cause unfinished excavation to erode, as specified in the CDFG Streambed Alteration Agreement and the NOAA-Fisheries Biological Opinion (File No. 151422SWR03AR8912 dated May 21, 2004 page 73).

21. During construction, all trash shall be properly contained, removed from the work site, and disposed of on a regular basis to avoid contamination of habitat during restoration activities. Following construction, all trash and construction debris shall be removed from work areas and disposed of properly.

22. Any materials placed in seasonally dry portions of a stream that could be washed downstream or could be deleterious to aquatic life, wildlife, or riparian habitat shall be removed from the project site prior to inundation by high flows.

23. Immediately after project completion and before the close of the seasonal work window, all exposed soils present in and around the project site which may deliver sediment to a stream shall be stabilized with mulch, seeding, and/or placement of erosion control blankets. Erosion control seeding shall include only native, regionally appropriate species as specified in the approved revegetation plan (see Special Condition No. 5 above).

24. Revegetation shall be done using regionally appropriate, native species only, as directed in the approved revegetation plan (see Special Condition No. 5 above). Native species salvaged in the project area during construction activities may be used for revegetation provided they are properly stored (*e.g,* containerized in pots if to be stored for more than 3 days, kept moist, shielded from wind, etc.) to ensure their health and vigor upon replanting. Planting of seedlings and salvaged plantings for revegetation shall begin after December 1 or when sufficient rainfall has occurred to ensure the best chance of survival of the plantings, but in no case after April 1.

25. Several photographic points shall be established to document all work performed. Photographs shall be recorded in sufficient frequency to document each stage of work.

(b) Mitigation Measures for Streamflow Diversion, Installing Fish Barriers, Relocating Fish, and Installing Flow Barriers and Silt Fences:

According to the impacts analysis prepared by the applicant (Exhibit No. 6), the construction and removal of stream flow diversion structures may have direct or indirect impacts on sensitive aquatic organisms and habitat. Because the two culvert crossings are barriers to fish passage, salmonids are unlikely to be found upstream of the project area. Impacts to fish may occur primarily downstream of the diversion structure.

Potential direct impacts to fish include injury or mortality due to crushing, electrocution, harassment, or stranding. Fish may be injured or killed during the construction and removal of the diversion structures. Due to the proposed timing of the project (late summer during low flows), adult salmonids are unlikely to be found in the project area, but it is possible that juveniles may be present. Juvenile fish could be bumped or crushed by footsteps during fish exclusion fence installation. Fish could also be injured or stressed by harassment from both fish fence installation and/or hazing (driving) them out of the project area, which could lead to mortality. Electrofishing to remove fish from inside the project reach could result in the death of individuals from electricity or transport to a new location.

Potential indirect impacts to fish include changes to habitat and water quality that could affect survival and numbers of individuals/populations. Dewatering of any portion of the stream channel could affect habitat. Dewatering may result in loss of aquatic biota that fish feed on or aquatic vegetation that fish hide in. In addition, lack of water could affect riparian vegetation on stream banks, resulting in drought stress and leaf drop or death. Loss of riparian vegetation, in turn, could lead to loss of shade and reduction in leaf litter contribution to the stream from the time the diversion is removed and flow restored until new riparian vegetation growth occurs/re-establishes. Placement of the fish exclusion fencing, construction of the diversion structures, and removal of the components could expose and stir up fine sediment on the streambed, resulting in a temporary increase in turbidity.

In addition to Mitigation Measure Nos. 1–25 above, the following mitigation measures (which include those proposed by the applicant as well as those measures required in the environmental document, project approvals, and grant described previously) will reduce these impacts to less than significant levels:

26. Measures to minimize disturbance associated with instream habitat restoration construction activities shall follow those outlined in the CDFG manual (Flosi *et al*. 1998).

27. As required by the National Marine Fisheries Service (NOAA-Fisheries) terms and conditions of the Biological Opinion (File No. 151422SWR03AR8912 dated May 21, 2004), mitigation measures shall be taken to reduce adverse impacts to salmonids during fish capture and relocation, including those measures listed in NOAA-Fisheries Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act (June 2000) and those measures listed in CDFG's California Salmonid Stream Habitat Restoration Manual (3rd Edition, Volume II, Flosi et al. 1998), which include, but are not limited to, the following:

    a. Any fish and other aquatic organisms (*e.g.*, amphibians) in the project area shall be relocated before construction commences. Relocation shall be accomplished by installing temporary fish barriers above and below the project reach, as proposed and as described above.

    b. Fish relocation shall occur only between June 15 and November 1.

    c. CDFG's *Measures to Minimize Impacts to Aquatic Habitat and Species During Dewatering of Project Sites* (pages IX-51 and IX-52) and *Measures to Minimize Injury and Mortality of Fish and Amphibian Species During Dewatering* (IX-52 and IX-53) of the CDFG Manual (referenced above) shall be followed.

    d. The field crew shall have a copy available on site at all times of the NOAA-Fisheries Biological Opinion referenced above, including these terms and conditions, and the NOAA-Fisheries electrofishing guidelines and CDFG manual referenced above.

    e. Fish relocation activities shall be performed only by qualified fisheries biologists with a current CDFG collectors permit and experience with fish capture and handling.

    f. Air and water temperatures shall be periodically measured, if necessary, and activities shall cease when temperatures exceed those allowed by CDFG and NOAA-Fisheries.

    g. Fish shall be excluded from reentering the work area by blocking the stream channel above and below the work area with fine-meshed net or screens. Mesh shall be no greater than 1/8 inch diameter, and the bottom edge of the net or screen shall be secured completely to the channel bed to prevent fish from reentering the work area. Exclusion screening shall be placed in areas of low water velocity to minimize fish impingement. Screens shall be checked periodically and cleaned of debris to permit free flow of water.

    h. Prior to capturing fish, the most appropriate release locations shall be determined in consultation with CDFG.

i. Prior to capturing fish, the most efficient means for capturing fish (*e.g.,* electrofishing, seining, etc.) shall be determined in consultation with CDFG. Electrofishing shall only be conducted by properly trained personnel following CDFG and NOAA-Fisheries guidelines.

j. Handling of salmonids shall be minimized. When handling is necessary, hands or nets shall be wetted prior to touching fish.

k. Fish shall be temporarily held in cool, shaded, aerated water in a container with a lid. Water temperatures shall not be greater than ambient instream temperatures. Aeration shall be provided with a battery-powered external bubbler. Water shall be well-oxygenated, with a dissolved oxygen level of 7 parts-per-million or greater. Fish shall be protected from jostling and noise and shall not be removed from the container until time of release.

l. A thermometer shall be placed in the holding containers and, if necessary, partial water changes shall be conducted to maintain a stable water temperature. If cooling is used, water temperatures shall not be allowed to cool more than 3° Celsius (5° Fahrenheit) below ambient instream temperatures. If the water temperature reaches or exceeds those allowed by CDFG and NOAA-Fisheries, fish shall be released and rescue operations ceased.

m. Overcrowding in holding containers shall be avoided. There shall be at least two containers on hand, and young-of-year fish shall be segregated from larger age-classes to avoid predation. Larger amphibians, such as Pacific giant salamanders, shall be placed in containers with larger fish.

n. Prior to release, the following information shall be recorded: (1) the number of fish and other aquatic organisms captured, including species and estimated year-class of each (*e.g*., fry, 1+ or 2+ juvenile, adult); (2) the number of listed salmonid injuries and fatalities by age class; (3) the number of successfully relocated listed salmonids by age class for each relocation site; and (4) the date and time of release of listed salmonids to each relocation site. Anesthetizing and measuring fish shall be avoided.

o. Listed salmonids shall be subject only to the minimum handling and holding times required to collect the above information and relocate them to appropriate aquatic habitat. All captured fish shall be allowed to recover from electrofishing and other capture gear before being returned to the stream.

p. If mortality during relocation exceeds 5 percent, efforts shall immediately cease and CDFG and NOAA-Fisheries shall be contacted.

q. Monitoring:

i) All fish captured and relocated shall be identified and recorded by a qualified fisheries biologist.

ii) Any mortality shall be documented. Any fish or amphibians taken shall be preserved and provided to CDFG within 24 hours, unless CDFG is present at the time of de-watering.

iii) The applicant shall provide fish relocation data to the CDFG Grant Manager on a form provided by the CDFG.

28. Stream flow barriers and stream flow diversion shall be installed as proposed and described above in Section IV-C-2-f and in Mitigation Measure Nos. 10 and 28 above. The stream diversion outlet shall be located immediately above the downstream fish exclusion fencing to avoid impacts to fish below the project. The diversion shall be removed as soon as work below ordinary high water is completed. Stream flow diversion shall be limited to the minimum amount of time necessary to complete work in the stream channel. The length of the diversion shall be the shortest possible while still minimizing effects to water quality and not encroaching on construction activities.

29. The suction end of the intake pipe shall be fitted with fish screens meeting CDFG and NMFS criteria to prevent entrainment or impingement of small fish.

30. A survey of the stream flow diversion area for stranded fish or amphibians shall be conducted by a qualified fisheries biologist during and immediately after stream diversion structures are installed.

31. Silt fences or other detention methods shall be installed to reduce the amount of sediment entering the stream (per Mitigation Measure Nos. 17-20 above). If a silt fence or other detention method is found not to be adequately containing sediment, construction activities shall cease until remedial measures are implemented that prevent sediment from entering the water below.

32. As in Mitigation Measure No. 17, effective erosion control measures shall be in place at all times during construction. Construction within the 5-year floodplain shall not begin until all temporary erosion controls (*e.g.*, straw bales or silt fences that are effectively keyed-in) are in place down slope of project activities within the riparian area. Erosion control measures shall be maintained throughout the construction period. If continued erosion is likely to occur after construction is completed, then appropriate erosion prevention measures shall be implemented and maintained until erosion has subsided.

33. Sediment shall be removed from sediment controls once it has reached one-third of the exposed height of the control. Whenever straw bales

are used, they shall be staked and dug into the ground 6 inches. Catch basins shall be maintained so that no more than 6 inches of sediment depth accumulates within traps or sumps.

34. Sediment-laden water created by construction activity shall be filtered before it leaves the right-of-way or enters the stream network or an aquatic resource area. Silt fences or other detention methods shall be installed as close as possible to culvert outlets to reduce the amount of sediment entering aquatic systems.

35. All habitat improvements, including placement of instream structures such as root-wads, stumps, etc. shall follow techniques described in the CDFG Manual (Flosi *et al.* 1998).

36. Any gravel imported from offsite for use in the proposed project shall be from a source known not to contain historic hydraulic gold mine tailings, dredger tailings, or mercury mine waste or tailings.

37. As in Mitigation Measure No. 25, several photographic points shall be established to document all work performed. Photographs shall be recorded in sufficient frequency to document each stage of work.

(c) Mitigation Measures for Stream Channel Rehabilitation Work

The project would result in adverse impacts to riparian vegetation along the creek banks and sensitive fish species, if present, in the channel reach during the excavation process. Additionally, a potential increase in suspended sediment and turbidity in downstream waters may result from channel excavation and placement of structural and embankment fill. Placement of gravel and instream fish habitat structures in the channel could also be considered a type of fill in the creek, but this is considered a beneficial (fill) effect of the project, as it is intended to improve fish habitat. Despite these potential impacts, the overall intent of the proposed project is the improvement of fish habitat, including the restoration of Rocky Gulch to more natural conditions, and therefore the net effect on sensitive species and their habitats would be positive.

In addition to Mitigation Measure Nos. 1–37 above, the following mitigation measures (which include those proposed by the applicant as well as those measures required in the environmental document, project approvals, and grant described previously) will reduce these impacts to less than significant levels:

38. As in Mitigation Measure No. 26, measures to minimize disturbance associated with instream habitat restoration construction activities shall follow those outlined in the CDFG manual (Flosi *et al*. 1998).

39. As described in Mitigation Measure Nos. 10, 11, 13, 17-20, and 27, work with heavy equipment shall be performed in isolation from flowing water; all fish species and other aquatic organisms (*e.g.*, amphibians) in the project area shall be relocated and prevented from entering the work site prior to construction commencement; the disturbance or removal of vegetation shall not exceed the minimum amount necessary to complete operations; and effective erosion control measures shall be in place at all times during construction.

40. Excavated material, if stockpiled, shall be stockpiled in areas where it cannot enter the stream channel. Stockpiling sites shall be determined prior to the start of construction. The temporary stockpiling of excavated material shall be minimized.

41. If feasible, topsoil shall be conserved for reuse at the project location or in other areas.

42. An engineer shall be on site during final grading to assure that the area is recontoured as per approved design specifications.

43. Soon after the bank recontouring work is complete, revegetation of the banks shall occur with appropriate regionally appropriate, native vegetation as per an approved revegetation plan prepared by a qualified botanist (see Mitigation Measure No. 24 and Special Condition No. 5 above).

44. Stream Channel Rehabilitation Monitoring:

    (a) Within 60 days of completion of the initial enhancement work, the following items shall be submitted: 1) "as built" plans that document successful implementation of the project as approved, and 2) an assessment of whether the project's goals have been or are likely to be achieved.

    (b) The project site shall be monitored for at least five years, or until the project goals have been achieved, for vegetative planting success, presence of salmonids, and verification of habitat use.

    (c) Annual reports shall be provided by the applicant by March 30th of each year describing and documenting fish presence, habitat evaluation, water quality, sedimentation, and establishment of vegetative cover at the project site.

    (d) As in Mitigation Measure Nos. 25 and 37, several photographic points shall be established to document all work performed. Photographs shall be recorded in sufficient frequency to document each stage of work.

(d) Mitigation Measures for Site Remediation Work

Adverse effects could occur to sensitive fish species from the removal of temporary flow diversions, fish barrier structures, and silt fences. Additionally, post-construction remediation of access and staging areas could indirectly affect fish habitat and water quality from storm water runoff from these areas. In addition to Mitigation Measure Nos. 1–44 above, the following mitigation measures (which include those proposed by the applicant as well as those measures required in the environmental document, project approvals, and grant previously described) will reduce these impacts to less than significant levels:

45. All temporary fill, synthetic mats and silt fences shall be removed from wetlands and waters of the U.S./State immediately on cessation of construction.

46. Appropriate Best Management Practices (BMPs) from Section 3 of the *California Stormwater Best Management Practices Handbook* (CASQA 2003, accessed online at http://www.cabmphandbooks.com/) shall be implemented to prevent entry of stormwater runoff into the excavation site, the entrainment of excavated contaminated materials leaving the site, and to prevent the entry of polluted storm water runoff into coastal waters during the transportation and storage of excavated contaminated materials.

47. Any disturbed banks shall be fully restored upon completion of construction.

48. At the completion of the project, soil compaction that is not an integral element of the design of a crossing shall be decompacted and seeded, as needed, with a mix of regionally appropriate native grasses and/or herbs effective at erosion control.

49. As in Mitigation Measure No. 23 above, after project completion and before the close of the seasonal work window, all exposed soils present in and around the project site which may deliver sediment to a stream shall be stabilized with mulch, seeding, and/or placement of erosion control blankets. Erosion control seeding shall include only native, regionally appropriate species as specified in the approved revegetation plan (see Special Condition 5 above).

50. Site Remediation Monitoring:

    (a) As in Mitigation Measure No. 44, annual reports shall be provided by the applicant by March 30th of each year, or until the project goal has been achieved, describing and documenting establishment of vegetative cover and recovery of affected wetlands at the project site.

(b) As in Mitigation Measure Nos. 25, 37, and 44, several photographic points shall be established to document all work performed. Photographs shall be recorded in sufficient frequency to document each stage of work.

Analysis

The proposed project incorporates reasonable and prudent mitigation measures required by federal, state, and local agency consultations, including the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, National Marine Fisheries Service (NOAA-Fisheries), and the California Department of Fish and Game, a co-applicant and funder for this proposed project. In a formal biological and conference opinion issued by NOAA-Fisheries, which addressed the effects of the proposed project on threatened species and designated critical habitat in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, NOAA-Fisheries determined that the project, with all its various mitigation measures, is not likely to jeopardize the continued existence of threatened Coho salmon, Chinook salmon, or NC steelhead, and is not likely to destroy or adversely modify Coho salmon designated critical habitat, or Chinook salmon and NC steelhead proposed critical habitat. Therefore, the Commission imposes Special Condition No. 3, which requires the implementation of Mitigation Measure Nos. 1-50 as described in this document that are either proposed by the applicant, required in the Mitigated Negative Declaration, required by these other agency approvals, or required as conditions of the grant funding provided for the project.

In addition to the mitigation measures proposed, some additional measures, summarized below, are necessary to mitigate the project's impacts on (a) impacts to riparian vegetation associated with allowing nonnative vegetation or native vegetation of non-local genetic stock to be installed or allowed to naturalize or persist on the site; (b) impacts to raptors or other wildlife in the food chain from allowing the use of rodenticides; (c) impacts on water quality associated with debris disposal from the channel excavation; and (d) impacts to wetlands associated with not minimizing wetland fill in the reconstruction of the footbridge.

Mitigation Measure Nos. 23-24, as listed above, states that soon after the project work is completed, revegetation of the banks would occur with appropriate native vegetation as per an approved revegetation plan prepared by a qualified botanist. To ensure that revegetation is conducted in the least environmentally damaging manner and appropriately mitigates the project impacts to riparian vegetation, other details should accompany this mitigation. These additional measures require all non-native invasive plants to be removed, that the area be replanted with habitat-specific native vegetation of local genetic stock, if available, that the use of dangerous rodenticides be prohibited, and that seedlings be planted when there is sufficient rainfall to ensure their best chance of survival. Therefore, the Commission imposes Special Condition No. 5, which requires the submittal, for the review and approval of the Executive Director, of a revegetation plan incorporating the elements described above.

Construction debris that is left on the site could be carried by stormwater runoff into the stream, thereby adversely affecting water quality and reducing the value of the proposed improvements in enhancing fish passage through Rocky Gulch. To avoid such impacts, all construction debris including excess excavated soil not used in the project, the old culverts to be replaced, packaging for new materials used in construction, wiring scraps, fasteners, etc. must be removed and disposed of in an upland location outside of the coastal zone or at an approved disposal facility. Therefore, the Commission attaches Special Condition No. 6, which requires the applicant to submit, for the Executive Director's review and approval, a debris disposal plan for removing and disposing of such construction debris detailing the manner of removal of debris from the site and the final destination where the debris will be taken.

The project proposes to remove the existing wooden footbridge spanning the creek in the project area for the duration of construction activities in the area, and then to salvage and reinstall the bridge upon project completion. No reinstallation methods are specified, but the existing bridge spans the creek entirely and does not include any support structures within the creek itself. The existing bridge is installed on apparently upland, grassy areas that lack wetland or riparian vegetation. To ensure that bridge reinstallation is conducted in the least environmentally damaging manner and that no impacts to the creek or riparian habitat occur, the Commission imposes Special Condition No. 7, which requires an "as built" plan of the area showing the restored creek elevations and extent of riparian vegetation in relation to bridge placement following construction activities.

The mitigation measures listed above include several monitoring provisions to document the progress of the proposed project. As proposed or required, the listed measures do not indicate that the applicant would submit this monitoring information to the Commission. The submittal of the monitoring information to the Commission is necessary to ensure that the project has been performed consistent with the proposed mitigation measures. Further, if the final report indicates that the planting effort has been unsuccessful, in part or in whole, based on the approved performance standards, a remediation plan should be prepared and submitted to the Commission to compensate for those portions of the original plan that did not meet the approved performance standards. Therefore, the Commission imposes Special Condition Nos. 8 and 9, which require these additional measures to occur.

The Commission finds that with the requirements of Special Condition No. 3, which incorporates the proposed mitigation measures 1-50 described above, and Special Conditions 4 through 10, which incorporate the additional measures described above, the project, as conditioned, incorporates the best mitigation measures feasible to reduce significant adverse environmental effects on the creek to less than significant levels consistent with the requirements of Section 30236 of the Coastal Act.

Conclusion

Therefore, the Commission finds that because (1) the primary objectives of the proposed project activities described above are to enhance fish and wildlife habitat in the project reach of Rocky Gulch; and (2) as conditioned herein, the best feasible measures for the enhancement of fish and wildlife habitat in the project reach of Rocky Gulch would be implemented with the project, the proposed substantial alteration of the streambed is allowable under Coastal Act Section 30236.

E. Geologic Stability

The Coastal Act contains policies to assure that new development provides structural integrity, minimizes risks to life and property in areas of high flood hazard, and does not create or contribute to erosion. Section 30253 of the Coastal Act states, in applicable part, the following:

New development shall:

> (l) *Minimize risks to life and property in areas of high geologic, flood, and fire hazard.*
>
> (2) *Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.* [emphasis added]

A hydraulic analysis completed for the project (Exhibit No. 9) summarizes the area's existing hydraulic conditions as follows (from McBain & Trush 2006, pp. 5-6):

> *The existing OAR culvert is undersized, has become partially aggraded with fine sediments, and is a partial barrier to salmonid migration. The present undersized culvert configuration provides the downstream landowner (Ginni Hassrick) protection at lower flood recurrences by preventing all the discharge from passing through the culvert, but the channel downstream of OAR is narrow, unconfined, and encroached by vegetation and home structures, posing significant flood risks at higher flood recurrences. The undersized culvert also backwaters, and floodwaters leave the channel along the right bank, causing flooding on the upstream landowner's (Nathan Prather) property. Overbank flows flood across OAR at floods above approximately a 5-yr recurrence interval. The existing condition also constricts coarse sediment from routing through the culvert and replenishing the downstream reconstructed reach. Finally, the inboard ditch along OAR that drains floodwater through a secondary culvert back to Rocky Creek may trap juvenile salmonids and other fish after floods recede.*

The hydraulic analysis developed three design alternatives for the project based on improvements to fish passage, flood risk to property and infrastructure, and desirability to

surrounding landowners. The preferred and recommended design alternative (design alternative #3) has been incorporated into the proposed project plans. Therefore, the project, as proposed, is designed to improve fish passage, restore channel capacity, and route extreme (*i.e.*, 10+ year) floods into pasturelands rather than Old Arcata Road or the inboard ditch, where fish stranding could occur.

Based on the recommended design alternative (which was based on hydraulic modeling of the project area using the applicant's proposed oversized box culvert replacements embedded and sloped as proposed), the following recommendations were included as part of the applicant's project design process (from McBain & Trush 2006):

- Use the same bankfull cross section dimensions as those used on the Rodoni project immediately downstream of the project site. By using the downstream cross section shape, the reach of channel through the culvert and around the Hassrick property (3261 Old Arcata Rd.) will have the same channel-forming (bankfull) discharge design characteristics, which should improve flow and sediment transport continuity through the project reach.
- Extend the downstream design channel slope of approximately 0.0063 through the Hassrick (the subject) property. At this slope, the proposed design channel (with inset floodplain) should convey approximately 170 to 210 cfs, which corresponds approximately to the 5-year peak flood discharge.
- The design cross section should have a bankfull channel width and depth of approximately 12.5 ft and 2.4 ft, respectively, with a floodplain bench occupying approximately 8 ft of width and set in approximately 1.5 ft below the pasture floodplain grade, for a total reconstructed channel width not to exceed approximately 20 ft. These are typical dimensions and the final as-built channel should incorporate topographic diversity (pools on the outside of the meander bend, shallow riffles, floodplain occupying the right bank upstream and left bank downstream of the downstream crossing, etc.).
- Between the OAR culvert and the downstream crossing: (1) dispose of fill by building up the rental house (second unit on property) driveway along the left bank, (2) excavate and relocate two cypress trees on the left bank downstream of the rental unit; and (3) build a berm or floodwall along the left bank from the driveway downstream past the rental unit, with top of berm elevation at or above 21.5 ft (NAVD88).
- Below the downstream crossing: (1) widen the existing channel only along the left bank, and protect the right bank vertical undercut and the landowner's fence and landscaping, (2) enhance the existing floodplain depression to convey overbank flow away from the channel along the left bank, (3) dispose of fill by building up the back yard grass area approximately 1-2 ft, and (4) remove or lengthen and raise wooden footbridge at station 57+75.
- Downstream of the Hassrick property, construct a smooth transition with the downstream reconstructed project reach [on the Rodoni property] so that the

channel gradient, cross section dimensions, and floodplains merge naturally with the downstream reach.

- Construct a smooth transition upstream and downstream of the proposed culvert upgrades.
- Provide bank and channel erosion protection downstream of the proposed culvert upgrades.
- Provide bank and channel erosion protection in areas of high shear stresses and velocities, and/or provide bank protection along the entire restored channel.
- Improve flood overflow conditions along the left bank floodplain on the Hassrick property downstream of the residences.
- Provide micro-topography within the restored channel to improve habitat conditions, such as pool features within the channel bend.
- Over-excavate the bottom of the channel 1 to 2 ft at selected locations, and backfill with appropriate river-run gravels and/or spawning gravels to design grade.
- Develop and implement revegetation plans for both properties upstream and downstream of Old Arcata Road.

Based on these design elements, which are included in the applicant's proposal, hydraulic analyses were conducted to analyze water surface elevations, water velocities, and flow distributions, and the following results were reported (McBain & Trush 2006):

- Discharge at Old Arcata Road: For all hydraulic model cases, the proposed design elements would increase flows through the Old Arcata Road culvert and in the channel through the Hassrick property. As a result, more flow would overtop the left bank downstream of the Old Arcata Road and flood into the pasture. The hydraulic analysis report states that *"…the model results indicate more discharge through the Old Arcata Road culvert than would probably occur, simply because the entire flood flow does not reach the culvert. This analysis therefore provides high estimates of water surface elevations downstream of Old Arcata Road through the Hassrick property, which can be considered conservative when assessing flood effects of the project."* (McBain & Trush 2006, p. 12).

The hydraulic report goes on to explain the change to flood conditions in the area resulting from the proposed project, as follows (from McBain & Trush 2006, p. 13):

- At the 1.5-yr flood stage, the primary change to exiting conditions is that overbank flow from the left bank downstream of OAR and the houses is eliminated, and the entire flood flow is conveyed to the downstream restored reach on the Rodoni property.
- At the 5-yr flood stage, in addition to retaining most of the total discharge within the design channel cross section (with inset floodplain) downstream

of OAR, the restored upstream channel would convey the entire 5-yr flood discharge to the OAR culvert. This is an important threshold because floods in the range of 2-5 yr recurrence are critical to sediment transport processes.

- At the 10-yr flood stage, most flow is still routed to the OAR culvert, but the proportion of flow leaving the left bank downstream of OAR increases to approximately 34% of total discharge. The main reason overbank flooding is currently so low at this location is because the discharge does not reach this location with the existing undersized culverts.
- Modeling results show that between the 10-yr and 100-yr flood, the channel upstream of the OAR culvert loses discharge to the floodplain, and floodwater flows northwest across the pasture similar to existing conditions.

- Steady-State Water Surface Profiles: According to the hydraulic report (McBain & Trush 2006, p. 13): *"In general, it appears that water surface elevations should remain approximately the same downstream of OAR, despite the increase in flows from the project…The primary benefit of the project will be improved conveyance with the more frequent flood events in the range of 1 to 5-yr recurrence. During these flood events, most of the flood flows will pass through the culvert and stay within the channel and inset floodplain through the Hassrick property. During larger flood events, water surface elevations downstream of OAR will be similar to existing conditions. However, upstream flood levels will be lower. For floods greater than a 5-year recurrence, overbank flooding will continue to occur along the left bank downstream of the Hassrick residential structures. Our design proposes to modify the left bank and enhance the existing shallow swale to convey floodwater away from the channel and down the pasture, as a way to control overbank flooding in this location."*

- Improved Channel and Flow Conditions at the Bankfull Discharge: According to the hydraulic report (McBain & Trush 2006, p. 13): *"The restored channel and upgraded culverts* [would] *generally increase and equalize channel velocities through the project reach. The channel and culvert improvements should slightly lower shear stress through the project reach, but more importantly, should provide uniform shear stress between the project reach and the recently restored lower reaches on the Rodoni property. An important item to note is the increased shear stresses upstream of the Old Arcata Road culvert for the design condition. The proposed project should improve sediment transport and routing conditions in Rocky Creek at the Old Arcata Road crossing and through the Hassrick property."*

Finally, the applicant submitted an additional geologic evaluation of the area prepared by the project engineer, which states the following with respect to erosion/geologic stability in the area (see Exhibit No. 4):

> *"The lower pasturelands of the watershed are reclaimed tidal marshes consisting of poorly drained silty clay loam. These soils transition into shallower loam underlain by stiff clayey hard pan and soft sedimentary rock formations as the creek gains elevation. The existing creek banks that were historically relocated and excavated reveal the harder clayey substrate and show little erosion. The project completed in 2005 downstream of the currently proposed project has experienced two winters with almost no signs of erosion. The upper watershed has intermittent rock outcroppings that have been mined for various purposes in the past, though the rock is known for its low durability. The channel system is well defined and has a high erosion resistance."*

Thus, based upon the area substrate's natural resistance to erosion, and based on the inclusion of design features in the project, including (1) using the same bankfull cross section dimensions as those used on the Rodoni project immediately downstream of the project site; (2) extending the downstream design channel slope of approximately 0.0063 through the Hassrick property (3261 Old Arcata Road); (3) incorporating the recommended design cross sections with respect to bankfull channel width, depth, and floodplain bench construction; and the various other recommended design elements (from McBain & Trush 2006) as discussed above, the Commission finds that risks to life and property from geologic hazards have been minimized, that the stability and structural integrity of the site or surrounding area have been assured, and the development will neither create nor contribute significantly to erosion, geologic instability, or destruction or in any way require the construction of protective devices that would substantially alter natural landforms along the adjoining stream banks.

Although the project has been evaluated and designed in a manner to minimize increased risk of flooding hazards, some risk of flood hazard remains. Therefore, the Commission attaches Special Condition No. 10, which requires the applicant to assume the risks of flooding hazards to the property caused by the approved development and waive any claim of liability on the part of the Commission. Given that the applicant has chosen to implement the project despite flooding risks, the applicant must assume the risks. In this way, the applicant is notified that the Commission is not liable for damage as a result of approving the permit for development. The condition also requires the applicant to indemnify the Commission in the event that third parties bring an action against the Commission as a result of the failure of the development to withstand hazards.

Therefore, the Commission finds that as conditioned, the development is consistent with Section 30253 of the Coastal Act.

F. Archaeological and Cultural Resources

Coastal Act Section 30244 provides protection of archaeological and paleontological resources and requires reasonable mitigation where development would adversely impact such resources.

The proposed project area is located within the ethnographic territory of the Wiyot Indians, who lived almost exclusively in villages along the protected shores of Humboldt Bay and near the mouths of the Eel and Mad Rivers (Pitsenbarger & Verwayen 2007). Several Wiyot villages are known to have occurred along the eastern shore of Arcata Bay in the general vicinity of the project area (Pitsenbarger & Verwayen 2007). The relatively larger and sedentary populations of these villages engaged in an economy of salmon fishing, marine-mammal hunting, shellfish gathering, and seasonal excursions inland for acorns. Pioneers from the gold rush era of the mid-1800's subsequently settled in the Arcata Bay region, and small farms that included gardens, pastures, and animal husbandry were established in the Bayside area by 1867 (Pitsenbarger & Verwayen 2007). Lumber operations began in the area in 1875, including a logging and quarrying railroad that ran through the Jacoby Creek region to Arcata Bay (Pitsenbarger & Verwayen 2007).

A cultural resources investigation was completed for the project in January of 2007 (Pitsenbarger & Verwayen 2007). No historic era or prehistoric cultural resources were identified in the project area in the investigation. Nevertheless, to ensure protection of any cultural resources that may be discovered at the site during construction of the proposed project, and to implement the recommendations of the cultural resources report, the Commission attaches Special Condition No. 4 that requires that if an area of cultural deposits is discovered during the course of the project, all construction must cease and a qualified cultural resource specialist must analyze the significance of the find. To recommence construction following discovery of cultural deposits, the applicant is required to submit a supplementary archaeological plan for the review and approval of the Executive Director to determine whether the changes are *de minimis* in nature and scope, or whether an amendment to this permit is required.

Therefore, the Commission finds that the proposed project, as conditioned, is consistent with Coastal Act Section 30244, as the development will not adversely impact archaeological resources.

G. California Environmental Quality Act (CEQA)

The California Department of Fish and Game acted as the lead agency for this project, which is part of the CDFG Fisheries Grant Restoration Program. As such, the CDFG prepared an Initial Study and Mitigated Negative Declaration for the grant program region, including Del Norte, Humboldt, Los Angeles, Mendocino, Monterey, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, Siskiyou, Sonoma, Trinity and Ventura Counties (State Clearinghouse Number 2006052041).

Section 13906 of the Commission's administrative regulation requires Coastal Commission approval of Coastal Development Permit applications to be supported by a finding showing the application, as modified by any conditions of approval, is consistent with any applicable requirements of the California Environmental Quality Act (CEQA). Section 21080.5(d)(2)(A) of CEQA prohibits a proposed development from being approved if there are any feasible alternatives or feasible mitigation measures available,

which would substantially lessen any significant adverse effect the proposed development may have on the environment.

The Commission incorporates its findings on Coastal Act consistency at this point as if set forth in full, including all associated environmental review documentation and related technical evaluations incorporated-by-reference into this staff report. Those findings address and respond to all public comments regarding potential significant adverse environmental effects of the project that were received prior to preparation of the staff report. As discussed above, the proposed project has been conditioned to be consistent with the policies of the Coastal Act. As specifically discussed in these above findings, which are hereby incorporated by reference, mitigation measures that will minimize or avoid all significant adverse environmental impacts have been required. As conditioned, there are no other feasible alternatives or feasible mitigation measures available that would substantially lessen any significant adverse impacts that the activity may have on the environment. Therefore, the Commission finds that the proposed project, as conditioned to mitigate the identified impacts, can be found consistent with the requirements of the Coastal Act and to conform to CEQA.

V. EXHIBITS

1. Regional Location Map
2. Vicinity Map
3. Assessor's Parcel Map
4. Project Description (amended, dated March 1, 2007)
5. Project Plans
6. Analysis of Water Diversion of Threatened Fish Species (amended, dated March 2, 2007)
7. CDFG Streambed Alteration Agreement (File No. R1-06-0660)
8. Botanical Survey Report
9. Hydraulic Analysis

REFERENCES

CASQA (California Stormwater Quality Association). 2003. *California Stormwater Best Management Practices Handbook*. Available online at http://www.cabmphandbooks.com/.

Finigan, J. 1957. *Pollution Rocky Gulch Creek.* Report to Humboldt County District Attorney. California Department of Fish and Game, Rocky Gulch file, Eureka Field Office (cited in Laird 2005).

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, & B. Collins. 1998 (3rd edition). *California Salmonid Stream Habitat Restoration Manual*. California Department of Fish and Game. Available online at http://www.dfg.ca.gov/nafwb/manual.html.

HBWAC & RCAA. 2005. *Humboldt Bay Watershed Salmon and Steelhead Conservation Plan*. Report prepared for the California Department of Fish and Game and the California Coastal Conservancy by the Humboldt Bay Watershed Advisory Committee (HBWAC) and the Natural Resources Services Division of Redwood Community Action Agency (RCAA).

Kalt, J. February 5, 2007. *Rocky Gulch Culvert Replacement Project Humboldt County Sensitive Plant Survey Results.* Unpublished technical report prepared for the California Department of Fish & Game, Eureka, CA by Jennifer Kalt, McKinleyville, CA.

Laird, A. 2005. *Biological Assessment: Lower Rocky Gulch Salmonid Access and Habitat Restoration Project, Bayside, Humboldt County, California*. Unpublished technical report prepared in Arcata, CA.

McBain & Trush, Inc. 2002. *Rocky Gulch Stream Assessment Project*. Unpublished technical report prepared for the California Department of Fish and Game by McBain & Trush, Arcata, CA. 85 pp.

McBain & Trush, Inc. July 24, 2006. *Rocky Gulch at Old Arcata Road Channel and Floodplain Modification: Conceptual Design; Grant Agreement #205300; Final Report.* Unpublished technical report prepared for Humboldt County Department of Public Works, Eureka, CA by McBain & Trush and Jeff Anderson & Associates, Arcata, CA.

NOAA-Fisheries. June 2000. *Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act.* Available online at http://www.nwr.noaa.gov/ESA-Salmon-Regulations-Permits/4d-Rules/upload/electro2000.pdf.

Pitsenbarger, K. & D. Verwayen. January 2007. *A Cultural Resources Investigation of the Rocky Gulch Culvert Replacement Project Located in Humboldt County, California; California Department of Fish and Game Project #137-R-1*. Unpublished technical report prepared for CDFG, Yountville, CA by Cultural Resources Facility, Center for Indian Community Development, Humboldt State University Foundation, Arcata, CA.

APPENDIX A

STANDARD CONDITIONS

1. Notice of Receipt and Acknowledgement. The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.

2. Expiration. If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable amount of time. Application for extension of the permit must be made prior to the expiration date.

3. Interpretation. Any questions of intent of interpretation of any condition will be resolved by the Executive Director of the Commission.

4. Assignment. The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

5. Terms and Conditions Run with the Land. These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

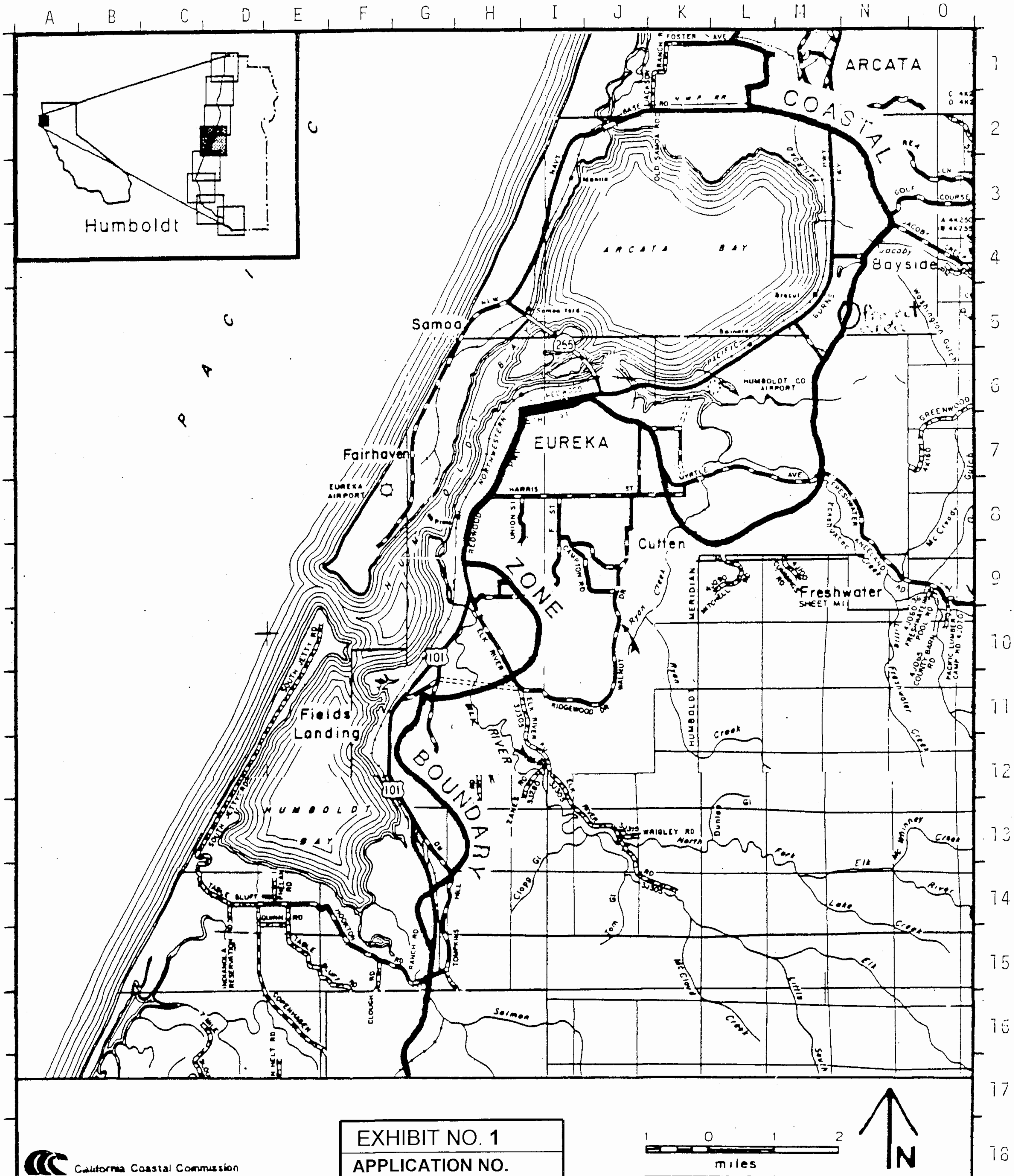


EXHIBIT NO. 1

APPLICATION NO.

1-06-049

HUMBOLDT COUNTY DEPT. OF PUBLIC WORKS

REGIONAL LOCATION MAP

County of Humboldt

Sheet 4 of 8

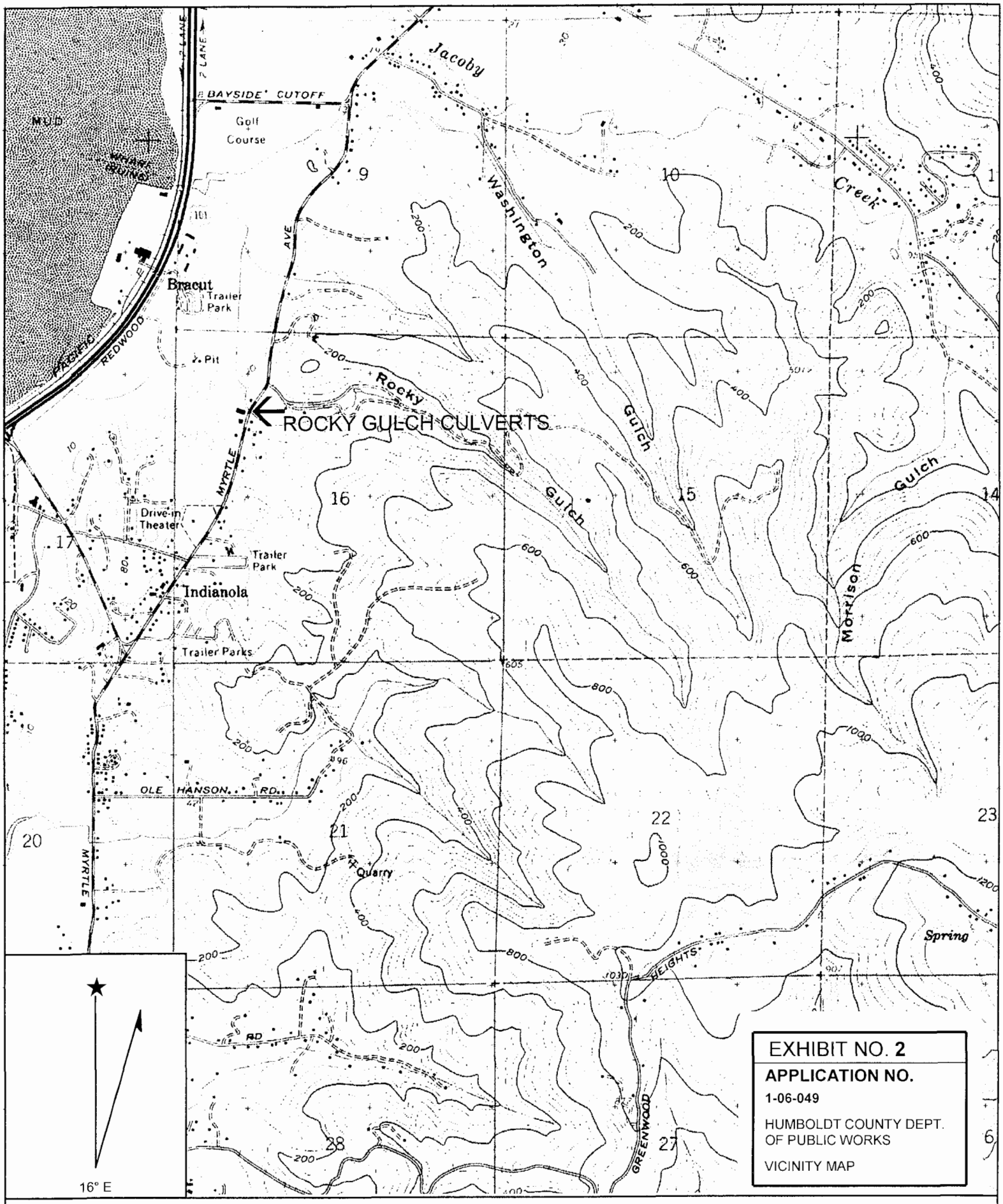


EXHIBIT NO. 2

APPLICATION NO.

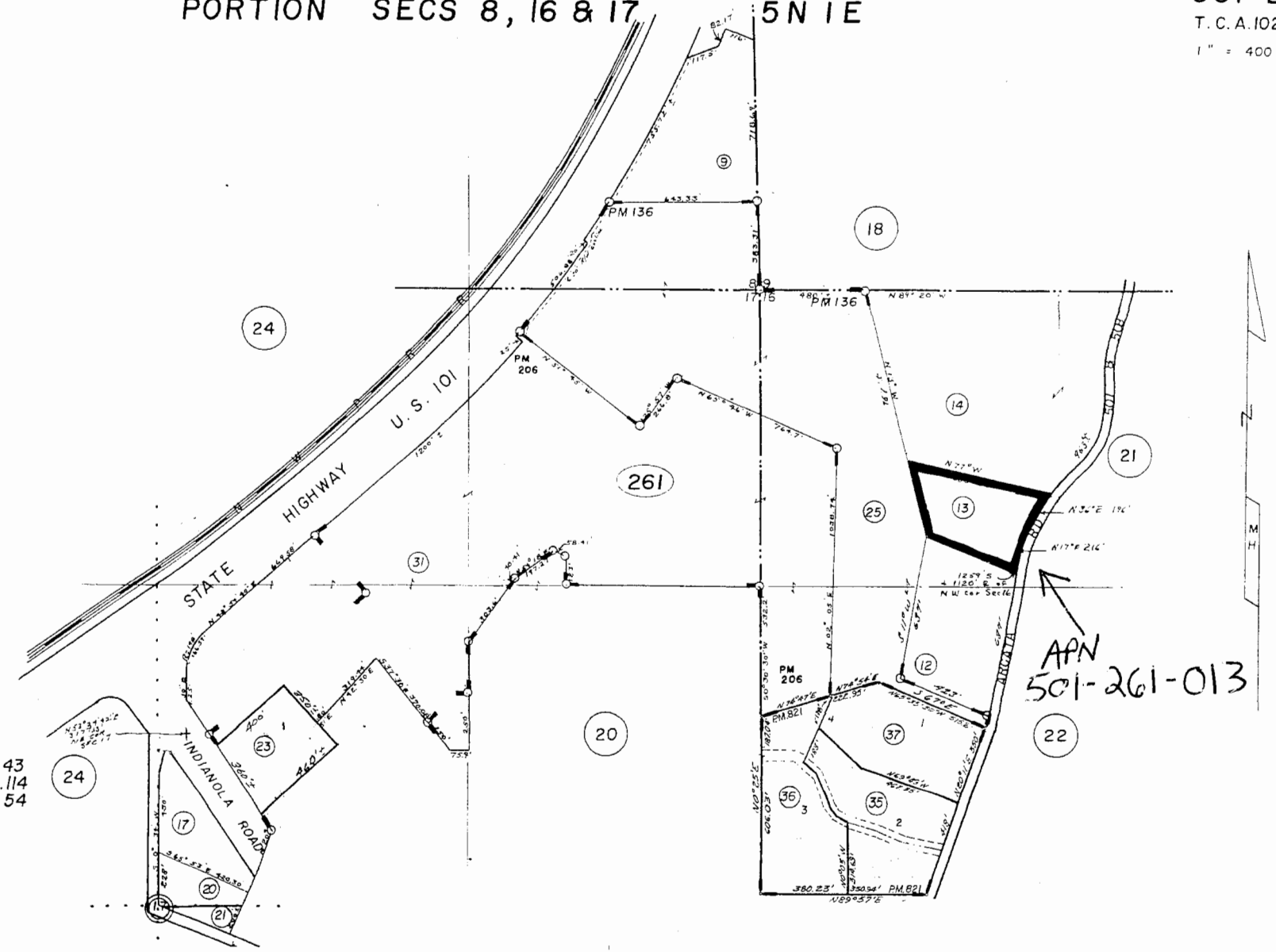
1-06-049

HUMBOLDT COUNTY DEPT. OF PUBLIC WORKS

VICINITY MAP

Name: ARCATA SOUTH
Date: 12/11/2006
Scale: 1 inch equals 2000 feet

Location: 040° 48' 44.9" N 124° 03' 45.3" W
Caption: Rocky Gulch Culvert Replacements/Stream Channel Rehabilitation
(Humboldt Co. Public Works)


PORTION SECS 8, 16 & 17 5N 1E
501-26
T. C. A. 102-03
1" = 400'
STATE HIGHWAY U.S. 101
INDIANOLA ROAD
PM 136
PM 206
PM 821
261
APN
501-261-013
R.S. Bk. 24, Pg. 70
R.S. Bk. 24, Pg. 23
R.S. Bk. 25, Pg. 77
P.M. No. 136 of P.M. Bk. 2, Pg. 43
P.M. No. 206 of P.M. Bk. 2, Pg. 114
P.M. No. 821 of P.M. Bk. 7, Pg. 54
EXHIBIT NO. 3
APPLICATION NO.
1-06-049
HUMBOLDT COUNTY DEPT. OF PUBLIC WORKS
ASSESSOR'S MAP
Rocky Gulch Culvert Replacements & Stream Channel Rehabilitation
Applicant: Humboldt County Public Works Department

(AMENDED)
PROJECT DESCRIPTION
Rocky Gulch Culvert/Old Arcata Road
Humboldt County Public Works Department
(March 1, 2007)

Location
The Rocky Gulch culverts are located on Old Arcata Road (OAR), 0.5 mile north of Indianola Road, in Section 16, Township 5 North, Range 1 East, and can be seen on the Arcata South 7.5' USGS Quadrangle Map. The culverts are approximately 4,400 feet (ft) upstream of Rocky Gulch's confluence with Humboldt Bay. See attached maps for details.

Background
The OAR culvert crossing of Rocky Gulch was identified as an instream barrier during the SB-271 funded inventory of Humboldt County's road system. The existing pipes are undersized and Old Arcata Road floods on a regular basis. One pipe is plugged with sediment, and the flowing pipe is a velocity barrier at migration flows. The culvert pipes immediately downstream are also velocity barriers. The channel between the two culvert crossings, and downstream has silted in and floods the surrounding pasture during winter flows.

Rocky Gulch has been the subject of habitat restoration activities downstream of these culverts in the form of tidegate replacement, relocation and rehabilitation of a portion of the channel, and rock weir construction in the channel. This project will extend habitat restoration activities on an additional 540 ft of Rocky Gulch channel.

Proposed Project
The proposed project consists of replacing two culverts, a footbridge, and channel rehabilitation of Rocky Gulch in the vicinity of OAR. See the attached Project Plans (10 sheets) for complete details.

Old Arcata Road Culvert

The existing culvert crossing on OAR consists of two 3-ft diameter concrete culvert pipes. The culvert pipes will be removed by an excavator. Approximately 431 cy of overburden material will be excavated to remove the pipes. Excavated material determined appropriate for backfill will be stockpiled at the site for re-use. The remaining spoils material will be transported to an approved disposal facility. One foot of aggregate base will be placed in the excavated area. A 16-ft wide x 5-ft high x 56-ft long aluminum box culvert will then be placed on top of the base at a 0.63% grade, structural backfill will be placed around the culvert, followed by embankment backfill (total 343 cy). About 6 inches of imported river run gravel (~17 cy) will be placed inside the culvert, and ½- to 2-ton rock slope protection (RSP, 26 cy) will be placed at the inlet and outlet to prevent scour and protect the culvert. Finally, the road will be re-established with class 3 aggregate base (63 cy) and 40 tons of asphalt concrete. See Project Plan sheets 3-5, and 9 of 10 for details.

Downstream Culvert

The culvert crossing approximately 105 feet downstream of OAR also consists of two 3-ft diameter concrete culvert pipes. This crossing allows direct access from the main

house on the property to a second house on the opposite side of the creek. The culvert pipes will be removed, and replaced with a 16-ft wide x 5-ft high x 28-ft long aluminum box culvert. The procedure used will be similar to that of the OAR culvert, minus the road base and paving. 212 cy of fill will be excavated during culvert pipe removal. Structural and embankment backfill will total ~131 cy. 24 inches of river run gravel (34 cy) will be placed on the culvert floor to simulate natural streambed. ½- to 2-ton RSP will be placed at the inlet and outlet. See Project Plan sheets 3, 4, and 8 of 10 for details.

Footbridge

An existing 25-ft long x 8-ft wide wood footbridge spans Rocky Gulch about 30 ft below the downstream culvert. The footbridge allows access from the main house to open pasture. This footbridge will be removed for stream channel restoration work. It will be salvaged and reinstalled when work at the site is complete. See Project Plan sheets 3 and 8 of 10.

Stream Channel Excavation/Re-Establishment

Due to the undersized culverts and their condition, the stream channel from below the footbridge to 175 feet above the OAR culvert is severely aggraded with fine sediment. The project proposes to remove fine sediment from this reach to re-establish the channel at a 0.63% grade. Working from the top of bank, an excavator will scoop sediment from the stream channel and deposit it in dump trucks which will transport the sediment to an off-site disposal facility. The excavated channel will be about 10- to 15-ft wide (at top of bank) x 4-ft deep. River run gravel may be placed on the stream bed in some locations (total 49 cy). Total length of stream channel subject to culvert replacement and channel restoration is ~540 ft.

In-stream structures consisting of several root wads and/or stumps will be placed in the stream channel to further enhance salmonid habitat. The number and location of structures will be determined during project construction.

See Amended Project Plan sheet 6, and Project Plan sheets 3, and 8-10 of 10 for details.

Overflow Ditch Repairs

Because the new culvert on OAR will be placed at a slightly different alignment, the roadside ditch immediately south of the OAR culvert (east side of road) will be relocated to direct road runoff to the new culvert inlet. Approximately 55 ft of ditch will be realigned and result in 29 cy of sediment excavated. 10 cy of this material will be used to fill in the old alignment. The remainder will be used for backfill on other portions of the project, or transported off site for stockpile/disposal. See Project Plan sheets 3 and 5 of 10.

Excavation/Fill Quantities (approximate volume in cubic yards)

Location	Excavation	Structural Fill	Embankment Fill	RSP	River Run Gravel	Net Loss/Fill
OAR Culvert	431	154	189	26	17	-45
Downstream Culvert	212	77	54	25	34	-22
Stream Channel Restoration	381	0	43	0	49	-289
Ditch Repairs	29	0	10	0	0	-19
Totals	**1053**	**231**	**296**	**51**	**100**	**-375**

Water Management

Rocky Gulch is a perennial stream. It will be necessary to divert stream flow through or around the project area during construction. The diversion will consist of a coffer dam at the upstream end of the project and approximately 550 feet of 12-18 inch diameter pipe to convey water to a point below the project area.

First, fish exclusion fencing will be installed above and below the project reach. Fish and other aquatic organisms found in the project area will be relocated above and below the project area by a qualified biologist. Then a coffer dam consisting of sand bags and filter fabric will be constructed at the upstream end of the project area. Streamflow will be conveyed through a 12-18 inch diameter pipe, which will be laid on the streambed. The pipe will be moved around as necessary to accommodate construction activities. At the downstream end, the pipe outlet will be placed on a small temporary splash pad of rock and gravel to minimize the possibility of scour from the daylighting flow. The outlet will be located immediately above the downstream fish exclusion fencing to avoid impacts to fish below the project. The diversion will be removed as soon as work below ordinary high water has been completed.

Streamflow diversion will be limited to the minimum amount of time needed to complete work in the stream channel. The length of the diversion will be the shortest possible while still minimizing effects to water quality and not encroaching on construction activities.

Diversion structures will be constructed and removed according to the mitigation measures outlined in Appendix B of the Final Mitigated Negative Declaration (Coey et.al. 2006). Electrofishing, if necessary, will be done according to DFG and National Marine Fisheries Service (NMFS) guidelines by qualified biologists.

See Amended Project Plan sheet 6 of 10 for details on the streamflow diversion.

Detour

During construction it will be necessary to control traffic through the site with the use of a temporarily-placed railroad flatcar bridge. Precast concrete grade beams will be placed north and south of the culvert crossing, and small ramps constructed at the approaches. The flatcar bridge will be placed across the existing OAR culvert crossing at approximately the centerline of the roadway. Work will proceed around and underneath the temporary bridge.

The temporary flatcar bridge detour will accommodate one-way traffic with short delays. It may be necessary at times to completely close the project area to traffic. When construction is complete, the detour will be removed. See Project Plans Sheet 7 of 10 for details.

Best Management Practices for Erosion and Sediment Control

The following measures have been incorporated into the proposed project to minimize impacts to Rocky Gulch due to erosion and the presence of fine sediment in the project area.

- The project will be constructed during the summer months when stream flow and chance of a precipitation event are lowest.

- No work will be done in the flowing stream channel. Stream flow will be diverted through or around the project area by means of temporary diversion dams. The diversion dams will be constructed of filter fabric with geo-grid or wire mesh backing and gravel filled sandbags. Water will be conveyed via pumps and pipes (see Project Plan sheet 6 of 10).

- Silt dams will be constructed at the diversion outlets to keep fine sediment from the construction areas out away from flowing water. Silt dams will be constructed of filter fabric wrapped straw bales (see Project Plan sheet 6 of 10).

- On-site stockpiles will be surrounded with straw bales or wattles to isolate material from stream banks in case of an unexpected precipitation event.

- Rock slope protection in the form of ½- to 2-ton rock will be placed at the new culvert inlets and outlets to minimize potential for bank erosion and scour.

- After construction is complete, the entire area will be revegetated. Initially the area will be seeded with a mix of fast growing native grasses and straw mulched. In addition, landscape trees and shrubs will be planted in the project reach below OAR as directed by the property owner.

Construction activities will be conducted in compliance with all applicable conditions and recommendations in the programmatic and project-specific documents pertaining to the California Department of Fish & Game Fisheries Restoration Grant Program and the Rocky Gulch project specifically.

ROCKY GULCH
CULVERT REPLACEMENT
COASTAL CONSERVANCY GRANT # 04-158

PROJECT DESCRIPTION: The Rocky Gulch Culvert Replacement project is located within the Humboldt Bay watershed, three miles northwest of Eureka. The barrier crossing takes place on Old Arcata Road at a point 5,000 feet upstream of the confluence of the creek with the bay. Two 36-inch culverts currently convey water under the roadway. These culverts are severely under sized, having capacity to convey less than a 2-year event.

The proposed project would install two 16ft x 5ft countersunk metal box culverts with a low, broad cross-section that would allow native bedload to accumulate. This project would remove a barrier to 2.7 miles of potential habitat.

BACKGROUND: An inventory of the Humboldt County road system was made in 2000 to determine which culverts were barriers to fish passage. The study, commissioned by the Five Counties consortium and funded by SB-271, created a priority listing of projects to improve fish passage. The inventory identified the Rocky Gulch culvert as a velocity barrier to salmonids through a moderate range of migration flows (Taylor 2000). The culvert was placed at 22nd on the priority list of passage enhancement projects.

The California Department of Fish & Game has recently completed a project (McBain & Trush, 2005) to improve habitat and access at the mouth of the creek, and have consulted with the County regarding alternatives for the Old Arcata Road crossing. Another barrier removal project is due for construction this summer upstream of the Old Arcata Road project. It will remove a culvert with a 4-6 foot jump and replace it with a bridge.

WATERSHED AND HABITAT CHARACTERISTICS: The Rocky Gulch watershed has an area of 1.5 square miles (960 acres) and is located on the Westerly face of the coastal ridge that rises to the Kneeland summit. The watershed is moderate in grade dropping from 1,200 feet to 10 feet over a distance of 16,370 feet. The creek flows year around providing good refuge for maturing salmonids.

The creek bedload in the culvert vicinity consists of silty gravels underlain by a compact silty-clay hardpan. The creek corridor below the roadway is not well vegetated due to years of grazing. The creek meanders through flat pastures for over 5,400 feet before entering Humboldt Bay.

There are estimated to be 2,200 feet of potential anadromous habitat upstream of the culverts under Old Arcata Road. The habitat is excellent with a good riparian canopy and well-graded gravels. The Rocky Gulch watershed contains suitable habitat for coho and chinook salmon and steelhead and cutthroat trout.

The proposed project will remove two existing migration barriers. This project in conjunction with two others performed in the watershed will make the entire length of the Rocky Gulch watershed available to salmonids, and will allow juvenile fish free movement.

EXISTING CONDITION: There are two existing 3-foot diameter culverts under Old Arcata Road and 2 smaller culverts within a private crossing immediately downstream of the County road. The Old Arcata Road culvert system is undersized for the normal winter creek flows, and creates flooding upstream of Old Arcata Road every winter. Every 2-4 years the flooding becomes severe enough to flow over the roadway creating dangerous conditions for the motoring public.

FEMA inundation mapping identifies the project and the surrounding area to be within the 100-year flood plain.

The creek has been realigned and channeled several times in the past to follow property lines and maximize grazing lands. Riparian canopy is limited in the vicinity of the roadway due to this traditional land use.

PROPOSED PROJECT: The proposed project will remove the existing culvert systems under Old Arcata Road and within the private crossing immediately downstream. These culverts will be replaced with two 16 foot wide by 5 foot high metal box culverts: a 56-foot long culvert under the County road and a 28-foot long culvert under the private crossing. The channel will be excavated to provide a hydraulic capacity to match that of the culverts.

The channel excavation and restoration work will mimic work done downstream in 2005. Large woody debris will be anchored into the channel banks to create habitat, and ¼-½ ton rock will be used as grade control to create pool-riffle systems and to armor the banks intermittently. River run gravel from ¾-4-inches in diameter will be placed behind and retained within the larger boulder matrix as shown in the picture of the new channel downstream.

ROCKY GULCH DOWNSTREAM OF PROPOSED PROJECT

Disturbed areas will be seeded and planted with a variety of native plants as shown in the attached Landscape, Erosion Control and Planting Plan prepared for the site by the Fish & Game.

The new culverts and channel modifications will maintain the creek bed at its current elevation and not result in any scour-head progression upstream. The proposed project will tie into the existing channel improvements downstream. Both projects were designed with the same hydrologic/hydraulic

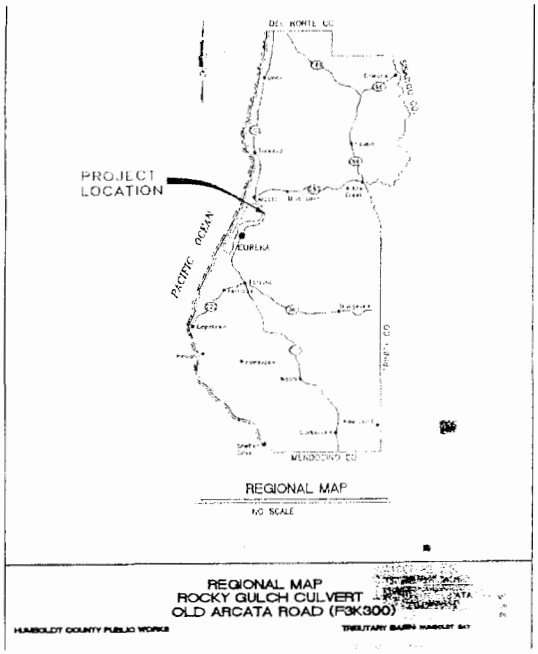
SOILS/GEOMORPHOLOGY: The lower pasturelands of the watershed are reclaimed tidal marshes consisting of poorly drained silty clay loam. These soils transition into shallower loam underlain by stiff clayey hard pan and soft sedimentary rock formations as the creek gains elevation. The existing creek banks that were historically relocated and excavated reveal the harder clayey substrate and show little erosion. The project completed in 2005 downstream of the currently proposed project has experienced two winters with almost no signs of erosion.

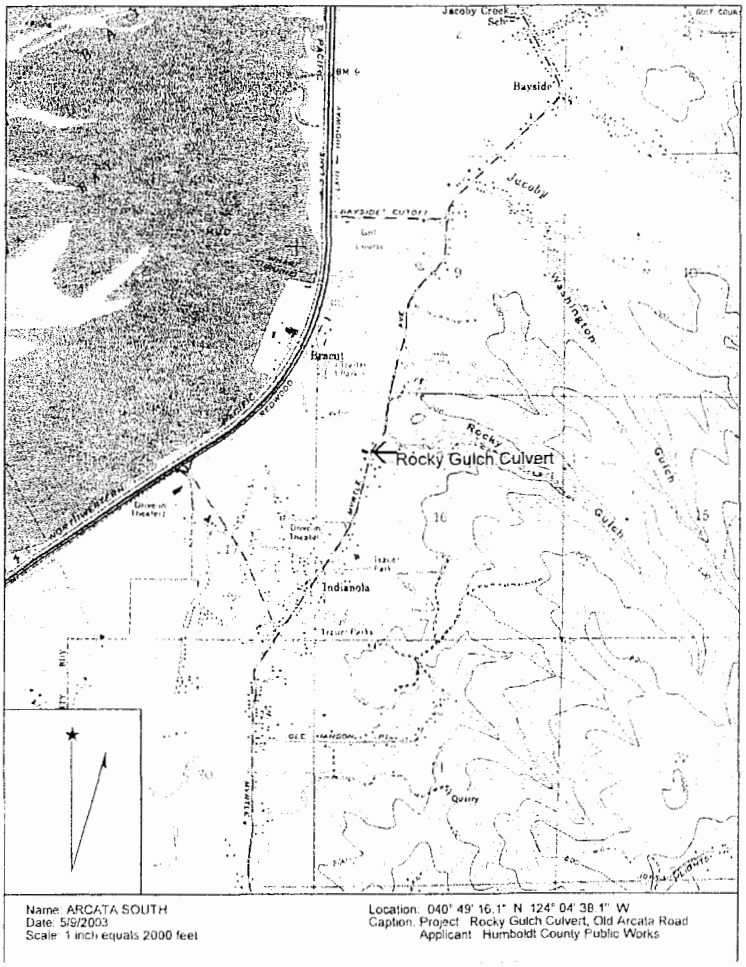
The upper watershed has intermittent rock outcroppings that have been mined for various purposes in the past, though the rock is known for its low durability. The channel system is well defined and has a high erosion resistance.

TIMELINE:

ACTION	MILESTONE DATE
Receive grant award notice -	March 2005
Board of Supervisor's Resolution for Coastal Conservancy contract	May 2005
Receipt of executed contracts	September 2005
Survey project sites	December 2005
Complete Hydrology/Hydraulics	July 2006
Complete Env. Docs and submit permits	December 2006
Complete project design & bid	May 2007
Begin construction	June 2007
Complete Construction	September 2007

LOCATION: See maps below



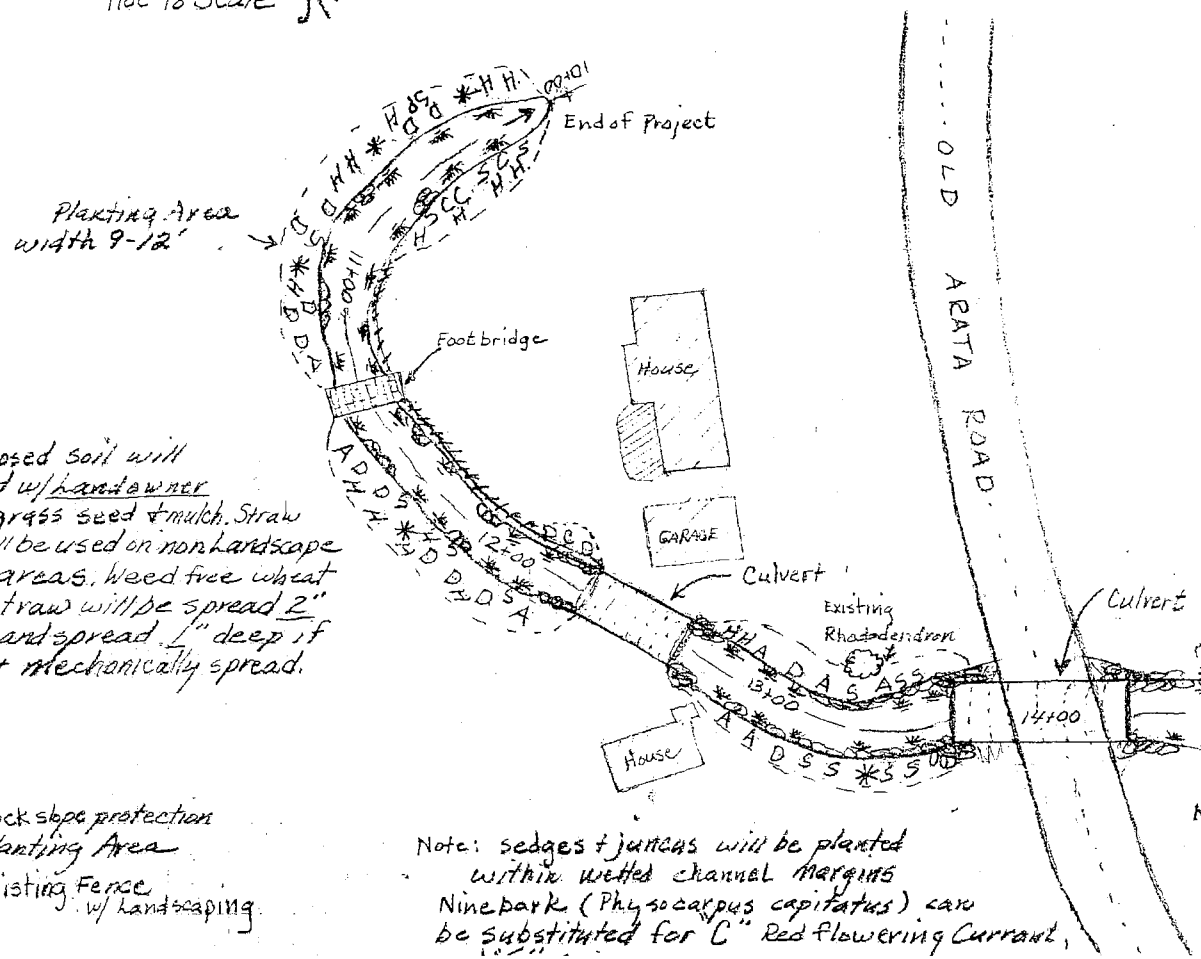


RECEIVED
MAR 2 0 2007
CALIFORNIA
COASTAL COMMISSION

Rocky Gulch Culvert Replacements
Landscape, Erosion Control / Planting Plan

Humboldt County Department of Public Works
DFG contract: P0510306
drawn by: John Schwabe, CDF&G, Feb. 28, 2007

not to Scale



Note: ALL exposed soil will be seeded w/ landowner approved grass seed & mulch. Straw mulch will be used on non Landscape disturbed areas. Weed free wheat or rice straw will be spread 2" deep if hand spread, 1" deep if chopped & mechanically spread.

Key

- RSP rock slope protection
- Planting Area
- Existing Fence w/ landscaping

Note: sedges & junceas will be planted within wetted channel margins
Ninebark (Physocarpus capitatus) can be substituted for "C" Red flowering Currant.

Native Plant Materials

- Local sedges & juncus transplants 500 mixed bareroot
- * Red Alder (Alnus rubra) clustered 3 plants @ 5' spacing 2gallon tree pots 33 total
- A Western Azalea (Rhododendron Occidentale) 2 gallon, 8 total
- D Red Twig Dogwood (Cornus glabrata) 1-2 gallon 16 total
- S Spiraea (Spiraea douglasii) 1-2 gallon 14 total
- C Red Flowering Currant (Ribes sanguineum) 1-2 gallon 5 total
- H Huckleberry (native) 1 gallon 16 total
- SP Sitka Spruce 2 gallon tree pots 6 total

Note: ALL containered stock sites will be sod scalped 30" square w/ minimum 24" woven weed mat applied after planting. Weed Mats will be covered w/ 3" native bark mutch.

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	ROAD NAME: OLD ARCATA ROAD		DESIGN SECTION: R. L. BURNETT	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS
	ROAD NO: F3K300	MILE POST: 6.19	DESIGNED BY: CJW	ROCKY GULCH CULVERT REPLACEMENTS
	AGREEMENT No.		DRAWN BY: JAB	COVER SHEET, LOCATION MAP, AND VICINITY MAP
	CONTRACT NO.: 205300		REVIEWED BY: RLB	
	DRAWING FILE NAME: L:\PROJECTS\205300\DWG\COSHOI.DWG		APPROVED BY: CJW	
	PLOT DATE: 11/30/2006			

SHEET 1 OF 10

INDEX OF SHEETS

APPLICABLE STANDARD PLANS

JULY 2004 CALTRANS STANDARD PLANS

A10A	ABBREVIATIONS
A10B	SYMBOLS
A62A	EXCAVATION AND BACKFILL MISCELLANEOUS DETAILS
A73C	DELINEATORS, CHANNELIZERS AND BARRICADES.
D88A	STRUT DETAILS FOR STRUCTURAL STEEL PIPE
T3	TEMPORARY RAILING (TYPE K)
T13	TRAFFIC CONTROL

FUNDING SOURCE

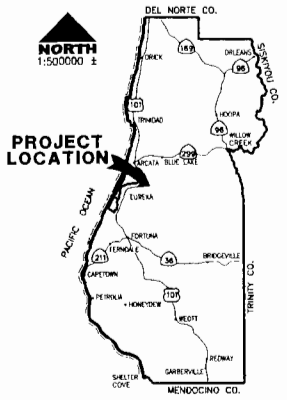
THIS PROJECT IS FUNDED BY DEPARTMENT OF FISH AND GAME

RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH & GAME

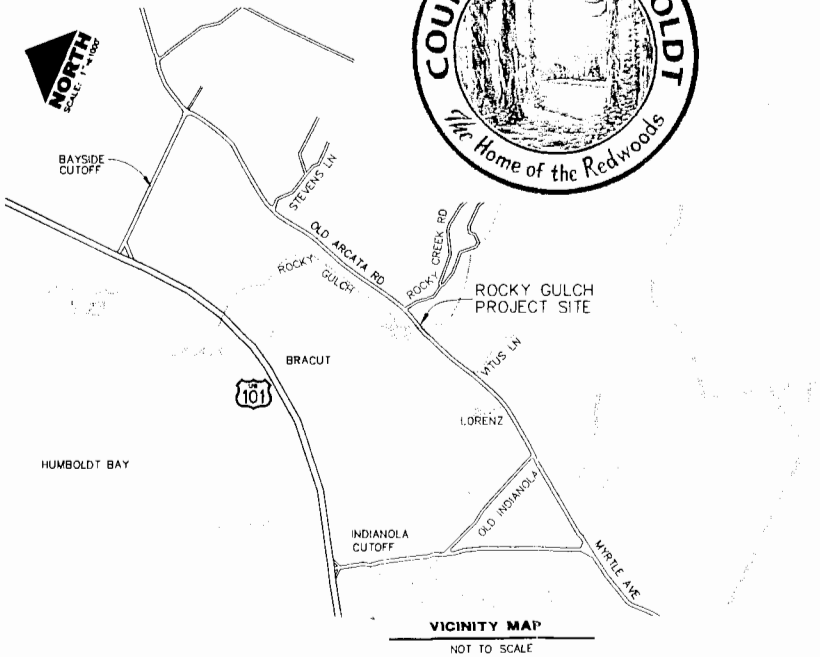
COUNTY OF HUMBOLDT
DEPARTMENT OF PUBLIC WORKS

PROJECT PLANS FOR CONSTRUCTION OF

ROCKY GULCH CULVERT REPLACEMENTS
OLD ARCATA ROAD (F3K300) AT PM 6.19
AGREEMENT NO. P0510306
CONTRACT NO. 205300



LOCATION MAP
SCALE: 1:500000 ±



VICINITY MAP
NOT TO SCALE

COUNTY OF HUMBOLDT
The Home of the Redwoods

RECOMMENDED

ROBERT L. BURNETT
RCE 36210, EXP. 06/30/2006 — DATE

REGISTERED PROFESSIONAL ENGINEER
ROBERT L. BURNETT
NO. 36210
EXP. 06/30/06
CIVIL
STATE OF CALIFORNIA

APPROVED

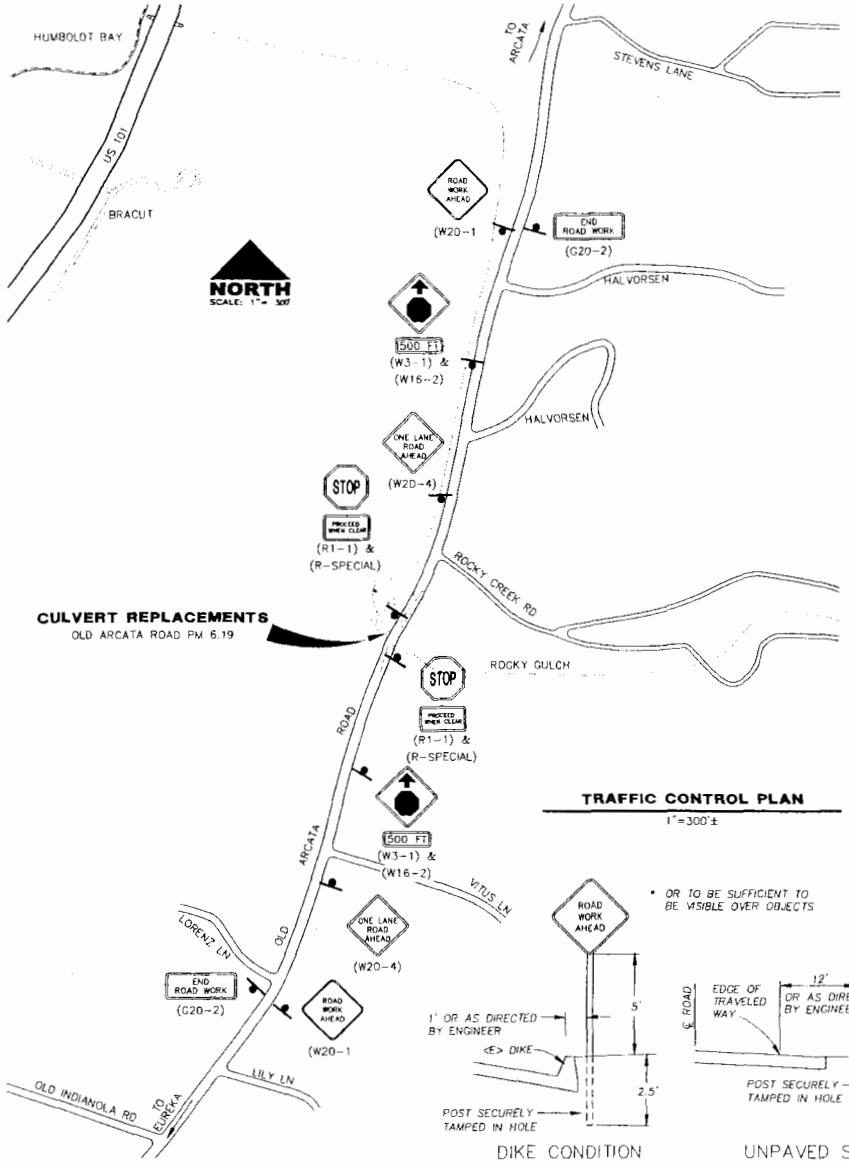
CHRISTOPHER J. WHITWORTH
RCE 51931, EXP. 6/30/2006 — DATE

REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER J. WHITWORTH
NO. 51931
EXP. 06/30/06
CIVIL
STATE OF CALIFORNIA

ORIGINAL LOW BID PRICE	CONSTRUCTED BY	RESIDENT ENGINEER
	PROJECT COMPLETED / /	CONSTRUCTION COST $

EXHIBIT NO. 5
APPLICATION NO.
1-06-049
HUMBOLDT COUNTY DEPT. OF PUBLIC WORKS
PROJECT PLANS (1 of 10)

BAR IS ONE INCH ON ORIGINAL DRAWING	ROAD NAME: OLD ARCATA ROAD		DESIGN SECTION: R. L. BURNETT	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS	SHEET 2 OF 10
	ROAD NO: F3K300	MILE POST: 6.19			
	AGREEMENT No.		DESIGNED BY: CJW	ROCKY GULCH CULVERT REPLACEMENTS	
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	CONTRACT NO.: 205300		DRAWN BY: JAB		
	DRAWING FILE NAME: L:\PROJECTS\205300\DWG\CDSHG2.DWG		REVIEWED BY: RLB	CONSTRUCTION AREA SIGNS, QUANTITES, SURVEY CONTROL AND DETAILS	
	PLOT DATE: 11/30/2006		APPROVED BY: CJW		



TRAFFIC CONTROL PLAN

1"=300'±

RURAL CONSTRUCTION AREA SIGN

– NOT TO SCALE –

QUANTITIES

ITEM NO.	ITEM CODE		ITEM DESCRIPTION	UNIT	BID QUANTITY
1	120050x		Construct Detour	LS	1
2	120090		Construction Area Signs	EA	10
3	129000		Temporary Railing (Type K)	EA	6
4	150805		Remove Culvert	EA	4
5	151000x		Water Management Plan	LS	1
6	151264		Salvage fence	LF	117
7	160101		Clearing and Grubbing	LS	1
8	192025	F	Structure Excavation (Culvert)	CY	643
9	193004	F	Structure Backfill (Culvert)	CY	231
10	193010x	F	Stream Channel Excavation	CY	381
11	193020x	F	Ditch Excavation	CY	29
12	197010		Place and Compact Embankment	CY	240
13	198020		Imported River Gravel (FL Culvert)	CY	100
14	203016	S	Erosion Control (Straw and Seed)	LS	1
15	204200x		Stream side revegetating and landscaping	LS	1
16	260301		Class 3 Aggregate Base	CY	83
17	390102		Asphalt Concrete (Type A)	Ton	40
18	510522		Minor Concrete (Pipe Cover)	C Y	2
19	674960x	S	16'-2" x 5'-1" x 56' Aluminum Box Culvert	LF	56
20	674960x	S	16'-2" x 5'-1" x 28' Aluminum Box Culvert	LF	28
21	674970x		8' x 25' Wood Bridge Salvage/Reinstall	LS	1
22	720105		Rock Slope Protection (1/2 ton, Method A)	TON	100
23	999990		Mobilization	LS	1

SURVEY CONTROL COORDINATES

PNT.#	NORTHING	EASTING	ELEV.	DESCRIPTION
50	2189217.009	5986445.201	24.48	FD. 1 1/2" IP
51	2189628.747	5986767.710	18.20	FD 2 1/2" IP
52	2189326.598	5986545.210	19.35	5/8" REBAR
53	2189412.834	5986339.117	17.76	5/8" W/ PL. CAP
54	2189693.110	5986583.983	13.66	COE MON
55	2189161.697	5986718.860	23.70	5/8" REBAR
56	2189508.990	5986454.778	17.82	60d
57	2189477.739	5986553.102	16.42	60d

1) THIS MAP REPRESENTS THE RESULTS OF A FIELD SURVEY PERFORMED ON APRIL 15 AND APRIL 20, 2005.
2) BASIS OF ELEVATIONS IS NAVD88 BASED ON TIES TO CPS CONTROL SET BY OSCAR LARSON AND ASSOCIATES FOR THE CITY OF EUREKA WATERLINE PROJECT.
3) BASIS OF BEARINGS IS NAD83, 1991.35 EPOCH, BASED ON TIES TO CPS CONTROL SET BY OSCAR LARSON AND ASSOCIATES FOR THE CITY OF EUREKA WATERLINE PROJECT. THIS BASIS WAS CONFIRMED BY THE TIE TO CPS CONTROL SET BY SHN ENGINEERS FOR THE OLD ARCATA ROAD IMPROVEMENT PROJECT.

SURVEY LAYOUT COORDINATES

PNT.#	NORTHING	EASTING	ELEV.	DESCRIPTION
5000	2189248.696	5986453.521	---	BEG-CULV1368
5001	2189212.225	5986496.016	---	END-CULV1424
5002	2189354.592	5986386.366	---	BEG-CULV1240
5003	2189328.857	5986397.511	---	END-CULV1268
5004	2189449.810	5986384.445	---	FOOTBRIDGE
5005	2189459.542	5986361.418	---	FOOTBRIDGE
5006	2189191.611	5986456.996	---	L1100CONFORM
5007	2189259.104	5986489.607	---	L1175CONFORM
5008	2188940.355	5987063.152	---	L-RADPT

CONSTRUCTION AREA SIGN SUMMARY

SIGN TYPE	QTY	DESCRIPTION	SIGN SIZE LOCAL ROADS	REMARKS	POST SIZE	NUMBER
W20-1	2	ROAD WORK AHEAD	36" x 36"	ORANGE BACKGROUND	4" x 4"	1
W20-4	2	ONE LANE ROAD AHEAD	48" x 48"	ORANGE BACKGROUND	4" x 4"	1
W3-1 & W16-2 500	2	STOP AHEAD 500 FT	48" x 48" 29" x 9"	ORANGE BACKGROUND	4" x 4"	1
R1-1 & R-SPECIAL	2	STOP PROCEED WHEN CLEAR	48" x 48" 29" x 9"	ORANGE BACKGROUND	4" x 4"	1
G20-2	2	END ROAD WORK	60" x 24"	ORANGE BACKGROUND	4" x 4"	2

NOTES

1) SIGNS SHALL BE PLACED AS SHOWN ON PLAN OR AS DIRECTED BY THE ENGINEER.
2) FINAL PLACEMENT OF SIGNS SHALL BE APPROVED BY RESIDENT ENGINEER.
3) ADDITIONAL PORTABLE SIGNS SHALL BE USED AS REQUIRED FOR OTHER ROADSIDE WORK.
4) SEE STANDARD PLAN T13 FOR TRAFFIC CONTROL SYSTEM.
5) IN ADDITION TO CONSTRUCTION AREA SIGNS AND WHEN DIRECTED BY THE RESIDENT ENGINEER, THE CONTRACTOR SHALL UTILIZE FLAGMEN AS NECESSARY TO DIRECT TRAFFIC.
6) DISTANCE TO W20-1 AND G20-2 MAY BE EXTENDED TO ENCOMPASS SITES WITHIN ONE MILE OF EACH OTHER.

2 of 10

BAR IS ONE INCH ON ORIGINAL DRAWING	ROAD NAME: OLD ARCATA ROAD		DESIGN SECTION R. L. BURNETT	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	ROAD NO: F3K300	MILE POST: 6.19	DESIGNED BY: CJW	ROCKY GULCH CULVERT REPLACEMENTS
	AGREEMENT No.		DRAWN BY: JAB	'C' LINE – ROCKY GULCH OVERVIEW & STREAM CHANNEL EXCAVATION
	CONTRACT NO.: 205300		REVIEWED BY: RLB	
	DRAWING FILE NAME: L:\PROJECTS\205300\DWG\LOSH03.DWG		APPROVED BY: CJW	
	PLOT DATE: 11/30/2006			SHEET 3 OF 10

APN 501-281-014
RODONI
DOC. 2001-17304

NORTH
SCALE: 1" = 50'

STREAM RESTORATION TO THE NORTH BY OTHERS

30' PUBLIC WATER EASEMENT

TO ARCATA

PROPERTY LINE

00+01

05+01

PUMP HOUSE

APN 501-261-013
HASSRICK
DOC. 2003-33399

35.4' FUTURE ROAD WIDENING (NOT A PART OF THIS PROJECT)

PRESERVE PUMP HOUSE AREA

11+00

SALVAGE/REINSTALL EXISTING FOOTBRIDGE. PROPOSED 8'x25' WOOD FOOTBRIDGE

HOUSE EL=21.9

PRESERVE EXISTING FENCE NEAR HOUSE

APN 501-291-009
PRATHER
DOC. XXXX

RELOCATE OVERFLOW DITCH (NOT A PART OF THIS PROJECT)

PROPOSED STREAM CHANNEL ALIGNMENT C-LINE

12+00

<E> ROW

'L' LINE (OAR LINE, FUTURE ALIGNMENT)

GARAGE EL=20.8

REMOVE EXISTING ALDERS IN STREAM CHANNEL

REMOVE TWO CULVERTS

12+50

REMOVE 18" SPRUCE (DEAD) AND OVERHEAD LIGHT

REMOVE AND REPLACE CHAIN LINK FENCE. L=±85'

PROPOSED 15'X28' ALUMINUM BOX CULVERT

DAYLIGHT

13+00

RELOCATE OR PROTECT CYPRESS TREES

(4-5 TREES)
(~6" DBH)

SMALL ALDERS

13+50

HOUSE EL=21.17

14+00

PROPOSED 16'X 56' ALUMINUM BOX CULVERT

NATIVE MATERIAL BERM

14+50

'C' LINE

15+00

15+50

16+00

16+50

17+00

17+50

ROCKY CREEK

PVT DWY

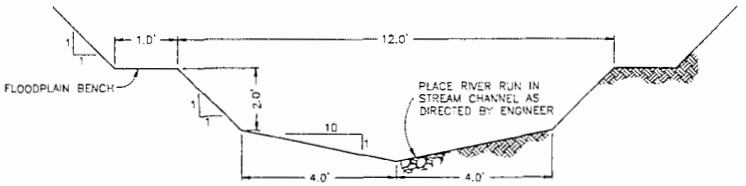
RELOCATE DITCH

REMOVE TWO CULVERTS

± 24' EXISTING ROADWIDTH

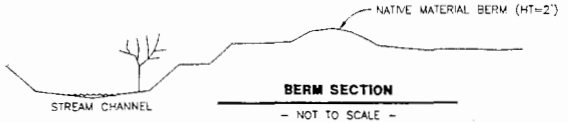
APN 501-291-008
HOVER
DOC. 1992-14329

TO EUREKA



STREAM CHANNEL SECTION

– NOT TO SCALE –



BERM SECTION

– NOT TO SCALE –

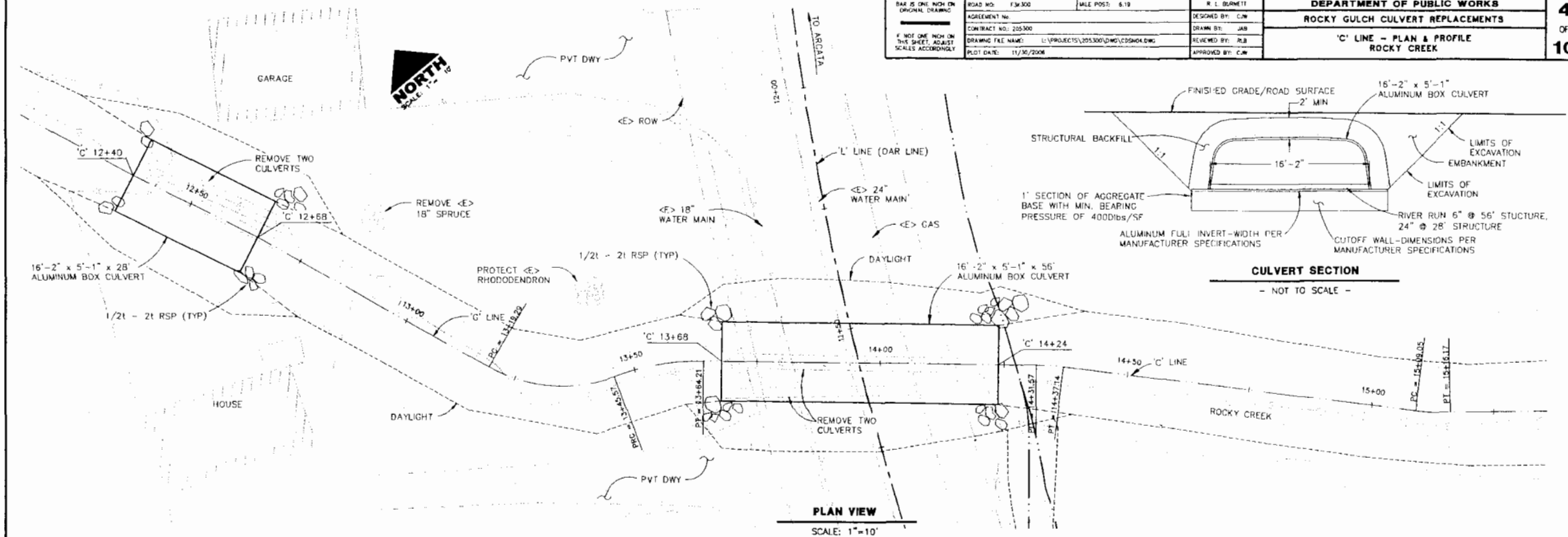
STREAM AREA RE-VEGETATING AND LANDSCAPING

PLANT	QUANTITY	COMMENTS
AZALEA		MEDIUM SIZED FOR FUTURE GROWTH
GRASS		SEED
RHODODENDRON		MEDIUM SIZED FOR FUTURE GROWTH
FRUIT TREE		OWNER SELECTION

AREAS OF VEGETATION REMOVAL

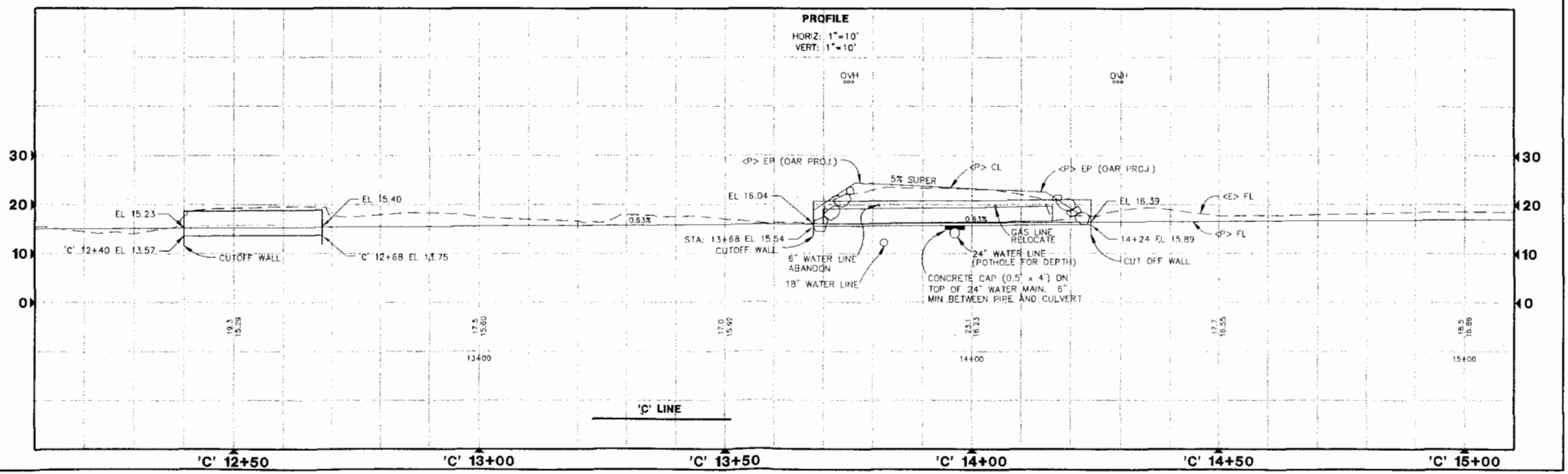
9 of 10

BAR IS ONE INCH ON ORIGINAL DRAWING	ROAD NAME: OLD ARCATA ROAD		DESIGN SECTION R. L. BURNETT	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS	SHEET 4 OF 10
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY	ROAD NO: F3#300	MILE POST: 6.19	DESIGNED BY: CJW	ROCKY GULCH CULVERT REPLACEMENTS	
	AGREEMENT No:		DRAWN BY: JAB	'C' LINE – PLAN & PROFILE ROCKY CREEK	
	CONTRACT NO.: 205300		REVIEWED BY: RLB		
	DRAWING FILE NAME: L:\PROJECTS\205300\DWG\CDSHO4.DWG		APPROVED BY: CJW		
	PLOT DATE: 11/30/2006				



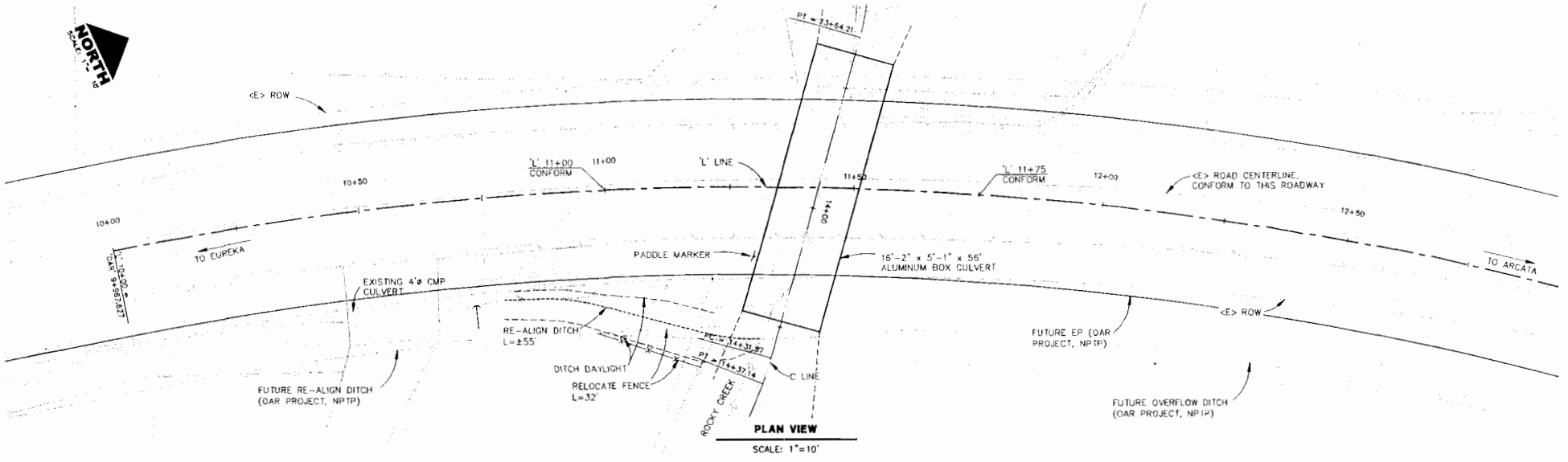
CULVERT SECTION

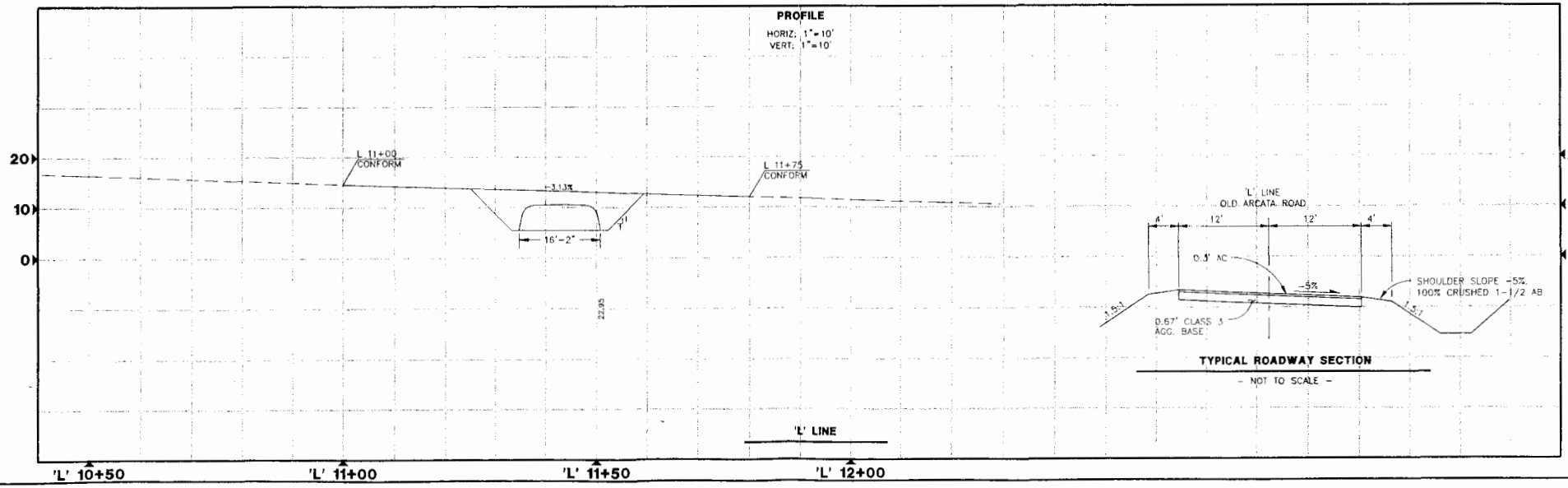
– NOT TO SCALE –



E-10

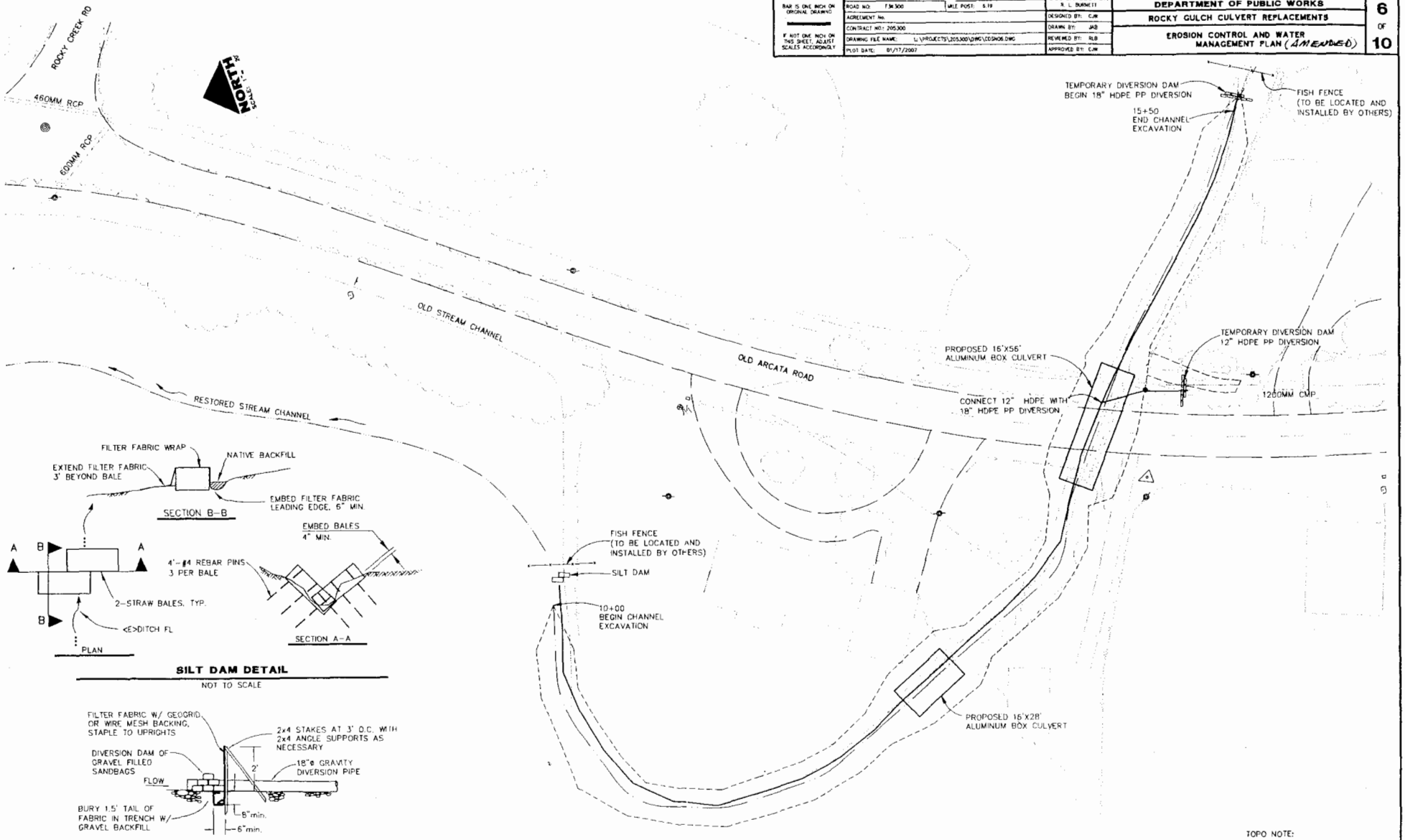
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	ROAD NAME: OLD ARCATA ROAD		DESIGN SECTION R. L. BURNETT	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS	SHEET 5 OF 10
	ROAD NO: F.M.300	MILE POST: 6.19	DESIGNED BY: CJW	ROCKY GULCH CULVERT REPLACEMENTS	
	AGREEMENT No.		DRAWN BY: JAB	'L' LINE – PLAN & PROFILE OLD ARCATA ROAD	
	CONTRACT NO.: 205300		REVIEWED BY: RLB		
	DRAWING FILE NAME: L:\PROJECTS\205300\DWG\CDSN05.DWG		APPROVED BY: CJW		
	PLOT DATE: 11/30/2006				





5 of 10

BAR IS ONE INCH ON ORIGINAL DRAWING	ROAD NAME: OLD ARCATA ROAD		DESIGN SECTION: R. L. BURNETT	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	ROAD NO: F.M.300	MILE POST: 5.19	DESIGNED BY: CJW	ROCKY GULCH CULVERT REPLACEMENTS
	AGREEMENT No.		DRAWN BY: JAB	EROSION CONTROL AND WATER MANAGEMENT PLAN (AMENDED)
	CONTRACT NO: 205300		REVIEWED BY: RLB	SHEET 6 OF 10
	DRAWING FILE NAME: L:\PROJECTS\205300\DWG\EC0506.DWG		APPROVED BY: CJW	
	PLOT DATE: 01/17/2007			



SILT DAM DETAIL

NOT TO SCALE

TEMPORARY DIVERSION DAM AND SILT EXCLUSION FENCE DETAIL

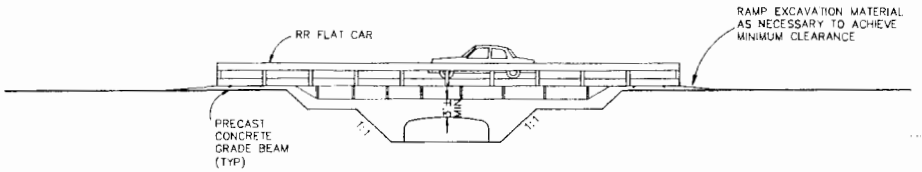
NOT TO SCALE

TOPO NOTE:

FOR THIS SHEET ONLY, THE OAR PROJECT TOPO WAS USED FOR WATER MANAGEMENT PLAN. CONCEPTUAL USE ONLY! DO NOT STAKE USING THIS PLAN.

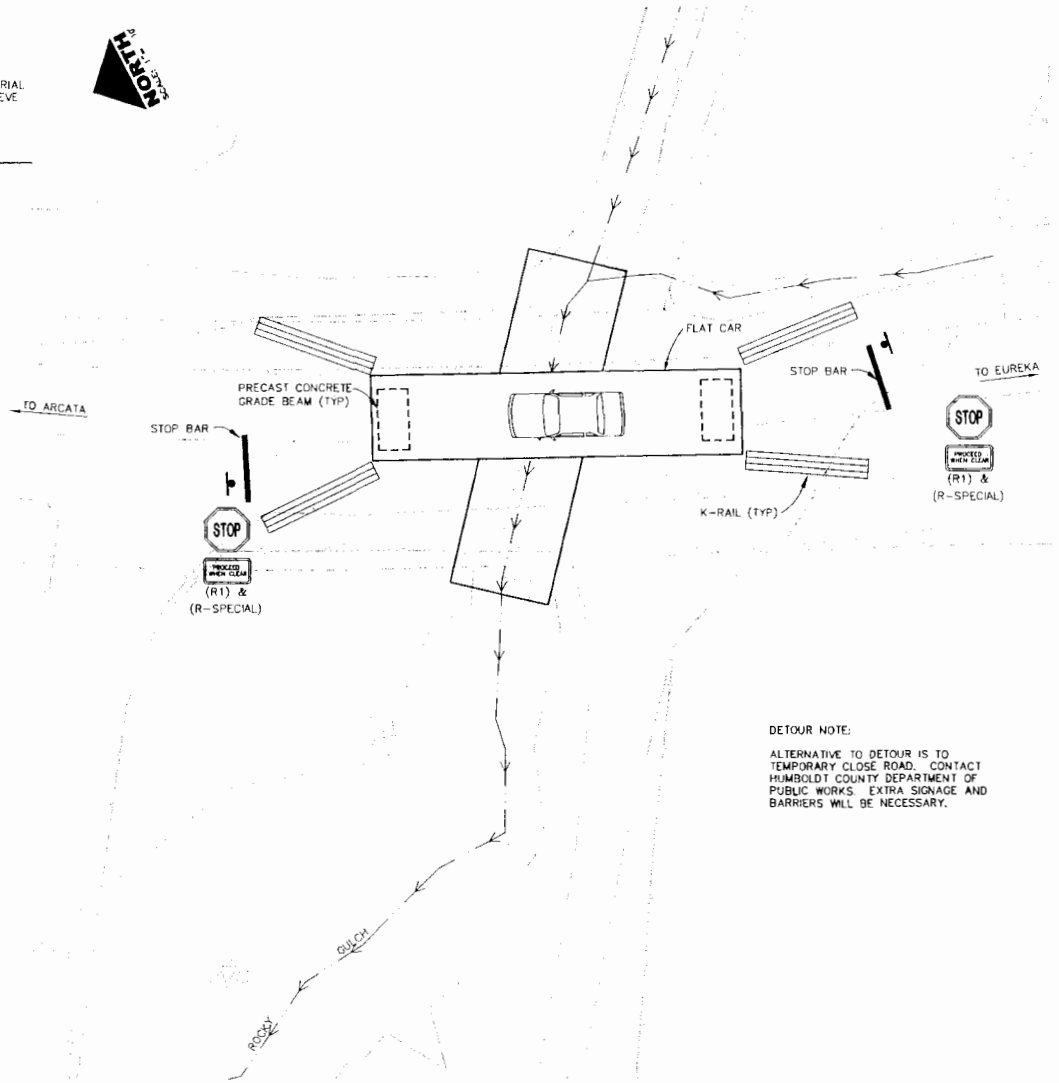
6 of 10

BAR IS ONE INCH ON ORIGINAL DRAWING	ROAD NAME: OLD ARCATA ROAD		DESIGN SECTION: R. L. BURNETT	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS	SHEET 7 OF 10
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	ROAD NO: F.M.300	MILE POST: 6.19	DESIGNED BY: CJW	ROCKY GULCH CULVERT REPLACEMENTS	
	AGREEMENT No:		DRAWN BY: JAB		
	CONTRACT NO.: 205.300		REVIEWED BY: RLB	DETOUR PLAN	
	DRAWING FILE NAME: L:\PROJECTS\205.300\DWG\CDSN07.DWG		APPROVED BY: CJW		
	PLOT DATE: 11/30/2006				



FLATCAR DETOUR ELEVATION VIEW

NOT TO SCALE



DETOUR NOTE:

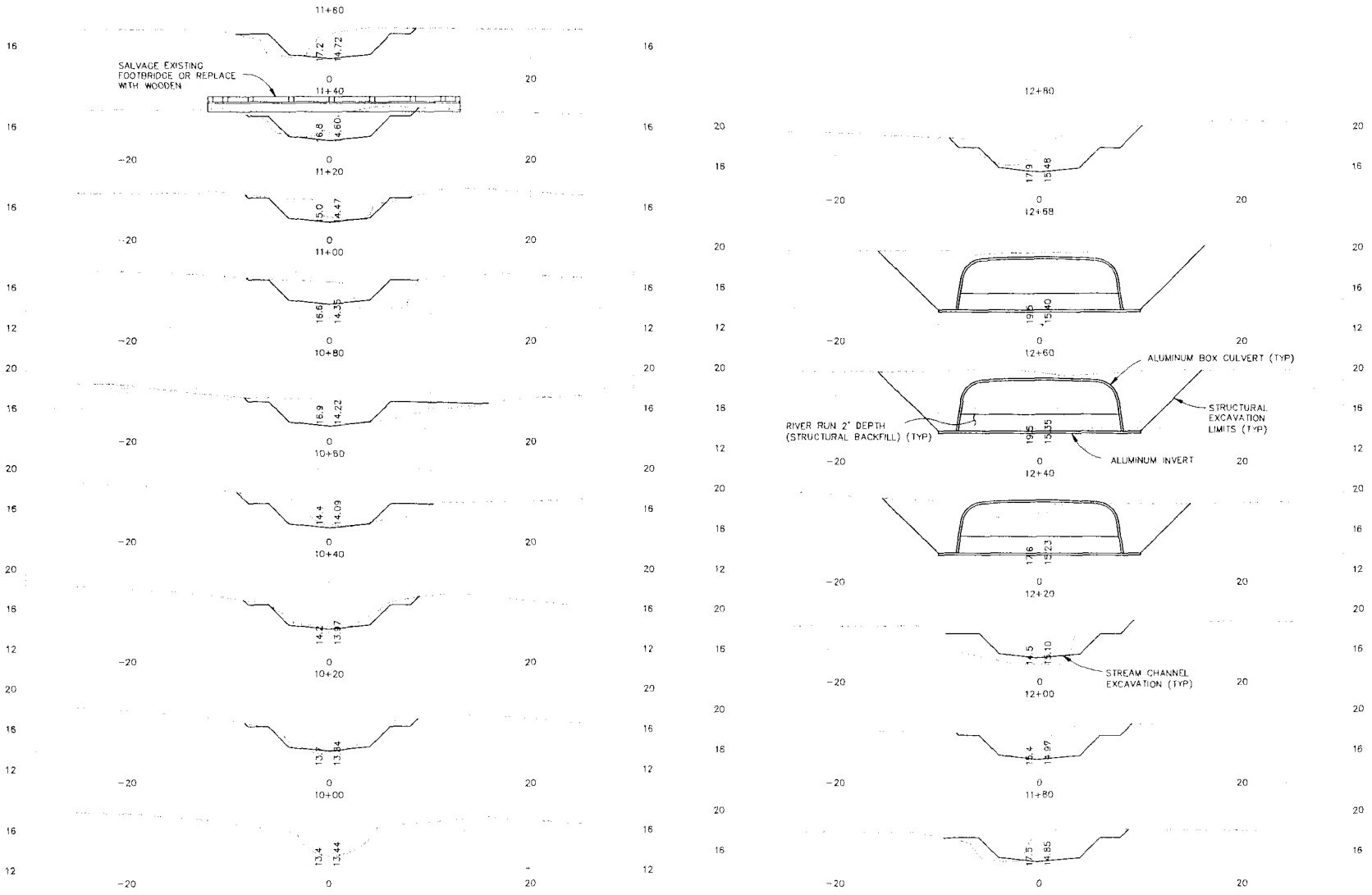
ALTERNATIVE TO DETOUR IS TO TEMPORARY CLOSE ROAD. CONTACT HUMBOLDT COUNTY DEPARTMENT OF PUBLIC WORKS. EXTRA SIGNAGE AND BARRIERS WILL BE NECESSARY.

FLATCAR DETOUR PLAN VIEW

SCALE: 1"=10'

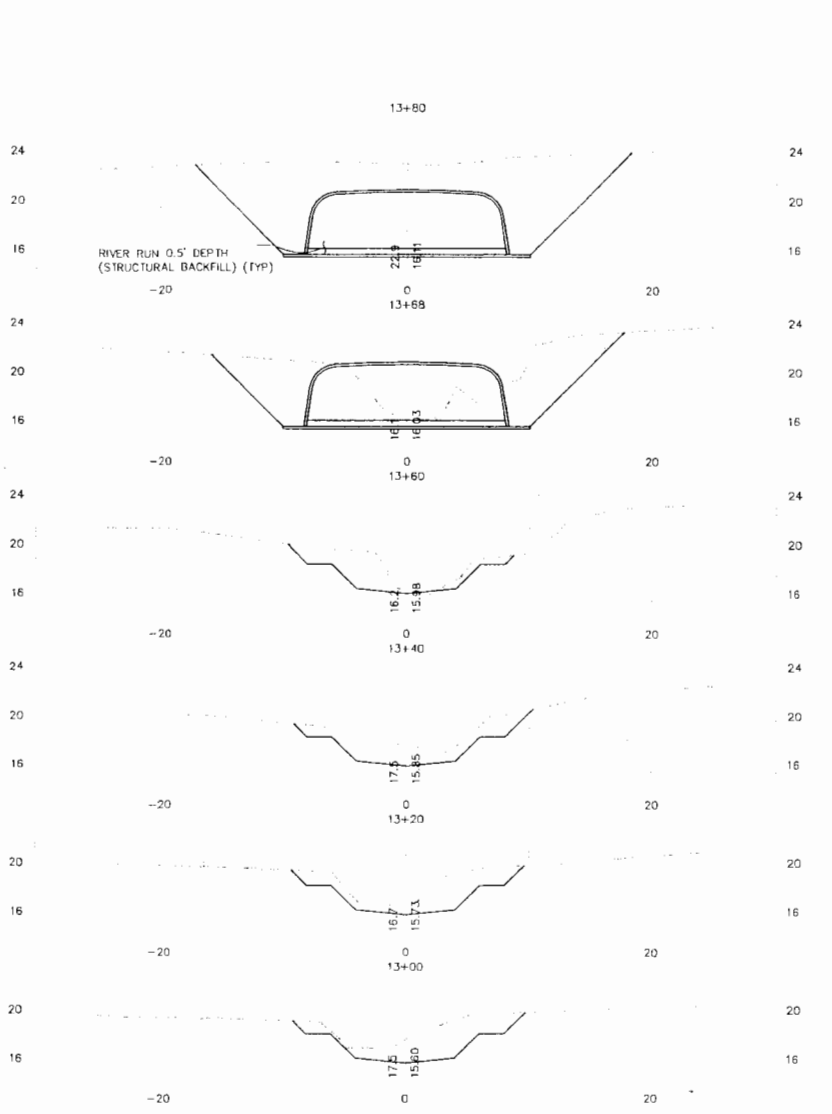
L 9 0

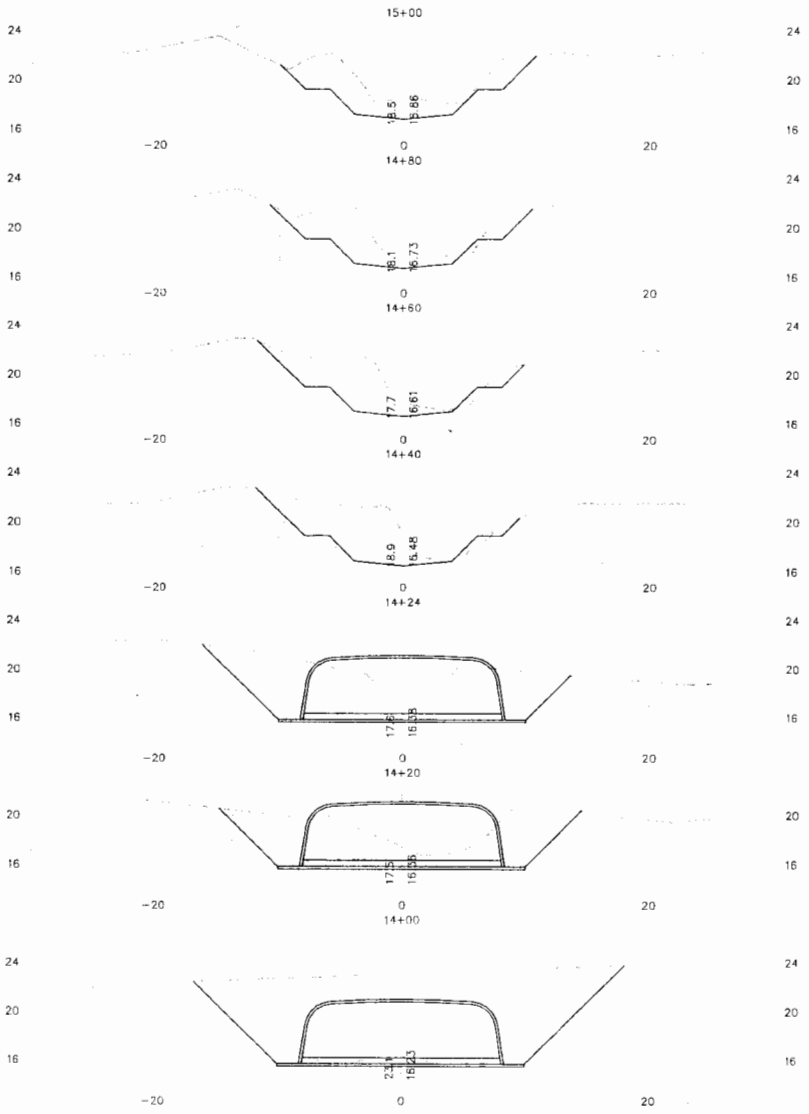
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	ROAD NAME: OLD ARCATA ROAD ROAD NO: 731.300 MILE POST: 5.19 AGREEMENT No.: CONTRACT NO.: 205300 DRAWING FILE NAME: L:\PROJECTS\205300\DWG\CDSN08.DWG PLOT DATE: 11/30/2006	DESIGN SECTION R. L. BURNETT DESIGNED BY: CJW DRAWN BY: JAB REVIEWED BY: RLB APPROVED BY: CJW	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS ROCKY GULCH CULVERT REPLACEMENTS ARCH CULVERT CROSS SECTIONS	SHEET 8 OF 10



8
8
10

BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	ROAD NAME: OLD ARCATA ROAD ROAD NO: F.M.300 MILE POST: 5.19 AGREEMENT No.: CONTRACT NO.: 205300 DRAWING FILE NAME: L:\PROJECTS\205300\DWG\CSSHOS.DWG PLOT DATE: 11/30/2006	DESIGN SECTION R. L. BURNETT DESIGNED BY: CJW DRAWN BY: JAB REVIEWED BY: RLB APPROVED BY: CJW	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS ROCKY GULCH CULVERT REPLACEMENTS ARCH CULVERT CROSS SECTIONS	SHEET 9 OF 10





0 of 10

BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	ROAD NAME: OLD ARCATA ROAD ROAD NO: F34,300 MILE POST: 8.19 AGREEMENT No. CONTRACT NO.: 205300 DRAWING FILE NAME: C:\PROJECTS\205300\DWG\CDSHT10.DWG PLOT DATE: 11/30/2006	DESIGN SECTION R. L. BURNETT DESIGNED BY: CJW DRAWN BY: JAB REVIEWED BY: RLB APPROVED BY: CJW	COUNTY OF HUMBOLDT DEPARTMENT OF PUBLIC WORKS ROCKY GULCH CULVERT REPLACEMENTS ARCH CULVERT CROSS SECTIONS	SHEET 10 OF 10

ROADSIDE DITCH EXCAVATION

STATION	AREAS Square Feet CUT	AREAS Square Feet FILL	VOLUMES Cubic Yards CUT	VOLUMES Cubic Yards FILL	CUMULATIVE VOLUMES Cubic Yards CUT	CUMULATIVE VOLUMES Cubic Yards FILL
10+00	5.52	0.00				
			2.14	0.00	2.14	0.00
10+05	18.31	0.00				
			4.36	0.00	6.50	0.00
10+10	28.61	0.00				
			5.13	0.00	11.63	0.00
10+15	26.75	0.00				
			4.76	0.00	16.39	0.00
10+20	24.71	0.00				
			4.23	0.00	20.62	0.00
10+25	21.03	0.00				
			3.41	0.00	24.04	0.00
10+30	15.83	0.00				
			2.38	0.00	26.41	0.00
10+35	9.83	0.00				
			1.36	0.00	27.78	0.00
10+40	5.50	0.00				
			0.75	0.00	28.53	0.00
10+45	2.95	0.00				
			0.38	0.00	28.90	0.00
10+50	1.10	0.01				
			0.10	0.00	29.00	0.01
10+52.18	1.40	0.09				
			0.00	0.00	29.00	0.01

DOWNSTREAM CULVERT
STRUCTURE EXCAVATION 28' STRUCTURE

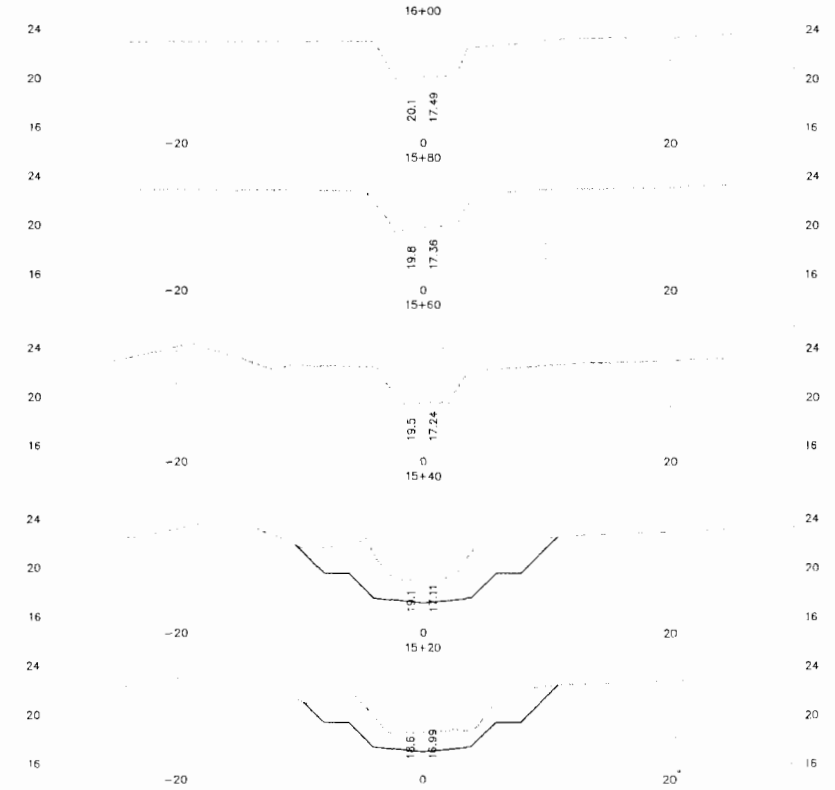
STATION	AREAS Square Feet CUT	AREAS Square Feet FILL	VOLUMES Cubic Yards CUT	VOLUMES Cubic Yards FILL	CUMULATIVE VOLUMES Cubic Yards CUT	CUMULATIVE VOLUMES Cubic Yards FILL
12+40	120.77	0.00				
			103.22	0.00	103.22	0.00
12+60	157.92	0.00				
			46.52	0.00	149.74	0.00
12+68	156.10	0.00				
			41.09	0.14	190.83	0.14
12+90	28.78	0.63				
			0.00	0.00	190.83	0.14

ADD EXCAVATION FOR STRUCTURE BACKFILL FOUNDATION
1'X20'X28'/27CY/FT=21CY; TOTAL=212CY

OAR CULVERT
STRUCTURE EXCAVATION 56' STRUCTURE

STATION	AREAS Square Feet CUT	AREAS Square Feet FILL	VOLUMES Cubic Yards CUT	VOLUMES Cubic Yards FILL	CUMULATIVE VOLUMES Cubic Yards CUT	CUMULATIVE VOLUMES Cubic Yards FILL
13+68	107.90	0.00				
			71.54	0.00	71.54	0.00
13+80	214.04	0.00				
			155.86	0.00	227.41	0.00
14+00	206.79	0.00				
			106.29	0.00	333.69	0.00
14+20	80.19	0.00				
			13.23	0.00	346.93	0.00
14+24	98.45	0.00				
			42.93	0.53	389.86	0.53
14+40	39.00	1.88				
			0.00	0.00	389.86	0.53

ADD EXCAVATION FOR STRUCTURE BACKFILL FOUNDATION
1'X20'X56'/27CY/FT=41CY; TOTAL=431CY



EARTHWORK QUANTITIES SUMMARY TABLE

DESCRIPTION	EXCAVATION (CY)	EMBANKMENT (CY)	STRUCTURE * BACKFILL (CY)	NET (CY)
OAR CULVERT	431	189	154	88
DOWNSTREAM CULVERT	212	54	77	81
STREAMCHANNEL EXCAV.	381	43	0	339
DITCH EXCAV.	29	0	0	29
TOTALS	1,053	286	231	537

* IF THE EXCAVATED MATERIAL DOES NOT MEET THE SPECS. FOR S.B. THEN S.B. MUST BE IMPORTED, THUS INCREASING THE NET MATERIAL TO 437+231=768CY.

STREAM CHANNEL EXCAVATION 10+00 TO 15+40
(INCLUDES CULVERT EXCAVATION)

STATION	AREAS Square Feet CUT	AREAS Square Feet FILL	VOLUMES Cubic Yards CUT	VOLUMES Cubic Yards FILL	CUMULATIVE VOLUMES Cubic Yards CUT	CUMULATIVE VOLUMES Cubic Yards FILL
10+00	0.00	0.00				
			2.32	0.28	2.32	0.28
10+20	5.27	0.76				
			4.77	0.29	7.09	0.57
10+40	6.10	0.02				
			6.04	2.33	13.13	2.90
10+60	10.72	5.79				
			10.75	5.62	23.88	8.51
10+80	18.30	9.37				
			11.73	9.25	35.60	17.77
11+00	15.31	10.75				
			8.97	4.96	44.58	22.73
11+20	10.54	0.44				
			10.60	0.71	55.18	23.44
11+40	18.08	1.47				
			14.34	1.85	69.53	25.28
11+60	18.71	4.15				
			14.63	3.25	84.15	28.53
11+80	20.78	4.60				
			14.91	1.75	99.06	30.28
12+00	17.05	0.69				
			9.08	5.05	108.14	35.33
12+20	7.48	12.93				
			47.50	4.79	155.64	40.12
12+40	120.77	0.00				
			103.22	0.00	258.86	40.12
12+60	157.92	0.00				
			46.52	0.00	305.38	40.12
12+68	156.10	0.00				
			41.09	0.14	346.47	40.26
12+80	28.78	0.63				
			20.93	0.23	367.39	40.49
13+00	27.72	0.00				
			18.99	0.00	386.39	40.49
13+20	23.57	0.00				
			18.77	0.00	405.16	40.49
13+40	25.67	0.00				
			16.95	0.10	422.11	40.59
13+60	19.04	0.29				
			19.21	0.04	441.32	40.64
13+68	107.90	0.00				
			71.54	0.00	512.86	40.64
13+80	214.04	0.00				
			155.86	0.00	668.73	40.64
14+00	206.79	0.00				
			106.29	0.00	775.02	40.64
14+20	80.19	0.00				
			13.23	0.00	788.25	40.64
14+24	98.45	0.00				
			42.93	0.53	831.18	41.15
14+40	39.00	1.88				
			26.83	1.14	858.01	42.31
14+60	33.43	1.21				
			23.89	0.69	881.90	43.00
14+80	31.07	0.67				
			23.57	0.25	905.46	43.25
15+00	32.56	0.00				
			25.35	0.00	930.82	43.25
15+20	35.49	0.00				
			31.03	0.00	961.85	43.25
15+40	47.29	0.00				
			0.00	0.00	961.85	43.25

Stream Channel Excavation = 962cy - 190cy - 390cy = 382cy

10-10

(AMENDED)
ANALYSIS OF WATER DIVERSION ON THREATENED FISH SPECIES

Project:	Rocky Gulch Culvert Replacements and Stream Channel Project
Applicant:	Humboldt County Department of Public Works
Date:	March 2007

EXHIBIT NO. 6
APPLICATION NO.
1-06-049 HUMBOLDT COUNTY DEPT. OF PUBLIC WORKS
ANALYSIS OF WATER DIVERSION ON THREATENED SPECIES (1 of 5)

Background

On December 11, 2006 the Humboldt County Department of Public Works filed an application for a Coastal Development Permit with the California Coastal Commission to replace two culvert crossings and perform stream channel rehabilitation work on Rocky Gulch, tributary to Humboldt Bay. Rocky Gulch is known to contain Southern Oregon/Northern California coho salmon (*Oncorhynchus kisutch*), listed as threatened by the U.S. Fish & Wildlife Service, and contains critical habitat for coho, Northern California steelhead (*O. mykiss*), and California Coast chinook salmon (*O. tshawytscha*). The project proposes to divert streamflow around the project area during construction activities. The Coastal Commission staff has requested analysis of the diversion on listed fish to better evaluate the proposed project (See letter dated January 11, 2007).

The original Analysis of Water Diversion (February 2007) discussed potential impacts to threatened fish species from two proposed diversion alternatives. During a site visit on February 14, 2007 a third alternative was discussed. It was agreed at that time that the third alternative was the preferred alternative.

This document analyzes the preferred alternative, which will divert streamflow through the length of the project site, for direct and indirect effects to federally listed fish. It will also present measures that will be undertaken to minimize impacts to listed fish.

General Project Description

Old Arcata Road Culvert

The existing culvert crossing on Old Arcata Road (OAR) consists of two 3-ft diameter concrete culvert pipes. The culvert pipes will be removed by an excavator. Approximately 431 cy of overburden material will be excavated to remove the pipes. Excavated material determined appropriate for backfill will be stockpiled at the site for re-use. The remaining spoils material will be transported to an approved disposal facility. One foot of aggregate base will be placed in the excavated area. A 16-ft wide x 5-ft high x 56-ft long aluminum box culvert will then be placed on top of the base at a 0.63% grade, structural backfill will be placed around the culvert, followed by embankment backfill (total 343 cy). About 6 inches of imported river run gravel (~17 cy) will be placed inside the culvert, and ½- to 2-ton rock slope protection (RSP, 26 cy) will be placed at the inlet and outlet to prevent scour and protect the culvert. Finally, the road will be re-established with class 3 aggregate base (63 cy) and 40 tons of asphalt concrete.

Downstream Culvert

The culvert crossing approximately 105 feet downstream of OAR also consists of two 3-ft diameter concrete culvert pipes. This crossing allows direct access from the main

house on the property to a second house on the opposite side of the creek. The culvert pipes will be removed, and replaced with a 16-ft wide x 5-ft high x 28-ft long aluminum box culvert. The procedure used will be similar to that of the OAR culvert, minus the road base and paving. 212 cy of fill will be excavated during culvert pipe removal. Structural and embankment backfill will total ~131 cy. 24 inches of river run gravel (34 cy) will be placed on the culvert floor to simulate natural streambed. ½- to 2-ton RSP will be placed at the inlet and outlet.

Footbridge

An existing 25-ft long x 8-ft wide wood footbridge spans Rocky Gulch about 30 ft below the downstream culvert. The footbridge allows access from the main house to open pasture. This footbridge will be removed for stream channel restoration work. It will be salvaged and reinstalled when work at the site is complete.

Stream Channel Excavation/Re-Establishment

Due to the undersized culverts and their condition, the stream channel from below the footbridge to 175 feet above the OAR culvert is severely aggraded with fine sediment. The project proposes to remove fine sediment from this reach to re-establish the channel at a 0.63% grade. Working from the top of bank, an excavator will scoop sediment from the stream channel and deposit it in dump trucks which will transport the sediment to an off-site disposal facility. The excavated channel will be about 10- to 15-ft wide (at top of bank) x 4-ft deep. River run gravel may be placed on the stream bed in some locations (total 49 cy). Total length of stream channel subject to culvert replacement and channel restoration is ~550 ft.

In-stream structures consisting of several root wads and/or stumps will be placed in the stream channel to further enhance salmonid habitat. The number and location of structures will be determined during project construction.

Proposed Streamflow Diversion Plan

Rocky Gulch is a perennial stream. It will be necessary to divert stream flow through or around the project area during construction. The diversion will consist of a coffer dam at the upstream end of the project and approximately 550 feet of 12-18 inch diameter pipe to convey water to a point below the project area.

First, fish exclusion fencing will be installed above and below the project reach. Fish and other aquatic organisms found in the project area will be relocated above and below the project area by a qualified biologist. Then a coffer dam consisting of sand bags and filter fabric will be constructed at the upstream end of the project area. Streamflow will be conveyed through a 12-18 inch diameter pipe, which will be laid on the streambed. The pipe will be moved around as necessary to accommodate construction activities. At the downstream end, the pipe outlet will be placed on a small temporary splash pad of rock and gravel to minimize the possibility of scour from the daylighting flow. The outlet will be located immediately above the downstream fish exclusion fencing to avoid impacts to fish below the project. The diversion will be removed as soon as work below ordinary high water has been completed.

Streamflow diversion will be limited to the minimum amount of time needed to complete work in the stream channel. The length of the diversion will be the shortest possible

while still minimizing effects to water quality and not encroaching on construction activities.

Diversion structures will be constructed and removed according to the mitigation measures outlined in Appendix B of the Final Mitigated Negative Declaration (Coey et.al. 2006). Electrofishing, if necessary, will be done according to DFG and National Marine Fisheries Service (NMFS) guidelines by qualified biologists.

Impacts Analysis

The construction and removal of streamflow diversion structures may have direct or indirect impacts on federally listed fish and habitat. Because the two culvert crossings are nearly complete barriers to fish passage, salmonids are unlikely to be found upstream of the project area. Direct impacts to anadromous fish will occur primarily downstream of the diversion structure.

Direct Impacts
Direct impacts to anadromous fish include injury or mortality due to crushing, electrocution, harassment, and stranding.

Fish may be injured or killed during the construction and removal of the diversion structures. Due to the timing of the project (late summer during low flows), adult salmonids are unlikely to be found in the project area. It is possible that some juveniles may be present. Juvenile fish could be bumped or crushed by footsteps during fish exclusion fence installation. Fish could also be injured or stressed by harassment from both fish fence installation and/or hazing (driving) them out of the project area, which could lead to mortality. Electrofishing to remove fish from inside the project area could result in the death of individuals from electricity or transport to a new location.

Indirect Impacts
Indirect impacts to anadromous fish include changes to habitat and water quality that could affect survival and numbers of individuals/populations.

Dewatering of any portion of stream channel could affect habitat. Dewatering may result in loss of aquatic biota that fish feed on or aquatic vegetation that fish hide in. In addition, lack of water could affect riparian vegetation on stream banks, resulting in drought stress, and leaf drop or death. This could lead to loss of shade and reduction in leaf litter contribution to the stream, from the time the diversion is removed and flow restored until new riparian vegetation growth occurs/re-establishes.

Diverting streamflow during project construction could affect water quality. Placement of the fish exclusion fencing, construction of the diversion structures, and removal of the components could expose and stir up fine sediment on the streambed, resulting in a temporary increase in turbidity.

Minimization Measures and Monitoring

To minimize potential impacts to anadromous fish in Rocky Gulch, minimization and mitigation measures will be taken in the installation and removal of diversions, and fish relocation activities associated with the project. The measures listed below are required by DFG and NMFS and will be utilized for the project.

- DFG will be notified 5 days before the diversion is installed. DFG personnel will supervise implementation of the diversion plan and oversee safe removal and relocation of salmonids (DFG 2006. Exhibit A, #6).
- Any equipment work within the stream channel will be performed in isolation from the flowing stream. Flow will be diverted with the use of coffer dams constructed of river gravel or sand bags. (Coey et. al. 2006. #6 page B-2, #3 page B-8).
- Prior to the start of construction activities (including diversion installation), fish exclusion fencing will be placed above and below the project reach (Flosi et. al. 2003. page IX-52)
- Any equipment entering the active stream installing a coffer dam will be preceded by an individual on foot to displace wildlife and prevent them from being crushed (Coey et. al. 2006. #8 page B-3).
- The suction end of the intake pipe will be fitted with fish screens. Turbid water pumped from the dewatered work site will be disposed of in an upland location (Coey et. al. 2006. #5, page B-8).
- Measures will be taken to minimize harm and mortality to listed salmonids resulting from fish relocation and dewatering activities (NMFS 2004. page 71).
  a) Relocation and dewatering from June 15-Nov 1
  b) Minimize the amount of wetted stream channel that is dewatered to the fullest extent possible
  c) Electrofishing will be performed by a qualified biologist according to *Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act* (NMFS 2000).
- Sediment-laden water created by construction activity will be filtered before it re-enters the stream. Silt fences or other detention methods will be installed to reduce the amount of sediment re-entering the stream (Coey et. al. 2006. #1.e., page B-20).
- If the mitigation measures cannot be implemented or actions cannot be modified to prevent or avoid impacts, activities will be discontinued (Coey et. al. 2006. #9, page B-9).

References

California Department of Fish & Game. 2006. Agreement #P0510306-Rocky Gulch Culvert Replacement. State of California, The Resources Agency.

Coey, Bob, G. Flosi, H. Sheradin. 2006. Final Mitigated Negative Declaration for the 2006 Fisheries Restoration Grant Program in Del Norte, Humboldt, Los Angeles, Mendocino, Monterey, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, Siskiyou, Sonoma, Trinity, and Ventura Counties and Required Agreement Regarding Proposed Stream or Lake Alteration. State of California, The Resources Agency, California Department of Fish & Game.

Flosi, Gary, S. Downie, J. Hopelain, M. Bird, R. Coey, B. Collins. 2003. California Salmonid Stream Habitat Restoration Manual, Part IX-Fish Passage Evaluation at Stream Crossings. State of California, The Resources Agency, California Department of Fish & Game. Sacramento, CA.

National Marine Fisheries Service. 2000. Guidelines for Electrofishing Waters Containing

Salmonids Listed Under the Endangered Species Act. United States Department of Commerce, National Oceanic and Atmospheric Administration.

National Marine Fisheries Service. 2004. "Biological Opinion-Issuance of a Regional General Permit to the California Department of Fish & Game for the Placement of Fill Material Into the Waters of the United States in Coastal, Central, and Northern California to Implement Salmonid Habitat Restoration Projects." United States Department of Commerce, National Oceanic and Atmospheric Administration. Long Beach, CA.

FEB 28 2007

Notice of Determination

TO: ☒ Office of Planning and Research

For U.S. Mail:
P.O. Box 3044
Sacramento, CA 95812-3044

Street Address:
1400 Tenth Street
Sacramento, CA 95814

FROM: Department of Fish and Game
601 Locust Street
Redding, CA 96001
Contact: John Schwabe
Phone: (707) 441-2006

LEAD AGENCY (if different from above):
California Department of Fish and Game
830 S Street
Sacramento, CA 95814-7023
Contact: Holly Sheradin
Phone: 916-327-8658

SUBJECT: Filing of Notice of Determination pursuant to § 21108 of the Public Resources Code

State Clearinghouse Number: **2006052041**

Project Title: **Lake and Streambed Alteration Agreement No. R1-06-0660 Rocky Gulch Culvert Replacements and Stream Channel Rehabilitation Project**

Project Location: **Rocky Gulch, tributary to Humboldt Bay, Humboldt County, Section 16, Township 5 North, Range 1 East, HDB&M.**

Project Description: **The Project proposes the replacement of two culverts, a footbridge, and channel rehabilitation of Rocky Gulch in the vicinity of Old Arcata Road, in Humboldt County.**

This is to advise that the Department of Fish and Game (DFG), acting as ☒ **the lead agency** / ☐ **a responsible agency** approved the above-described project on the date signed below and has made the following determinations regarding the above described project:

1. The project ☐ **will** / ☒ **will not** have a significant effect on the environment. (This determination is limited to effects within DFG's jurisdiction when DFG acts as a responsible agency.)
2. ☐ **An environmental impact report** / ☒ **A negative declaration** / ☐ **A timber harvesting plan** was prepared for this project pursuant to CEQA.
3. Mitigation measures ☒ **were** / ☐ **were not** made a condition of DFG's approval of the project.
4. A Statement of Overriding Considerations ☐ **was** / ☒ **was not** adopted by DFG for this project.
5. Findings ☐ **were** / ☒ **were not** made by DFG pursuant to Public Resources Code § 21081(a). DFG did, however, adopt findings to document its compliance with CEQA.
6. Compliance with the environmental filing fee requirement at Fish and Game Code § 711.4 (check one):
   - ☐ Payment is submitted with this notice.
   - ☐ A copy of a receipt showing prior payment is on file with DFG.
   - ☐ A copy of the Lead Agency's Certificate of Fee Exemption and De Minimis Impact Finding is on file at DFG.
   - ☒ Payment is not required when the Department is Lead Agency.

☒ Lead Agency certification: DFG, as Lead Agency, has made the final EIR with comments and responses and record of project approval, or the Negative Declaration, available to the General Public at the DFG office identified above.

☐ Responsible Agency statement: The final EIR, Negative Declaration, or THP that was prepared by the Lead Agency for this project is available to the General Public at the office location listed above for the Lead Agency. DFG's record of decision is available at the DFG office identified above.

Signed: Signature on File *Date:* 2/26/07

DONALD B. KOCH
Regional Manager
Northern Region
California Department Fish and Game

Date Received for filing at OPR:

EXHIBIT NO. 7
APPLICATION NO.
1-06-049 HUMBOLDT COUNTY DEPT. OF PUBLIC WORKS
CDFG STREAMBED ALTERATION AGREEMENT
(1 of 10)

CALIFORNIA DEPARTMENT OF FISH AND GAME
CEQA FINDINGS FOR THE
AGREEMENT REGARDING PROPOSED LAKE OR STREAMBED
ALTERATION NO. R1-06-0660

Introduction

The California Environmental Quality Act (**CEQA**) (Public Resources Code section 21000, *et seq.*) and the State CEQA Guidelines (**Guidelines**) (Section 15000, et seq., Title 14, California Code of Regulations) require that no public agency shall approve or carry out a project for which a mitigated negative declaration (MND) has been completed that identifies one or more significant effects, unless such an agency makes the following finding as to each significant effect:

Changes or alterations have been required in, or incorporated into, the project which mitigate or avoid the significant effects on the environment.

As the lead agency for the project, the California Department of Fish and Game (DFG) adopted the MND for the Project on **June 7, 2006.** DFG found that the Project will not result in significant environmental effects with the mitigation measures required in, or incorporated into the Project.

DFG is issuing a Lake or Streambed Alteration Agreement (Agreement) to the project applicant, **Ms. Ann Glubczynski representing Humboldt County Department of Public Works of Eureka.** The project is located on **Rocky Gulch, tributary to Humboldt Bay, Humboldt County, Section 16, Township 5 North, Range 1 East, HDB&M**.

Findings

DFG has considered the MND adopted for the project and has concluded that the Agreement should be issued under the terms and conditions specified therein. On the basis of the record before DFG, there is no substantial evidence that the project will have a significant effect on the environment. DFG finds that the MND reflects DFG's independent judgment and analysis. In this regard, DFG hereby adopts the findings set forth in the MND insofar as they pertain to the Project's impacts on biological resources.

Signature on File

Signed: _____ *Date:* 2/26/06

DONALD B. KOCH
Regional Manager,
Northern Region
California Department Fish and Game

2410

Notification Number R1-06-0660

AGREEMENT REGARDING PROPOSED LAKE OR STREAMBED ALTERATION FISH AND GAME CODE SEC. 1600

THIS AGREEMENT, entered into between the State of California, Department of Fish and Game, hereinafter called the Department, and Ms. Ann Glubczynski, representing Humboldt County Department of Public Works of Eureka, State of California, hereinafter called the Operator, is as follows:

Whereas, pursuant to Section 1602 of the California Fish and Game Code (Code), the Operator, on the 11th day of December 2006, notified the Department that he/she intends to substantially divert or obstruct the natural flow of, or substantially change the bed, channel, or bank of the following water: Rocky Gulch tributary to Humboldt Bay, in the County of Humboldt, State of California, in S. 16; T. 5 North; R. 1East; and

Whereas, the Department, represented by John W. Schwabe has determined that the activities proposed in the Operators notification may substantially affect existing fish and wildlife resources.

THEREFORE, IT IS AGREED THAT:

1. All provisions of this Agreement remain in force throughout the term of the Agreement. Any provisions of the Agreement may be amended or the Agreement may be terminated at any time provided such amendment and/or termination are agreed to in writing by both parties. Mutually approved amendments become part of the original Agreement and are subject to all previously negotiated provisions.

2. A copy of this Agreement must be provided to all contractors and subcontractors and shall be available at the project site during all periods of active work.

3. The Operator, contractor, or subcontractors are jointly liable for compliance with the terms of this Agreement. Any violation of the terms of this Agreement shall make this Agreement null and void, and all activity must stop until another Agreement is made.

PROVISIONS:

1. Only work described in the project description submitted in the Agreement notification and that identified in Grant #P0510306 Statement of Work will be allowed. All work must be approved in writing in advance by the Department grant/contract manager assigned to the project.

3910

2. If, in the opinion of the Department, conditions arise or change in such a manner as to be considered deleterious to aquatic life, operations shall cease until corrective measures are taken.

3. Timing. To avoid impacts to aquatic habitat the activities carried out in the restoration program typically occur during the summer dry season.

   a) Work around streams is restricted to the period of June 15 through November 1 or the first rainfall. This is to take advantage of low stream flow and avoid the spawning and egg/alevin incubation period of salmon and steelhead.

   b) Upslope work generally occurs during the same period as stream work. Road decommissioning and other sediment reduction activities are dependent on soil moisture content. Upslope projects do not have seasonal restrictions in the Incidental Take Statement but work may be restricted at some sites to allow soils to dry out adequately. In some areas equipment access and effectiveness is constrained by wet conditions.

   c) The permissible work window for individual work sites will be further constrained as necessary to avoid the nesting or breeding seasons of birds and terrestrial animals. At most sites with potential for raptor (including northern spotted owls) and migratory bird nesting, if work is conditioned to start after July 31, potential impacts will be avoided and no surveys will be required. For work sites that might contain nesting marbled murrelets, the starting date will be September 15 in the absence of surveys. The work window at individual work sites could be advanced if surveys determine that nesting birds will not be impacted.

   d) For restoration work that could affect swallow nesting habitat (such as removal of culverts showing evidence of past swallow nesting), construction will occur after August 31 to avoid the swallow nesting period. Alternatively, the suitable bridge nesting habitat will be netted before initiation of the breeding season to prevent nesting. Netting must be installed before any nesting activity begins, generally prior to March 1. Swallows must be excluded from areas where construction activities cause nest damage or abandonment.

   e) Planting of seedlings shall begin after December 1, or when sufficient rainfall has occurred to ensure the best chance of survival of the seedlings, but in no case after April 1.

4. Stream bank modifications to facilitate project construction operations shall be performed in a manner that will not cause negative impacts upstream and downstream in the stream channel, such as accelerated bank erosion or loss of vegetation.

5. The disturbance or removal of vegetation will not exceed the minimum necessary to complete operations. The contractor shall ensure that the spread or introduction of

invasive exotic plants shall be avoided to the maximum extent possible. When practicable, invasive exotic plants at the work site shall be removed. Any disturbed banks shall be fully restored upon completion of construction. Re-vegetation shall be done using native species. Planting techniques can include seed casting, hydro-seeding, or live planting methods using the techniques in Part XI of the *California Salmonid Stream Habitat Restoration Manual.*

6. Access to the work site will be on existing roads and access ramps when available. The number of access routes, number and size of staging areas, and the total area of the work site activity shall be limited to the minimum necessary to complete the restoration action.

7. Any materials placed in seasonally dry portions of a stream that could be washed downstream or could be deleterious to aquatic life, wildlife, or riparian habitat shall be removed from the project site prior to inundation by high flows.

8. During all activities at project work sites, all trash that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris shall be removed from work areas.

9. HAZARDS AND HAZARDOUS MATERIALS

a) Heavy equipment that will be used in these activities will be in good condition and will be inspected for leakage of coolant and petroleum products and repaired, if necessary, before work is started.

b) Any equipment or vehicles operated within or adjacent to the stream will be checked and maintained daily to prevent fuel, lubricant, or coolant leaks.

c) Staging/storage areas for equipment, materials, fuels, lubricants, and solvents, will be located outside of the stream's high water channel and associated riparian area. Stationary equipment such as motors, pumps, generators, compressors, and welders located within the dry portion of the stream channel or adjacent to the stream, will be positioned over drip-pans. Vehicles will be moved out of the normal high water area of the stream prior to refueling and lubricating. The contractor shall ensure that contamination of habitat does not occur during such operations. Prior to the onset of work, the Department shall ensure that the contractor has prepared a plan to allow a prompt and effective response to any accidental spills. All workers shall be informed of the importance of preventing accidental spills.

d) All activities performed in or near a stream will have absorbent materials designated for spill containment and clean-up at the activity site for use in case of an accidental spill. Clean-up of all spills will begin immediately. The Operator shall notify the State Office of Emergency Services immediately at 1-800-852-7550. The Department will be notified

by the Operator (CalTip 1-888-334-2258) of any spills and will be consulted regarding clean-up procedures.

e) The contractor shall have dependable radio or phone communication on-site to be able to report any accidents or fire that might occur.

f) Work with heavy equipment will be performed in isolation from flowing water, except as may be necessary to construct coffer dams to divert stream flow and isolate the work site.

g) All internal combustion engines shall be fitted with spark arrestors.

h) The contractor shall have an appropriate fire extinguisher(s) and fire fighting tools (shovel and axe at a minimum) present at all times when there is a risk of fire.

i) Vehicles shall not be parked in tall grass or any other location where heat from the exhaust system could ignite a fire.

j) The contractor shall follow any additional rules the landowner has for fire prevention.

k) Water flows may be diverted to allow access to the project site. Diverted water shall be piped and remain within the natural banks of the stream.

l) Any equipment work within the stream channel shall be performed in isolation from the flowing stream. If there is any flow when the work is done, the contractor shall construct coffer dams upstream and downstream of the excavation site and divert all flow from upstream of the upstream dam to downstream of the downstream dam. The coffer dams may be constructed with clean river gravel or sand bags, and may be sealed with sheet plastic. Sand bags and any sheet plastic shall be removed from the stream upon project completion. Clean river gravel may be left in the stream, but the coffer dams must be breached to return the stream flow to its natural channel.

m) For minor actions, where the disturbance to construct coffer dams to isolate the work site would be greater than to complete the action (for example, placement of a single boulder cluster), then measures will be put in place immediately downstream of the work site to capture suspended sediment. This may include installation of silt catchment fences across the stream, or placement of a filter berm of clean river gravel. Silt fences and other non-native materials will be removed from the stream following completion of the activity. Gravel berms may be left in place after breaching, provided they do not impede the stream flow.

n) Any equipment entering the active stream (for example, in the process of installing a coffer dam) shall be preceded by an individual on foot to displace wildlife and prevent them from being crushed.

10. Suitable large woody debris removed from fish passage barriers that is not used for habitat enhancement, shall be left within the riparian zone so as to provide a source for future recruitment of wood into the stream.

11. Measures shall be taken to minimize harm and mortality to listed salmonids resulting from fish relocation and dewatering activities:

    a) Fish relocation and dewatering activities shall only occur between June 15 and November 1 of each year.

    b) Applicant shall minimize the amount of wetted stream channel that is dewatered at each individual project site to the fullest extent possible.

    c) All electrofishing shall be performed by a qualified fisheries biologist and conducted according to the National Marine Fisheries Service Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act, June 2000.

    d) The applicant will provide fish relocation data to the Department Grant Manager on a form provided by the Department of Fish and Game.

    e) Additional measures to minimize injury and mortality of salmonids during fish relocation and dewatering activities shall be implemented as described in Part IX, pages 52 and 53 of the *California Salmonid Stream Habitat Restoration Manual.*

    f) If for some reason these mitigation measures cannot be implemented, or the project actions proposed at a specific work site cannot be modified to prevent or avoid potential impacts to anadromous salmonids or their habitat, then activity at that work site will be discontinued.

12. If any wildlife is encountered during the course of construction, said wildlife shall be allowed to leave the construction area unharmed, and shall be flushed, hazed, or herded in a safe direction away from the project site.

13. Any trees containing red tree vole nests encountered at a work site will be flagged and avoided during construction.

14. For any work sites containing western pond turtles, foothill yellow-legged frogs or tailed frogs, the contractor shall provide to the Department contract manager for review and approval, a list of the exclusion measures that will be used at their work site to prevent take or injury to any individual pond turtles or frogs that could occur on the site. The contractor shall ensure that the approved exclusion measures are in place prior to

construction. Any turtles or frogs found within the exclusion zone shall be moved to a safe location upstream or downstream of the work site, prior to construction.

15. All habitat improvements shall be done in accordance with techniques in the *California Salmonid Stream Habitat Restoration Manual*. The most current version of the manual is available at: http://www.dfg.ca.gov/habitats.

16. If the Operator's work changes from that stated in the notification specified above, this Agreement is no longer valid.

17. Nothing in this Agreement authorizes the Operator to trespass on any land or property, nor does it relieve the Operator of responsibility for compliance with applicable Federal, State, or local laws or ordinances.

18. Additional Provision: The Operator will provide a revised water diversion plan for the project as discussed during field inspection on 02/14/07. The Department's Contract/Grant Manager will need to receive the revised diversion plan 30 days prior to construction. The plan will include a scaled drawing and a written narrative describing installation sequencing. The Operator will notify the Department's Contract/Grant Manager or designated Department Representative a minimum of 5 work days prior to implementation of the project. This should provide sufficient time to perform a final in field inspection and coordinate the fish relocation, and water diversion.

Additional provisions for upslope and fish crossing projects

1) The Operator will implement the following measures to minimize harm to listed salmonids resulting from culvert replacement activities and other instream construction work:

   a) All stream crossing replacement or modification designs, involving fish passage, must be visually reviewed and authorized by NOAA Fisheries (or Department) engineers prior to commencement of work.

   b) If the stream in the project location was not passable to, or was not utilized by all life stages of, all covered salmonids prior to the existence of the road crossing, the project shall pass the life stages and covered salmonid species that historically did pass there. Retrofit culverts shall meet the fish passage criteria for the passage needs of the listed species and life stages historically passing through the site prior to the existence of the road crossing.

   c) Effective erosion control measures shall be in-place at all times during construction. Construction within the 5-year flood plain will not begin until all temporary erosion controls (e.g., straw bales or silt fences that are effectively keyed-in) are in-place down slope of project activities within the riparian area. Erosion control measures shall be

maintained throughout the construction period. If continued erosion is likely to occur after construction is completed, then appropriate erosion prevention measures shall be implemented and maintained until erosion has subsided.

d) Sediment shall be removed from sediment controls once it has reached one-third of the exposed height of the control. Whenever straw bales are used, they shall be staked and dug into the ground 6 inches. Catch basins shall be maintained so that no more than 6 inches of sediment depth accumulates within traps or sumps.

e) Sediment-laden water created by construction activity shall be filtered before it leaves the right-of-way or enters the stream network or an aquatic resource area. Silt fences or other detention methods shall be installed as close as possible to culvert outlets to reduce the amount of sediment entering aquatic systems.

f) Upon project completion, all exposed soil present in and around the project site shall be stabilized within 7 days.

2) The Operator will implement the following measures to minimize harm to listed salmonids resulting from construction in the riparian corridor:

a) Retain as many trees and brush as feasible, emphasizing shade producing and bank stabilizing trees and brush.

b) Use project designs and access points that minimize riparian disturbance without affecting less stable areas, which may increase the risk of channel instability.

c) Minimize compaction by using equipment that either has (relative to other equipment available) less pressure per square inch on the ground or a greater reach, thus resulting in less compaction or less area overall compacted or disturbed.

d) At the completion of the project, soil compaction that is not an integral element of the design of a crossing should be de-compacted.

e) Disturbed and compacted areas shall be re-vegetated with native plant species. The species used should be specific to the project vicinity or the region of the state where the project is located, and comprise a diverse community structure (plantings should include both woody and herbaceous species). Plant at a ratio of two plantings to one removed plant.

f) Unless otherwise specified, the standard for success is 80 percent survival of plantings or 80 percent ground cover for broadcast planting of seed after a period of 3 years.

g) The spread or introduction of invasive exotic plants will be avoided to the maximum extent possible.

3) The Operator will implement the following measures to minimize harm to listed salmonids resulting from ground disturbance activities:

a) Work sites will be winterized at the end of each day when significant rains are forecast that may cause unfinished excavations to erode. Winterization procedures shall supervised by a professional trained in erosion control techniques and involve taking necessary measures to minimize erosion on unfinished work surfaces. Winterization includes the following: smoothing unfinished surfaces to allow water to freely drain across them without concentration or ponding; compacting unfinished surfaces where concentrated runoff may flow with an excavator bucket or similar tool, to minimize surface erosion and the formation of rills; and installation of culverts, silt fences, and other erosion control devices where necessary to convey concentrated water across unfinished surfaces, and trap exposed sediment before it leave the work site.

b) Adequate erosion control supplies (gravel, straw bales, shovels, etc.) shall be kept at all restoration sites to ensure sediment is kept out of water bodies.

c) Mulching and seeding is required on all exposed soil which may deliver sediment to a stream.

This Agreement becomes effective upon signature by all parties. This Agreement is valid until April 1, 2008 or completion of the project or five years, whichever comes first.

Robert Burkett
Operator

Assoc Civil Eng.
Title

Humboldt Co Public Works
Organization

2/20/07
Date

Signature on File

DONALD B. KOCH
Regional Manager
Department of Fish and Game

2/26/06
Date

Rocky Gulch Culvert Replacement Project
Humboldt County

February 5, 2007
Prepared by Jennifer Kalt
for the California Department of Fish and Game

Location: T 5N, R 1E, Sec. 16, Arcata South Quad
Project Applicant: Humboldt County Dept. of Public Works
Botanical Surveyors: Jennifer Kalt
Humboldt State University Sponsored Programs Foundation, Arcata, CA
Survey Date: February 1, 2007
Field Person-hours: 0.5 hour

INTRODUCTION

This report was prepared to assess potential impacts to botanical resources in conjunction with the Rocky Gulch Culvert Replacement Project under the direction of the California Department of Fish and Game. This project is intended to improve juvenile and adult steelhead trout and coho salmon migration and rearing by replacing two culverts at a road crossing, with approximately 360 feet of bank enhancement. This report is intended as an attachment to the Cultural Resources Investigation for the Rocky Gulch Culvert Replacement Project. For a map of the project area and specific information on the proposed project, please refer to the associated report.

In order to meet California Environmental Quality Act (CEQA) requirements, a habitat assessment for potential presence of sensitive plant species was conducted to determine whether the proposed project would have significant negative impacts on any sensitive plants or habitats in the project area. Sensitive plants are rare, threatened or endangered species as defined by the Federal and California Endangered Species Acts, as well as non-listed species that require consideration under 14 Cal. Code Reg. §15380. Sensitive habitats are considered a high priority for inventory due to their rarity status as defined by the California Department of Fish and Game (CDFG). This report focuses on the results of the sensitive plant surveys for the Rocky Gulch Culvert Replacement Project.

ENVIRONMENTAL SETTING

The project area is located along Rocky Gulch, a tributary of Humboldt Bay, in Humboldt County, California. The property is within the county's right of way adjacent to a county road. Adjacent land is owned and managed by private

landowners, and land use includes agriculture and residential, with timber harvest upslope from the project site. The project area includes the creek bed, creek bank, and access points where heavy machinery will be brought down to the creek from the main road. The project area is in a riparian corridor dominated by alder, Himalaya berry, and *Scirpus microcarpus*, within a landscape dominated by vegetation of the Redwood series (Sawyer and Keeler-Wolf 1995). The project site is approximately 40 feet above mean sea level.

METHODS

Prior to field surveys, a list of the sensitive plant species and habitats with recorded occurrences in the assessment area was compiled by consulting the California Department of Fish and Game (CDFG) California Natural Diversity Database (CDFG 2002) and the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California (CNPS 2001). The assessment area was defined as the USGS 7.5' quadrangle in which the project is located (Arcata South Quad), as well as the eight adjacent quadrangles (Arcata North, Eureka, Tyee City, McWhinney Creek, Fields Landing, Korbel, Blue Lake, and Iaqua Buttes). *RareFind 2,* the CNDDB electronic database, was used to query known occurrences (Nov. 2004 edition). The queries yielded 36 sensitive species previously documented in the assessment area (Table 1) and 3 sensitive plant communities (Table 2).

Table 1. Rocky Gulch Assessment Area: Predicted Sensitive Plant Species, Blooming Periods, and CNPS Rankings.

Scientific Name	Blooming Period	CNPS Rank
Abronia umbellata ssp. *breviflora*	Jun-Oct	1B.1
Astragalus pycnostachyus var. *pycnostachyus*	Apr-Oct	1B.2
Astragalus umbraticus	May-Jul	2.3
Bensoniella oregona		1B.1
Carex arcta	Jun-Aug	2.2
Carex leptalea	May-Jul	2.2
Carex lyngbyei	May-Aug	2.2
Carex praticola	May-Jul	2.2
Castilleja affinis ssp. *litoralis*	Jun	2.2
Castilleja ambigua ssp. *humboldtiensis*	Apr-Aug	1B.2
Cordylanthus maritimus ssp. *palustris*	Jun-Oct	1B.2
Didymodon norrisii		2.2
Epilobium oreganum	Jun-Sep	1B.2
Erysimum menziesii ssp. *eurekense*	Mar-Apr	1B.1
Erythronium revolutum	Mar-Jun	2.2
Fissidens pauperculus		1B.2
Gilia capitata ssp. *pacifica*	Apr-Aug	1B.2
Gilia millefoliata	Apr-Jul	1B.2
Hesperevax sparsiflora var. *brevifolia*	Mar-Jun	2.2

Iliamna latibracteata	Jun-Aug	1B.2
Lathyrus japonicus	May-Aug	2.1
Lathyrus palustris	Mar-Aug	2.2
Layia carnosa	Mar-Jul	1B.1
Lilium occidentale	Jun-Jul	1B.1
Lycopodium clavatum	Jul-Aug	2.3
Mitella caulescens	Apr-Oct	2.3
Monotropa uniflora	Jun-Aug	2.2
Montia howellii	Mar-May	2.2
Sidalcea malachroides	Apr-Aug	1B.2
Sidalcea malviflora ssp. *patula*	May-Jun	1B.2
Sidalcea oregana ssp. *eximia*	Jun-Aug	1B.2
Spergularia canadensis var. *occidentalis*	Jun-Aug	2.1
Thermopsis robusta		1B
Thlaspi californicum	May-Jun	1B.1
Tiarella trifoliata var. *trifoliata*	Jun	3
Usnea longissima		
Viola palustris	Mar-Aug	2.2

Table 2. Rocky Gulch Assessment Area: Sensitive Plant Communities.

Northern Coastal Salt Marsh
Northern Foredune Grassland
Upland Douglas Fir Forest

The primary sources for information on the status of sensitive plant species and plant communities are the California Native Plant Society and CDFG. The CNPS Inventory of Rare and Endangered Plants of California is a comprehensive list with five categories that are summarized below. Plants on lists 1A, 1B and 2 are considered sensitive species as described in the California Environmental Quality Act (14 Cal. Code Reg. §15380) and are therefore the focus of this report.

1A: Plants presumed extinct in California
1B: Plants rare, threatened, or endangered in California and elsewhere
2: Plants rare, threatened, or endangered in California but more common elsewhere
3: Plants about which we need more information - a review list
4: Plants of limited distribution – a watch list

A new Threat Code extension was recently added following the CNPS List (e.g. 1B.1, 2.2 etc.). This extension replaces the E (Endangerment) value from the R-E-D Code. The main difference is that the number coding is now reversed to reduce confusion and represent this information in parallel with the threat rankings that the California Natural Diversity Database (CNDDB) uses. Therefore the logic is reversed so that the lower the number, the higher the corresponding threat level.

New Threat Code extensions and their meanings:

.1 - Seriously endangered in California
.2 – Fairly endangered in California
.3 – Not very endangered in California

CDFG has a similar list of Special Vascular Plants, Bryophytes, and Lichens published by the CDFG Natural Diversity Database (CNDDB). The Special Plants List includes the CNPS Inventory, as well as species considered sensitive by other governmental agencies (e.g., Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. Forest Service). In addition, CNDDB recognizes certain habitats as sensitive (CDFG 2001).

in keeping with guidelines established by both CNPS (CNPS 2001) and CDFG (CDFG 2000), field surveys were floristic in nature. A field visit is typically planned to coincide with the blooming periods of listed species. However, due to a scheduling oversight, the field visit was not done during the typical field season. A habitat assessment was conducted to determine whether suitable habitat for any sensitive species known from the assessment area have the potential to be present within the project area. All plants encountered during the surveys were identified to the taxonomic level necessary to determine whether or not they are sensitive. Taxonomy follows the Jepson Manual (Hickman 1993). The entire project site was thoroughly surveyed to identify all plant species present.

Jennifer Kalt conducted the pre-field scoping, field surveys, and plant identification. Kalt is a professional botanist with a Bachelor of Science degree in Botany and a Master of Arts degree in Biology from Humboldt State University, with more than five years of experience conducting sensitive plants surveys in northern California. The survey was conducted on February 1, 2007, with 0.5 field-person hour spent surveying the project area.

SPECIES LIST

The following species were observed within the project site. All plants were identified to the most specific taxonomic level necessary to determine presence of sensitive species.

Tree layer:
Alnus rubra red alder

Shrub layer:
Rubus discolor Himalaya berry

Herbaceous layer:

Anthoxanthum odoratum	sweet vernal grass
	bamboo (horticulultural)
Cardamine sp.	toothwort
Cortaderia jubata	pampas grass
Daucus carota	Queen Anne's lace
Dipsacus sp.	Teasel
Epilobium sp.	willowherb
Equisetum telmeteia	horsetail
Geranium molle	hairy geranium
Hypochaeris radicata	cat's ear
Juncus effusus	rush
Raphanus sp.	wild radish
Rumex acetosella	sheep sorrel
Rumex sp.	dock
Scirpus microcarpus	
Scrophularia californica	California figwort
Solidago sp.	goldenrod
Stachys sp.	hedge nettle
other roadside grasses	(not flowering)

RESULTS

No sensitive species, sensitive plant habitat, or sensitive plant communities were encountered during field surveys of the project area. Although surveys were not conducted during an appropriate time of year for all species (blooming period in most cases), no suitable habitat for sensitive species was found within the project area.

RECOMMENDATIONS

Results of botanical surveys indicate that negative impacts to sensitive species will not occur as a result of the Rocky Gulch Culvert Replacement Project, since no sensitive species, sensitive plant habitat, or sensitive plant communities were found within the project sites. Reseeding exposed soils with native species that occur in the project area is recommended after work is completed.

REFERENCES

California Department of Fish and Game, Natural Diversity Database. January 2001. Special Vascular Plants, Bryophytes, and Lichens List. Biannual publication, Mimeo.

547

California Department of Fish and Game. May 2000. Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities. Sacramento, CA.

California Native Plant Society (CNPS). 2001. Inventory of Rare and Endangered Vascular Plants of California. California Native Plant Society Special Publication No. 1 (sixth edition). Sacramento, CA.

Hickman, J.C. (ed.). 1993. The Jepson Manual: Higher Plants of California. University of California Press. Berkeley and Los Angeles, CA.

Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation.* California Native Plant Society. Sacramento, CA.

McBain & Trush | FISHERIES
HYDROLOGY
RIPARIAN ECOLOGY
STREAM RESTORATION
FLUVIAL GEOMORPHOLOGY

P.O. Box 663, Arcata, CA 95518 • 980 7th Street, Arcata, CA 95521
Phone: (707)826-7794 • Fax: (707)826-7795

Rocky Gulch at Old Arcata Road
Channel and Floodplain Modification: Conceptual Design
Grant Agreement #205300

FINAL REPORT

July 24, 2006

Prepared for: Chris Whitworth,
Humboldt County Department of Public Works
1106 Second Street
Eureka, CA 95501

Mark Lancaster
Five Counties Salmonid Conservation Program
Trinity County Planning Department
PO Box 2819
Weaverville, CA 96093

Gary Flosi
CA Department of Fish and Game
1455 Sandy Prairie Court
Fortuna, CA 95540

Prepared by: Darren Mierau
McBain and Trush, Inc.
980 7th Street
Arcata, CA 95521

Jeff Anderson
Jeff Anderson and Associates
P.O. Box 841
Arcata, CA 95518

1 INTRODUCTION

1.1 Background

Rocky Gulch is a 1.55 square mile watershed that drains into North Humboldt Bay approximately 6 miles north of Eureka, CA (Figure 1). Rocky Gulch historically supported coho salmon (*Oncorhynchus kisutch*) and steelehead (*O. mykiss*) populations, but past timber and agricultural land uses caused extirpation of these populations by the early 1960's. Since 2001, state and federal resource agencies have provided grant funding for planning and restoration activities in Rocky Gulch, with the overarching goal of restoring anadromous fish access, habitat conditions, and naturally reproducing salmonid populations (coho salmon and steelhead) from Humboldt Bay to approximately the Rock Quarry located 1.5 miles upstream of Old Arcata Road.

McBain & Trush was awarded a grant in 2001 for the "Rocky Gulch Stream Assessment Project". The objectives of this project were to assess migratory access, habitat conditions, and restoration needs of Rocky Creek, prioritize restoration actions, and develop site-specific recommendations for habitat restoration. In addition, McBain & Trush coordinated with the landowners, resource agencies, and the local community to hear different restoration perspectives and ultimately achieve a shared vision for stream restoration in Rocky Gulch. The Stream Assessment Report (McBain and Trush 2002) recommended seven essential actions to restore salmonid populations to Rocky Gulch (Figure 2), including:

- Task A: Replace the Rocky Gulch tidegate (completed 2004)
- Task B: Enhance estuarine conditions in Rocky Gulch (initiated 2005)
- Task C: Realign the lower Rocky Gulch channel to reduce confinement (completed 2005)
- Task D: Set back dikes confining Rocky Gulch along Old Arcata Road (completed 2005)
- Task E: Rehabilitate the channel around the old Williamson Ranch (Ginni Hassrick's property)
- Task F: Replace the Old Arcata Road culvert
- Task G: Replace the barrier culvert upstream of the Old Arcata Road culvert (scheduled for 2006)
- Task H: Rehabilitate the stream channel surrounding the barrier culvert (scheduled for 2006)

A proposal for the "Rocky Gulch Salmonid Access and Habitat Restoration Project" (Tasks A-D) was submitted to the CA Department of Fish and Game (CDFG) in 2002 and was awarded in 2003. The engineering design and regulatory compliance phases were conducted from June 2003 to August 2005. A new tidegate was installed in December 2004 to restore adult salmon to access Rocky Gulch, allowing reestablishment of the population. In August 2005 the final permits were obtained for the stream habitat construction elements (Tasks B-D), on-the-ground construction activities began August 18th, and were completed by the middle of October. The Salmonid Access and Habitat Restoration project contained eight elements:

- Installation of a new tidegate at the bottom end of Rocky Gulch to allow fish passage;
- Excavation of aggraded sediments from approximately 1,100 ft of slough channel;
- Reconstruction of nearly 2,800 ft of channel to eliminate unnatural 90 degree bends and re-meander straightened sections;
- Relocation of the 2,500 ft section of dike that parallels Old Arcata Road to 50 ft back from the existing stream channel to create a floodplain, increase the riparian corridor, and increase floodway capacity;

- Placement of dredged material to rehabilitate approximately 4,900 feet of dikes to protect adjacent agricultural lands;
- Installation of 3,200 ft of riparian fencing, two armored cattle crossings and watering access sites, and one bridge;
- Revegetation of native riparian and wetland plant species, and installation of erosion control features;
- Development of procedures and protocols for future maintenance of the channel, and a riparian grazing agreement for the riparian areas.

The Barrier Culvert Project (Tasks G and H) was awarded funding in 2005, and will be implemented in 2006. There is at least 2,200 ft of high quality salmonid habitat upstream of the barrier culvert that is presently inaccessible to coho salmon and steelhead. Aquatic habitat above the culvert has been recovering since the mid-1960's timber harvests, and together with downstream habitat there appears to be abundant habitat suitable to sustain coho salmon and steelhead. The objective of the project is to replace the barrier culvert with a bridge to restore fish access upstream of the culvert. The project will also rehabilitate approximately 300 ft of stream channel upstream and downstream of the new bridge, build an inset floodplain, and expand flood capacity.

With completion of the lower Rocky Gulch restoration (2004-5) and the barrier culvert project (2006), only Tasks E and F remain of the recommended restoration actions in Rocky Gulch. These tasks include channel rehabilitation at the Old Williamson Ranch (owned by Ginni Hassrick) downstream of Old Arcata Road, and replacement of the culvert under Old Arcata Road.

McBain & Trush (M&T) and Jeff Anderson & Associates (JAA) were contracted to work with the landowners and agencies to assist in developing a design solution for the Old Arcata Road culvert and the surrounding properties. We were tasked to (1) extend surveys upstream and downstream of OAR and develop topography for hydraulic modeling and design, (2) extend the existing hydraulic model to incorporate the project reach, and (3) coordinate design recommendations with the landowners and Humboldt County to develop a project alternative and design details that satisfied landowners and HCPW, while improving salmonid habitat and migration conditions. HCPW retained the responsibility to develop culvert dimensions and construction plans for project implementation.

The properties surrounding the culvert are small (3-5 acre) privately owned parcels zoned for residential use (Figure 3). McBain and Trush and Jeff Anderson met with landowners Ginni Hassrick and Nathan Prather several times to discuss design alternatives. The failing retaining wall structure on the left bank upstream of the culvert was also discussed with landowner Lee Hover. This design memorandum presents design alternatives considered, presents our hydraulic modeling results, and then recommends a design that best balances landowner concerns, flood risks and impacts, and salmonid habitat issues.

Funding for this project was provided by the Five Counties Salmonid Conservation Program, with contracting assistance from Gary Flosi of CDFG. The contract was administered through the Humboldt County Public Works Department, with oversight by Chris Whitworth.

1.2 Project Site Description

The location of Rocky Creek relative to residential structures in the vicinity of the Old Arcata Road (OAR) culvert presents a difficult problem and is a constraint to improving fish passage, habitat conditions, and flooding in this reach. Rocky Gulch passes under Old Arcata Road (OAR) at station 60+00 (i.e., 6,000 ft upstream of Humboldt Bay) through a pair of 3 ft and 1.5 ft diameter, 48 ft long concrete pipes (Figure 4). The present undersized culverts pass a total flood discharge up to approximately 100 cfs (estimated from hydraulic modeling as the 2 to 3-yr flood). At higher flows, floodwaters overtop the right bank, flow northwest across a pasture (floodplain), and collect in a secondary flood channel along the inboard ditch on the east side of OAR (Figure 3) . The pasture slopes

gradually away from the channel and toward the inboard ditch, encouraging flood flow in a northwesterly direction. Streamflows collected in the secondary flood channel pass through a 1.5 ft diameter culvert at the foot of Rocky Creek Road before rejoining Rocky Gulch.. Floods exceeding approximately a 5-yr recurrence interval overwhelm the ditch and secondary culvert capacity and flow overtops the road (Figure 5). A previous landowner constructed a berm along the right bank of the main channel for approximately 150 ft upstream of the culvert, in an attempt to route flood flow to the OAR culvert. This effort has been unsuccessful, primarily due to the undersized OAR culvert and the sloped topography.

The OAR culvert was assessed during a culvert passage survey conducted by Humboldt County (Taylor and Associates 2000), which reported the following:

> **Site #27:** Rocky Gulch; Old Arcata Road **Priority Ranking =** #22
> **Overall condition:** Poor, one culvert is overgrown and completely plugged with fine sediment. Entire
> channel flows through one 3' pipe (nearly full at low summer flow).
> **Sizing:** Extremely undersized, especially with one pipe completely overgrown. Floods Old Arcata Road
> on a regular basis.
> **Barrier Status:** Yes, excessive velocities occur in pipe at a moderate range of expected migration flows.

Downstream of OAR, the channel is severely undersized (approximately 8 ft wide). Building structures (garage on right bank, small rental house on left bank) encroach the channel at station 59+00, leaving 45 ft between garage and rental house. At this same location, two small culverts (1.5 and 3 ft diameters) (henceforth referred to as "the downstream crossing") are embedded into the landscaping to allow foot traffic and lawnmower passage across the creek (Figure 6). A large plunge pool has formed at the outlet of these culverts. Below the plunge pool, the channel is narrow, confined, and scoured of most coarse sediment. A second private residential stream crossing at station 57+90 consists of an old redwood plank bridge. The channel then rounds a tight right corner and joins the upstream end of the reconstructed reach (completed in 2005). Cattle fencing spans the channel at the downstream property boundary. Winter floods in 2005 and 2006 caused bank erosion along the left bank in the reach between OAR and the downstream crossing, and thoroughly scoured the channel downstream of Station 58+50. With exception of the plunge pool, salmonid habitat quality in this reach is poor.

1.3 2D Modeling of the 100-yr Flood

We developed a 2D hydraulic model to demonstrate the 100-year flood discharge for existing conditions, to improve our understanding of flood conditions in the project area , and to demonstrate general flood flow paths and patterns around properties and infrastructure (i.e., direction of flow, volumes, velocities). Because of the limitations in the topographic data and budget to develop and calibrate the 2D model, the model results are only approximate, and should be used for information purposes only.

The 2D model used for this project was FESWMS-FST2DH (FHWA, 2002) [1]. To develop the model, the project area was discritized into material types based on land use and roughness characteristics, which were then mapped to each element of the finite element mesh within the SMS program. Based on field assessments and past modeling efforts in the vicinity, a Manning's roughness coefficient or *n* value was assigned to each material type. Table 1 lists each material type, representative *n* values, and turbulence

[1] FST2DH applies the finite element method to solve steady-state or time-dependent systems of equations that describe two-dimensional depth-averaged surface water flow and transport of non-cohesive sediment by surface waters. Mesh development and pre- and post- processing were conducted using the Surface-Water Modeling System (SMS 9.0) (Brigham Young University 2005).

coefficients used in the 2D model. Figure 7 shows a plan view of the finite element mesh developed for the project area and the material types overlaid onto the mesh. The mesh was extended upstream and downstream of the project site to limit boundary condition effects and better characterize flow distribution into the project site.

Table 1. Material types, Manning's roughness coefficients (n Values), and viscosity values for project area

Material Type	Manning's n Value	Turbulence (ft^2/s)
Channel	0.05 - 0.1	20
Pasture	0.08 - 0.1	50
Woods	0.1 - 0.12	50
Drainage Ditch	0.04 – 0.06	20
Road	0.04	20
Residential	0.1	50
Brush	0.1 - 0.12	50
Levee	0.08 - 0.1	50
Channel – low n value	0.03	20
Pasture overflow	0.08 - 0.1	50
Concrete culvert w/ gravel bed	0.02 – 0.03	20
Corrugated culvert w/ gravel bed	0.03	20

Under existing conditions, two important flow conditions should be noted. First, during floods larger than a 2-3-yr recurrence interval, more than half of the flood flow leaves the main channel upstream of OAR and flows in a northwest direction across the floodplain. This flow divergence occurs well upstream of the road crossing and will not be significantly altered by modifying the Old Arcata Road culvert, especially at flood flows greater than the 5-yr event. Second, out-of-bank flows occur along the left bank downstream of OAR, along the apex of the channel bend west of the house on the Hassrick property. Flood flow leaving the channel at this location is conveyed safely down the pasture without threatening any infrastructure, and returns to Rocky Gulch via a culvert and flapgate 300 ft upstream of the main Rocky Creek tidegate. Figures 8 and 9 show 2D model results for existing conditions for the 100-year flood event. Figure 8 is a plot of water depth and velocity vectors (scaled to magnitude), and Figure 9 shows water surface elevation and velocity vectors.

1.4 Summary of Existing Conditions

The existing OAR culvert is undersized, has become partially aggraded with fine sediments, and is a partial barrier to salmonid migration. The present undersized culvert configuration provides the downstream landowner (Ginni Hassrick) protection at lower flood recurrences by preventing all the discharge from passing through the culvert, but the channel downstream of OAR is narrow, unconfined, and encroached by vegetation and home structures, posing significant flood risks at higher flood recurrences. The undersized culvert also backwaters, and floodwaters leave the channel along the right bank, causing flooding on the upstream landowner's (Nathan Prather) property. Overbank flows flood across OAR at floods above approximately a 5-yr recurrence interval. The existing condition also

constricts coarse sediment from routing through the culvert and replenishing the downstream reconstructed reach. Finally, the inboard ditch along OAR that drains floodwater through a secondary culvert back to Rocky Creek, may trap juvenile salmonids and other fish after floods recede.

2 TOPOGRAPHIC SURVEYS

Portions of the land within the project area had been surveyed in prior projects, but additional surveys were required. The Humboldt County Public Works (HCPW) Department collected topographic surveys on parcels adjacent to the culvert, and M&T crews collected topography, channel profile, and cross section data upstream to station 69+00 and downstream to the Rodoni property. The resulting topographic surface provided the basis for hydraulic modeling and construction designs (Figure 10). We also obtained and orthorectified the 2001 aerial photographs from the Humboldt Bay Harbor, Recreation, and Conservation District for use as a basemap (Figure 10).

3 HYDROLOGY

3.1 Methods

The U.S. Army Corps of Engineers Hydrologic Modeling System (HEC-HMS) was used to estimate flood discharges for the Rocky Gulch project area (USACOE 2000). HEC-HMS simulates the rainfall-runoff and routing processes for both natural and anthropogenic-controlled environments, and can be used for event or continuous modeling. HEC-HMS contains models for simulating water losses, runoff transformations, and open-channel routing, and different methods for the analysis and generation of meteorologic input data. For this analysis, the following models and methods contained in HEC-HMS were used: (1) infiltrative losses were modeled using the Natural Resource Conservation Service (NRCS) curve number method, (2) the transformation of excess rainfall into surface runoff was done with the NRCS unit hydrograph method using default settings, and (3) basin-wide precipitation was estimated using the NRCS 24-hour hypothetical design storms and 24-hour precipitation depths specified in the NOAA Atlas 2 for the Western U.S. Channel routing was not used in this analysis, but was incorporated into the time of concentration estimate. We developed simulated hydrographs for use in an unsteady 1D hydraulic model.

The Rocky Gulch project area was divided into three sub-watersheds consisting of the main Rocky Gulch creek, South Tributary, and North Tributary. Watershed boundaries and areas, creek lengths and slopes were determined from 7.5 minute USGS quad maps. General soil conditions were derived from Soil Vegetation Maps of California (USFS, 1975). NRCS curve numbers (CN) for each land use were determined from Chow et al. (1988), and the NRCS TR-55 Manual (1986).

Time of concentration (t_c) estimates for existing conditions in each sub-watershed were determined using the method described in the NRCS TR-55 manual. Since minimal stream gaging exists for Rocky Gulch, the lag time (t_{lag}) parameter used in the NRCS method was estimated from the calculated t_c using the suggested NRCS default ($t_{lag} = 0.6t_c$). Winter baseflow was included in the flood analysis for Rocky Gulch based on the flow duration curve. Winter baseflow was assumed equal to 3.1 cfs, which is approximately the 40% exceedence probability, and was distributed to each sub-watershed by drainage area ratios (Rocky Creek = 2.5 cfs, South Tributary = 0.5 cfs, and North Tributary = 0.6 cfs). Basin-wide precipitation input for HEC-HMS consisted of the NRCS 24-hour Type 1A hypothetical storm for the Pacific Northwest Region. Precipitation depths were determined from the NOAA 2 Atlas for the Rocky Gulch area. Table 2 summarizes the HEC-HMS input parameters for the Rocky Gulch project area. These data are available for the Q_2, Q_{10}, Q_{25}, and Q_{100} events, but not for the $Q_{1.5}$ event.

To evaluate the HEC-HMS results, flood frequency analysis was done using the USGS regional flood frequency relationships (Waananen and Crippen 1977), and the Lehre Method (Lehre 1997). The Lehre Method is an unpublished method adapted from Rantz (1964) which scales flood frequency estimates for a USGS stream gage. We used the discontinued USGS gage for Jacoby Creek (USGS 11480000 Jacoby C Nr Freshwater CA), a tributary to Humboldt Bay with a drainage area of 6.07 mi^2 above the gage, and a 10 year gaging record (1955-1964). The Lehre Method is based on Rantz (1964), but rather than using a regional regression equation derived from a number of stream gages, Lehre's (1997) adaptation relies solely on the USGS flood frequency estimates for the Jacoby Creek gage. In this method, peak flows for Rocky Gulch are scaled from Jacoby Creek flows using the ratios of both drainage area and mean annual discharge (1.80 cfs for Rocky Creek; 15.1 cfs for Jacoby Creek). Mean annual discharge for Rocky Gulch was estimated using mean annual precipitation depth (45 in) minus mean annual evapotranspiration depth (23 in), both from isohyetal maps in Rantz (1964). The result (excess rainfall depth) is then transformed to an outflow rate in cubic feet per second.

Table 2. HEC-HMS parameters for Rocky Gulch project area

Parameters	Unit	Rocky Creek	South Tributary	North Tributary
Watershed Area	(mi^2)	1.096	0.199	0.252
CN (weighted)		74.04	70.35	70.17
Percent Impervious	(%)	0.29	0.14	0.14
Initial Loss	(in)	0.701	0.843	0.850
Time of Concentration (tc)	(min)	156	88.4	76.3
Hydrograph Lag Time (tlag)	(min)	93.6	53.1	45.8
Winter Baseflow	(cfs)	2.5	0.5	0.6

3.2 Results and Discussion

The peak discharge estimates for the Rocky Gulch study area obtained from the HEC-HMS flood frequency analysis fell between the two regional estimates for all flood estimates except the Q_2 event (Table 3). We plotted the HEC-HMS peak discharges for the Old Arcata Road culvert (Rocky Creek and South Tributary combined) along with the USGS regional equations and Lehre method (Figure 11). Peak discharge hydrographs generated from the HEC-HMS analysis for the Old Arcata Road culvert were also plotted for the 2-yr, 10-yr, 25-yr, and 100-yr (Q_2, Q_{10}, Q_{25}, and Q_{100}) flood events (Figure 12).

The channel-forming discharge is the theoretical steady discharge that if maintained indefinitely, would produce the same channel geometry as the natural long-term hydrograph (Soar & Thorne, 2001). A single channel-forming discharge is useful in determining channel morphological characteristics and stable channel designs. For this study, the 1.5-yr recurrence flood was assumed equal to the channel-forming discharge (Leopold et al. 1964). Because the HEC-HMS results do not provide the 1.5-yr flood, we estimated this flood using a Log Pearson Type III distribution of the HEC-HMS flood frequency data (Figure 13). The 1.5-yr flood had a discharge value of 80 cfs for Rocky Gulch at Old Arcata Road (includes the South Fork, but not the North Fork). The 24-hr precipitation depth required to produce a peak discharge at Old Arcata Road of 80 cfs was 3.3 inches. The resulting 1.5-yr flood hydrograph is also shown on Figure 12.

7940

Table 3. Peak discharge estimates for Rocky Gulch project area

Event	Precip. Depth[1] (in)	Rocky Creek (cfs)	South Tributary (cfs)	North Tributary (cfs)	Old Arcata Rd. Culvert[2] (cfs)	USGS Regional Eq. (cfs)	Lehre Method (cfs)
Q_2	3.7	92	15	20	107	137	108
Q_5	5.0	175	32	43	207	213	177
Q_{10}	5.5	210	40	53	250	284	225
Q_{25}	6.5	283	56	74	339	363	281
Q_{50}	7.3	345	69	92	141	439	323
Q_{100}	7.8	384	78	103	462	492	366

1) Precipitation depth for Rocky Creek watershed from NOAA Atlas 2,
2) Combined peak discharge from Rocky Creek and South Tributary hydrographs.

4 DESIGN

Several meetings were held with landowners to discuss alternative design strategies and the implications of each strategy on channel dimensions and flooding. We considered three alternatives: (1) maintain a small OAR culvert to preserve existing conditions, (2) install a 100-yr flood culvert to pass all floods, and (3) upgrade to a medium-sized OAR culvert to reduce the frequency but allow some flooding along and over OAR. We judged each alternative based on improvements to fish passage, risk to property and infrastructure, and desirability to each of the landowners. Each design alternative is briefly described below.

4.1 Summary of Alternative Designs Considered

Design Alternative-1: This alternative would consist of replacing the OAR culvert with a similar-sized or slightly larger culvert that would maintain approximately the same flood conditions, in which the culvert causes a backwater and directs floodwater across the floodplain and down the drainage ditch along Old Arcata Road. The culvert would pass flood discharge up to approximately a 2-yr recurrence interval. During larger floods, floodwater would primarily flow along the OAR ditch and drain through the secondary culvert at the foot of Rocky Creek Road, but would continue to overtop OAR.

This design alternative is undesirable for several reasons. First, as was reported in the County's culvert assessment (Taylor and Associates 2000), the culvert is a partial barrier to salmonid migration because "excessive velocities occur in pipe at a moderate range of expected migration flows". Replacing the existing culverts with a similarly sized culvert would not necessarily resolve this problem. Second, the channel and culverts passing around the Hassrick property downstream of OAR are undersized and are a bottleneck to flow and sediment continuity between the upstream reaches (sediment sources) and the recently restored lower section of Rocky Creek. Third, the secondary flood channel along OAR may pose a stranding threat to young-of-year and juvenile salmonids; the more frequently that floods access this ditch, the higher the likelihood of stranding.

Finally, this ditch acts as a sediment trap, becoming aggraded with fine sediment (sand and fine gravel), requiring frequent maintenance to maintain its capacity.

Design Alternative-2: This alternative was the design initially targeted by our analysis and landowner discussions, and was intended to enable a single-thread channel and adjacent floodplains to convey all flow up to the 100-yr flood through the OAR culvert and past Ginni Hassrick's residence. This alternative would eliminate the secondary flood channel and flooding over OAR, allow sediment to route downstream, and avoid risks of fish stranding and sedimentation in the inboard ditch along OAR.

There were several constraints that eliminated this alternative. First, upstream of OAR the creek is unconfined and slightly perched along this 600-800 ft section, which allows out-of-bank flow to drain away from the channel. In order to convey floodwaters to the OAR culvert, a new dike would be required to confine the floodplain for at least 500-700 ft or more upstream of the OAR culvert. This flood corridor would need to have the capacity to convey up to 445 cfs (our design 100-yr flood at the Old Arcata Road culvert). Second, downstream of OAR the constriction between Ginni Hassrick's garage and rental unit (45 ft wide) would require very large channel dimensions to convey the 100-yr flood (Figure 14). Engineered bank protection would also be required to prevent bank erosion and channel migration toward the rental house. The landowner was not supportive of these requirements in order to convey the 100-yr flood. Third, immediately downstream of the garage-rental constriction, floodwater would still flow out-of-bank along the left bank, and flow down onto the Rodoni pasture outside the newly reconstructed dikes, unless this left bank was confined by 200-300 ft of additional new dikes tied into dikes in the Rodoni pasture.

Design Alternative-3: This alternative would enlarge the OAR culvert and expand the channel capacity upstream and downstream of the culvert to convey approximately a 5-yr to 10-yr flood within the main channel, and minimal or no flow down the secondary flood channel. Material excavated to widen the channel upstream of the culvert would be spoiled on-site to construct a low-elevation berm that would help route floodwaters to the culvert. This configuration would restore sediment transport continuity of most sand and gravel bedload, but would still maintain the secondary flood channel along OAR for larger floods. This would also reduce, but not eliminate, flooding over OAR. Enlargement of the secondary culvert at the foot of Rocky Creek Road may also help alleviate backwatering in the secondary flood channel and flooding over OAR. This design alternative would reduce flood risks for both landowners adjacent to OAR, greatly improve fish passage through the OAR culvert, and minimize flooding over OAR.

4.2 Description of Recommended Design Alternative

Based on our evaluation of these channel design configurations and discussions with landowners, we recommend Design Alternative-3 as the best approach to improve fish passage at the OAR culvert, restore channel capacity around the Hassrick property, and route floods through this residential area. Our hydraulic analysis of design conditions included only this alternative. We recommend the same general bankfull cross section dimensions used on the Rodoni project be extended up through the OAR culvert reach. By using the downstream cross section shape, the reach of channel through the culvert and around the Hassrick property will have the same channel-forming (bankfull) discharge design characteristics, which should improve flow and sediment transport continuity through the project reach. Figure 15 plots discharge versus channel slope for the typical design channel cross-section for different Manning's roughness conditions. We propose to extend the downstream design channel slope of approximately 0.0063 through the Hassrick property. At this slope, the proposed design channel (with inset floodplain) should convey approximately 170 to 210 cfs, which corresponds approximately to the 5-year peak flood discharge. The design cross section should have a bankfull channel width and depth of approximately 12.5 ft and 2.4 ft, with a floodplain bench occupying approximately 8 ft of width and set in approximately 1.5 ft below the pasture floodplain grade, for a total reconstructed channel width not to exceed

approximately 20 ft. These are typical dimensions and the final as-built channel should incorporate topographic diversity (pools on outside of meander bend, shallow riffles, floodplain occupying the right bank upstream and left bank downstream of the downstream crossing etc.).

Humboldt County Public Works is currently proposing to replace the existing undersized culverts, both at Old Arcata Road and the downstream crossing on the Hassrick property, with a 16 ft x 5.25 ft corrugated arched box culvert at each crossing location. Due to anticipated infrastructure constraints, HCPW proposes to embed both culverts approximately 0.5 ft, and set both culverts at the design slope of 0.0063. We incorporated the HCPW culvert dimensions into our hydraulic models, and results are presented in Section 4.3 below.

In addition to the channel and culvert dimensions, we provide recommendations for several other design elements that were discussed and agreed upon with the landowners. These elements include (Figure 16):

- along the right bank upstream of OAR culvert: (1) remove berms confining the channel, (2) enlarge the channel to the recommended design dimensions for approximately 200 ft upstream of OAR, (3) rebuild small 2 ft high berm, set-back 50 ft from right bank, (4) remove old wooden retaining wall along the left bank just upstream of the culvert, and replace with Rock Slope Protection (RSP) to stabilize bank slope, (5) install rock overflow weir at head of OAR drainage ditch, and (6) revegetate new floodplain with native riparian vegetation.
- between the OAR culvert and the downstream crossing: (1) dispose of fill by building up the rental house driveway along the left bank, (2) excavate and relocate two cypress trees on the left bank downstream of the rental unit, (3) build a berm or floodwall along left bank from the driveway downstream past the rental unit, with top of berm elevation at or above 21.5 ft (NAVD88).
- below the downstream crossing: (1) widen the existing channel only along the left bank, and protect the right bank vertical undercut and the landowner's fence and landscaping, (2) enhance the existing floodplain depression to convey overbank flow away from the channel along the left bank, (3) dispose of fill by building up the back yard grass area approximately 1-2 ft, and (4) remove or lengthen and raise wooden footbridge at station 57+75.
- downstream of the Hassrick property: (1) construct a smooth transition with the downstream reconstructed project reach so that the channel gradient, cross section dimensions, and floodplains merge naturally with the downstream reach.

Hydraulic analyses were conducted for existing conditions and for Alternative-3 channel designs, based on these design elements.

4.3 Hydraulic Analysis

The majority of the hydraulic analysis for this project used the 1D model, primarily to develop existing flow conditions and evaluate the hydraulic effects of alternative design options within the project area. The existing conditions models represent land use, topography, and culvert conditions as they currently exist in the project area. Site topography was obtained from McBain & Trush and Humboldt County Public Works (HCPW). The recently restored lower portion of Rocky Creek is included in the existing conditions models. The design conditions model was developed to evaluate flooding upstream of OAR culvert, the proposed channel design around the Hassrick property, and the proposed HCPW culvert replacements for the OAR crossing and the downstream crossing on the Hassrick property. The design conditions model was used to analyze water surface elevations, water velocities, and flow distributions.

The 1D hydraulic model used for this analysis was the U.S. Army Corps of Engineers HEC-RAS modeling system (USACE, HEC 2002). The HEC-RAS model calculates one-dimensional (1D) water surface profiles and average channel velocities for both steady, gradually varied flow, and unsteady flow

through a network of channels. Both steady and unsteady modeling techniques were used for this analysis. Unsteady modeling was used to estimate effects from tidal conditions, flow splits, storage volumes, flood hydrographs, and culvert and weir flows on water surface elevations for both existing (pre-project) and design conditions. The unsteady model results were also used to provide boundary conditions and storage volume elevations for the steady model. The steady-state model was used to more rapidly assess project effects on peak floods and modified culvert hydraulics. During this analysis, problems with the HEC-RAS unsteady culvert routines were discovered that limited the ability and usefulness of the unsteady model to simulate different culvert options. These problems did not occur with the steady-state culvert routines. Reference can be made to the HEC-RAS manual for information specific to steady and unsteady modeling.

Both the steady-state and unsteady 1D models were used to estimate the effects of the proposed design elements on water surface elevations and water velocities through the project reach. The 1D steady-state and unsteady existing conditions models and design conditions models were run for the 1.5-year, 5-year, 10-year and 100-year flood events. The steady-state models were used to provide most of the results presented below. The unsteady model was used primarily to illustrate storage changes and provide boundary conditions for the steady-state models.

Study Area and Model Extent: The unsteady model reach extended from Humboldt Bay to approximately 300 ft upstream of Old Arcata Road. The unsteady model included channel flow, tidegate and tidal effects, storage areas, flow splits, and weir and culvert flow in a networked system. The steady-state model is a subset of the unsteady model with the model reach extending from approximately 2,000 ft downstream to 300 ft upstream of Old Arcata Road. The steady-state model includes the effects of channel flow, culvert and weir flow, and simple flow splits.

Topographic, Bathymetric and Flow Structure Data: Cross section and culvert data were obtained from channel cross section surveys, the 1-ft photogrammetry map provided by HCPW, and topographic surveys conducted by McBain & Trush. Model cross sections were typically extracted from digital surfaces using the SMS program, and directly incorporated into HEC-RAS. As necessary, channel survey data were inserted into specific cross sections in HEC-RAS. Storage area stage-volume relationships were developed from the site topography as required. Culverts and tidegates within the project reach were included in the HEC-RAS simulations as required. Culvert geometry and cross sections were obtained from field surveys and measurements.

Channel Parameters: Manning's roughness coefficients (n) were estimated based on prior modeling efforts and by field comparison of channel and overbank conditions with published color photos, descriptive data, and computed n values for stream channels found in Barnes (1967), French (1985) and Hicks and Mason (1991). The n values used in the 1D modeling are consistent with the values listed in Table 1. The default HEC-RAS contraction/expansion coefficients (contraction = 0.1, expansion = 0.3) were used for the 1-d steady-state model.

Discharge Values and Boundary Conditions: To analyze effects of the proposed project elements, the steady and unsteady models were run for different discharge conditions outlined in the hydrologic analysis (Section 3). For the steady model, the 1.5-yr, 5-yr, 10-yr, and 100-yr peak flood discharges for each tributary were analyzed (Table 4). For the unsteady model, the 5-yr, 10-yr, and 100-yr flood hydrographs were used in the analysis.

Downstream water surface elevations (boundary conditions) are required in order for HEC-RAS to generate water surface profiles. For the steady state model, the downstream boundary condition was determined from the unsteady model results (Table 4). For unsteady modeling, measured tidal elevations in Brainard Slough were used for the boundary condition.

Table 4. Discharge values and boundary conditions for steady-state model

Flood Event	Flood Discharge (cfs)		DS Boundary Condition WSE (ft – NGVD88)		Upstream Storage WSE (ft – NGVD88)	
	Rocky Creek	South Tributary	Existing Condition	Design Condition	Existing Condition	Design Condition
1.5-year	70	11	8.26	8.39	14.9	14.0
5-year	175	32	9.05	8.66	18.6	15.3
10-year	210	40	9.26	8.77	18.7	17.0
100-year	384	78	9.62	9.64	19.0	18.8

4.4 Hydraulic Model Results and Discussion

4.4.1 Discharge at Old Arcata Road

An important project goal of the project is to improve flow conditions in Rocky Creek within the project reach. The recommended design alternative would enlarge the channel capacity upstream and downstream of the OAR culvert, and enlarge the culvert capacity at Old Arcata Road and the downstream crossing on the Hassrick property. Table 5 summarizes 1D steady-state model results for the expected change in discharge conditions from implementation of the proposed alternative. For all modeled cases, the proposed design elements would increase flows through the Old Arcata Road culvert and in the channel through the Hassrick property. As a result more flow would overtop the left bank downstream of Old Arcata Road and flood into the pasture.

The 1D steady-state model could not accurately assess overbank flows and the flow divergence that occur upstream of Old Arcata Road. This is a limitation of 1D modeling compared to 2D modeling. Consequently, the 1D model results indicate more discharge through the Old Arcata Road culvert than would probably occur, simply because the entire flood flow does not reach the culvert. This analysis therefore provides high estimates of water surface elevations downstream of Old Arcata Road through the Hassrick property, which can be considered conservative when assessing flood effects of the project.

Table 5. Expected discharge changes from project design elements. Overbank discharge upstream of Old Arcata Road flows down the secondary flood channel to the secondary culvert. Overbank discharge downstream of Old Arcata Road flows north down the Rodoni pasture drainage ditches.

Flood Event	Flood Flow (cfs)	Overbank Discharge Upstream of Old Arcata Road (cfs)		Discharge Through Old Arcata Road Crossing (cfs)		Overbank Discharge Downstream of Old Arcata Road (cfs)	
		Existing Condition	Design Condition	Existing Condition	Design Condition	Existing Condition	Design Condition
1.5-year	80	0	0	80	80	10	0
5-year	207	110	0	97	207	25	70

12 of 40

10-year	250	147	1	103	249	29	105
100-year	462	200	67	262	395	165	229

At the 1.5-yr flood stage, the primary change to existing conditions is that overbank flow from the left bank downstream of OAR and the houses is eliminated, and the entire flood flow is conveyed to the downstream restored reach on the Rodoni property. At the 5-yr flood stage, in addition to retaining most of the total discharge within our design channel cross section (with inset floodplain) downstream of OAR, the restored upstream channel would convey the entire 5-yr flood discharge to the OAR culvert. This is an important threshold, because floods in the range of 2-5 yr recurrence are critical to sediment transport processes. At the 10-yr flood stage, most flow is still routed to the OAR culvert, but the proportion of flow leaving the left bank downstream of OAR increases to approximately 34% of total discharge. The main reason overbank flooding is currently so low at this location is because the discharge does not reach this location with the existing undersized culverts. Modeling results show that between the 10-yr and 100-yr flood, the channel upstream of the OAR culvert loses discharge to the floodplain, and floodwater flows northwest across the pasture similar to existing conditions.

4.4.2 Steady-State Water Surface Profiles

We analyzed water surface profiles through the project reach for the 1.5-yr, 5-yr, 10-yr and 100-yr flood flows, respectively (Figures 17-20), and cross-section plots and water surface elevations for selected sections within the project reach downstream of Old Arcata Road for the 5-yr and 100-yr flood event (Figures 21-26). The modeling cross section locations are indicated in Figure 10. For the 1.5-yr flood event the proposed project substantially lowers water surface elevations through the design reach due to the increased channel dimensions and the increased culvert capacities. However, for the 5-yr, 10-yr, and 100-yr flood flows the design condition water surface elevations are either slightly below or slightly above existing conditions within the design reach downstream of OAR. It appears that the transition in water surface elevations occurs at the downstream crossing within the Hassrick property. Our analysis indicates that water surface elevations are substantially reduced upstream of Old Arcata Road due to the increased channel and culvert dimensions.

In general, it appears that water surface elevations should remain approximately the same downstream of Old Arcata Road, despite the increase in flows from the project (Table 5). The primary benefit of the project will be improved conveyance with the more frequent flood events in the range of 1 to 5-yr recurrence. During these flood events, most of the flood flows will pass through the culvert and stay within the channel and inset floodplain through the Hassrick property. During larger flood events, water surface elevations downstream of OAR will be similar to existing conditions. However, upstream flood levels will be lower. For floods greater than a 5-year recurrence, overbank flooding will continue to occur along the left bank downstream of the Hassrick residential structures. Our design proposes to modify the left bank and enhance the existing shallow swale to convey floodwater away from the channel and down the pasture, as a way to control overbank flooding in this location.

4.4.3 Improved Channel and Flow Conditions at the Bankfull Discharge

A key component of the Rocky Creek channel design is not only to improve flow conditions, but also improve sediment routing through the project reach. Transport of coarse sediment through this reach is an important mechanism for maintaining the newly restored channel on the Rodoni property. To demonstrate the improved transport capacity, we estimated channel velocities and channel shear stress from the 1D steady-state model at the approximate bankfull discharge of 80 cfs (Figures 27 and 28). The restored channel and upgraded culverts generally increase and equalize channel velocities through the project reach. The channel and culvert improvements should slightly lower shear stress through the project reach, but more importantly, should provide uniform shear stress between the project reach and the recently

restored lower reaches on the Rodoni property. An important item to note is the increased shear stresses upstream of the Old Arcata Road culvert for the design condition. The proposed project should improve sediment transport and routing conditions in Rocky Creek at the Old Arcata Road crossing and through the Hassrick property.

5 RECOMMENDATIONS

The following recommendations are provided for Humboldt County Public Works (HCPW) as they move forward with implementation of the proposed project.

- Discuss all final design features with adjacent landowners, including potential flood stages relative to their property structures, the final channel dimensions and layout, and the 16 x 5.25 ft culverts proposed by Humboldt County Public Works.
- Construct a smooth transition at the tie-in between the existing downstream restored channel and the proposed upstream channel, especially between channel and floodplain flow transitions.
- Construct a smooth transition upstream and downstream of the proposed culvert upgrades.
- Provide bank and channel erosion protection downstream of the proposed culvert upgrades.
- Provide bank and channel erosion protection in areas of high shear stresses and velocities, and/or provide bank protection along the entire restored channel.
- Improve flood overflow conditions along the left bank floodplain on the Hassrick property downstream of the residences.
- Provide micro topography within the restored channel to improve habitat conditions, such as pool features within the channel bend.
- Over-excavate the bottom of the channel 1 to 2 ft at selected locations, and backfill with appropriate river run gravels and/or spawning gravels to design grade.
- Develop and implement re-vegetation plans for both properties upstream and downstream of Old Arcata Road.
- Allow McBain & Trush, Inc. and Jeff Anderson & Associates to review final design and construction drawings prior to project implementation.

6 REFERENCES

Barnes, H. H. (1967). *Roughness Characteristics of Natural Channels*, U.S. Geological Survey Water-Supply Paper 1849, U.S. Geological Survey, Washington.

Brigham Young University (BYU) (2005). *Surfacewater Modeling System (SMS) Version 9.0*, Environmental Modeling Research Laboratory of Brigham Young University.

Chow, V. T., Maidment, D.R., and Mays, L. W. (1988). *Applied Hydrology*, McGraw-Hill, Inc., New York

Federal Highway Administration (FHWA) (2003). *User's Manual for FESWMS FST2DH, Two-dimensional Depth-average Flow and Sediment Transport Model*, Office of Research, Development, and Technology, Turner-Fairbank Highway Research Center, McLean, VA.

French, R. H. (1985). *Open-Channel Hydraulics*, McGraw-Hill, New York.

Hicks, D. M., and Mason P. D. (1991). *Roughness Characteristics of New Zealand Rivers*, Water Resources Survey, DSIR Marine and Freshwater, Private Bag, Kilbirnie, Wellington, New Zealand.

Lehre, A.K. 1997. Spreadsheet for flood frequency analysis prepared for Lab 5, Geology 531, Humboldt State University.

14 of 40

Leopold, L.B., M.G. Wolman, and J.P. Miller. 1964. Fluvial processes in geomorphology. Freeman, San Francisco.

McBain and Trush, Inc. 2002. Rocky Gulch Stream Assessment Project. Report prepared for California Department of Fish and Game. 85 pages.

McBain & Trush, Inc. 2005. Rocky Gulch Salmonid Access and Habitat Restoration Project: Phase I Final Report. Report prepared for California Department of Fish and Game. 25 pages.

Natural Resource Conservation Service (formally Soil Conservation Service) (1988). *Urban Hydrology for Small Watersheds, Technical Release 55*, United States Department of Agriculture, Soil Conservation Service.

Rantz, SE. 1964. Surface-Water Hydrology of Coastal Basins of Northern California: USGS Water-Supply Paper 1754.

Soar, P. J., and Thorne, C. R. (2001). Channel Restoration Design for Meandering Rivers, U.S. Army Corps of Engineers Engineer Research and Development Center, Coastal and Hydraulics Laboratory, ERDC/CHL CR-01-1.

Taylor, R, and Associates. 2000. Humboldt County Culvert Inventory and Fish Passage Evaluation. Final Report - April 16, 2000. Project funded by SB-271, Contract # FG 7068-IF.

U.S. States Army Corps of Engineers, Hydraulic Engineering Center (2002). *HEC-RAS, River Analysis System – User's Manual and Hydraulic Reference Manual*, U.S. Army Corps of Engineers Hydraulic Engineering Center, Davis, California, CPD-69.

U.S. States Army Corps of Engineers, (2000). *HEC-HMS, Hydrologic Modeling System – User's Manual and Hydraulic Reference Manual*, U.S. Army Corps of Engineers Hydraulic Engineering Center, Davis, California.

Waananen, A.O. and J.R. Crippen. 1977. Magnitude and frequency of floods in California. USGS, Water Resources Investigation 77-21, Menlo Park, CA. 96 p.

15 of 40

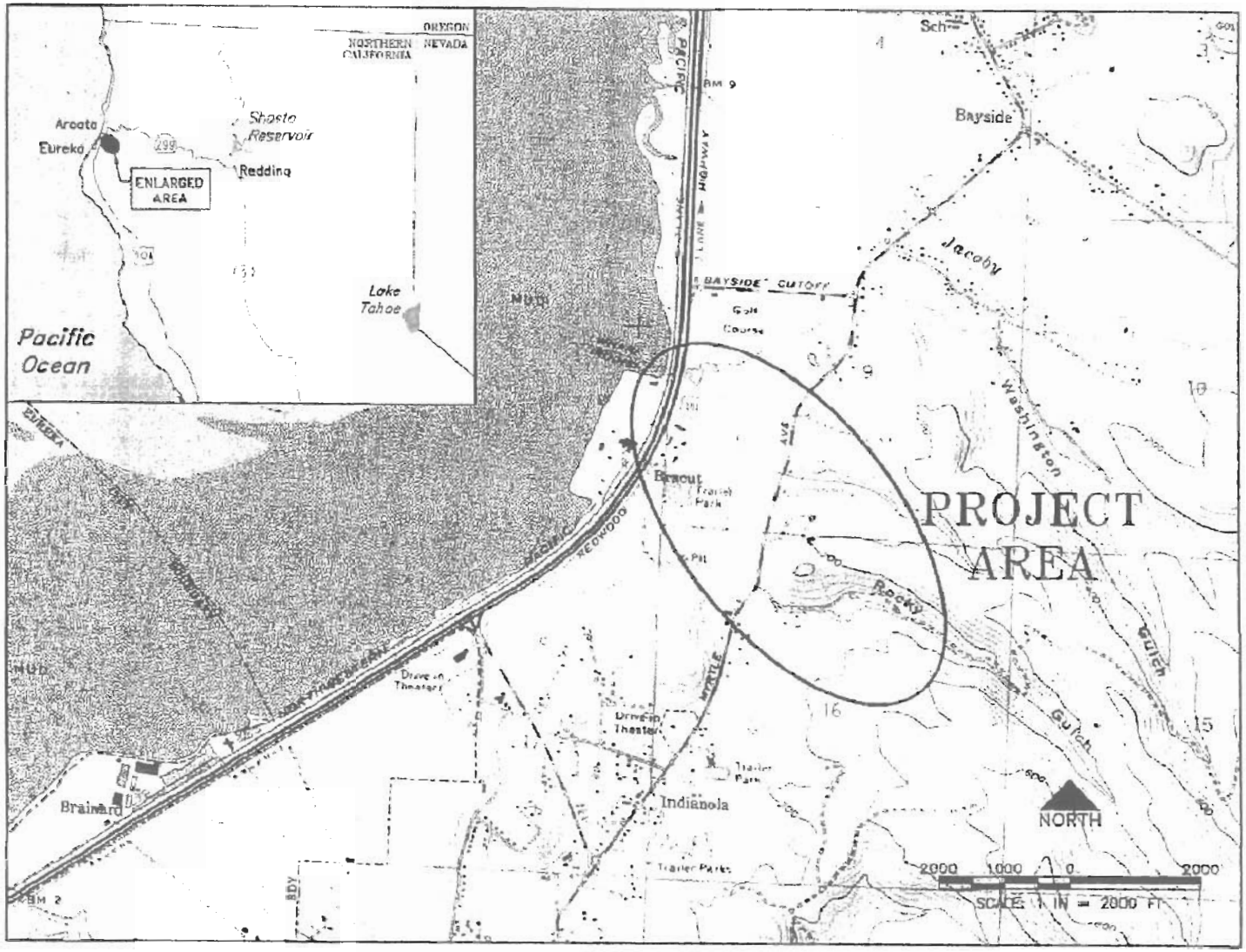


Figure 1. Location of Rocky Gulch project area. The intersection of Rocky Creek with Myrtle Avenue (Old Arcata Road) is the focus of this project.

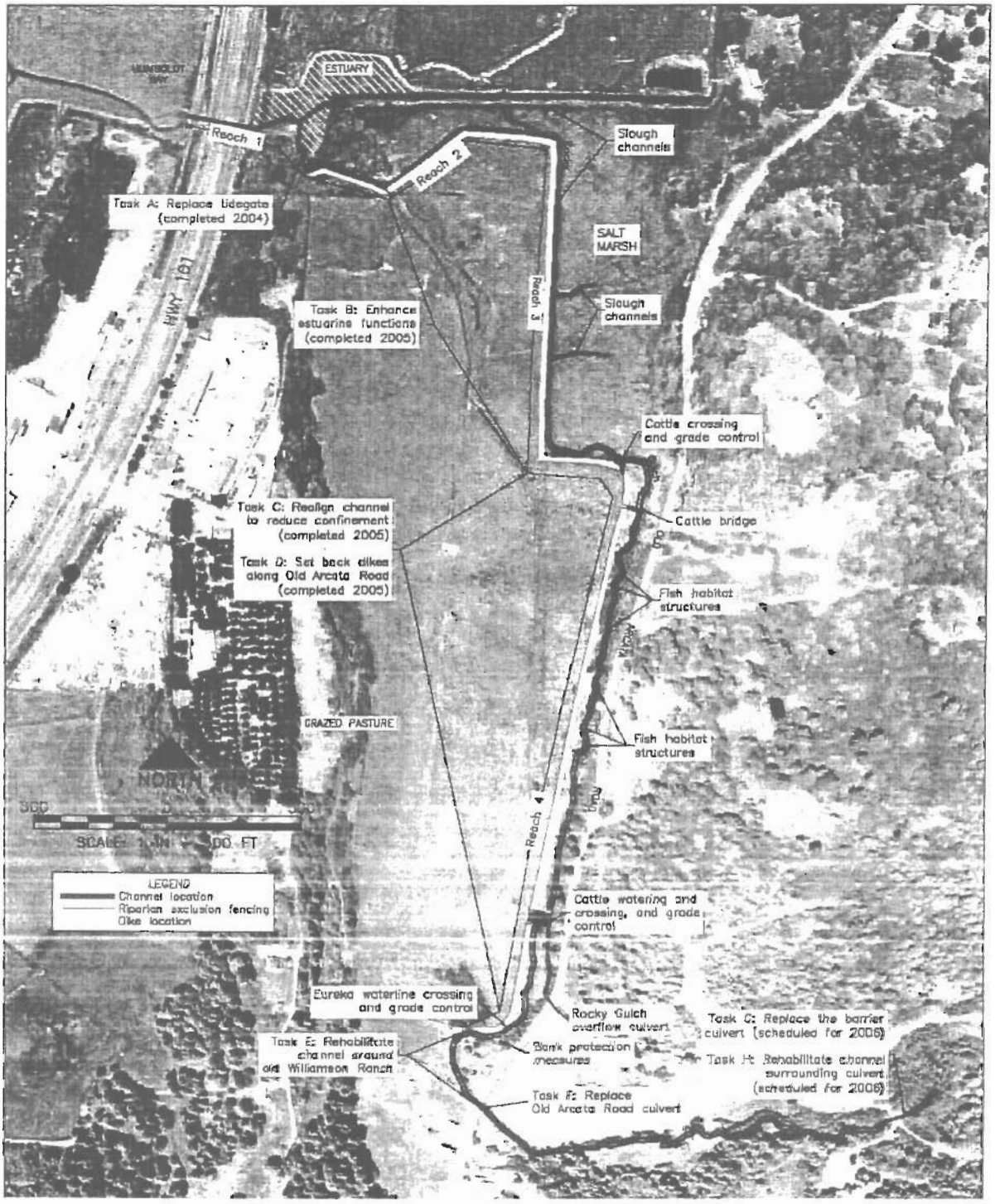


Figure 2. Proposed conceptual design for the entire Rocky Gulch watershed, developed by McBain & Trush, Inc and CDFG during the initial Stream Assessment Project.

17040

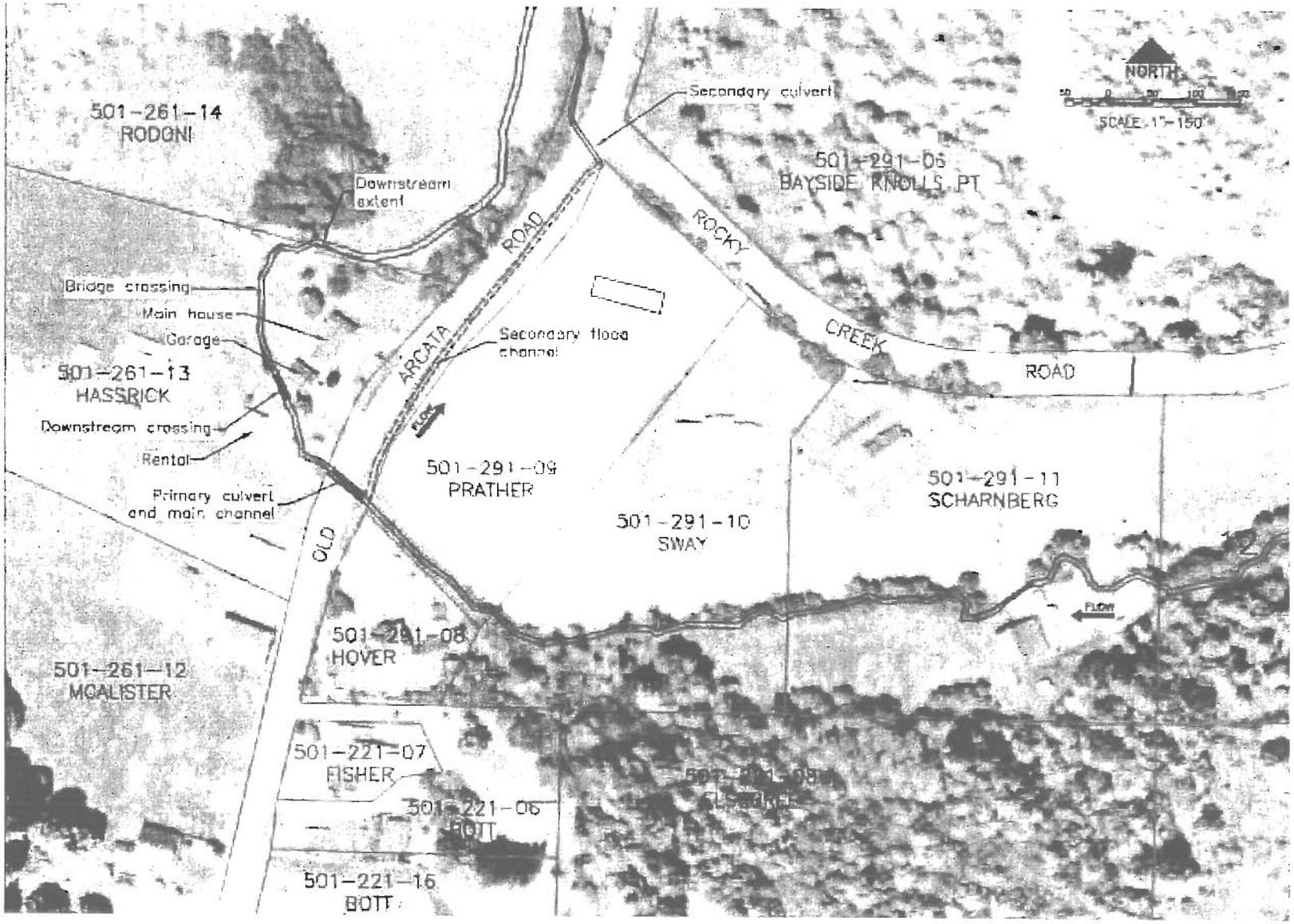


Figure 3. Residential parcels along Old Arcata Road surrounding the project area.

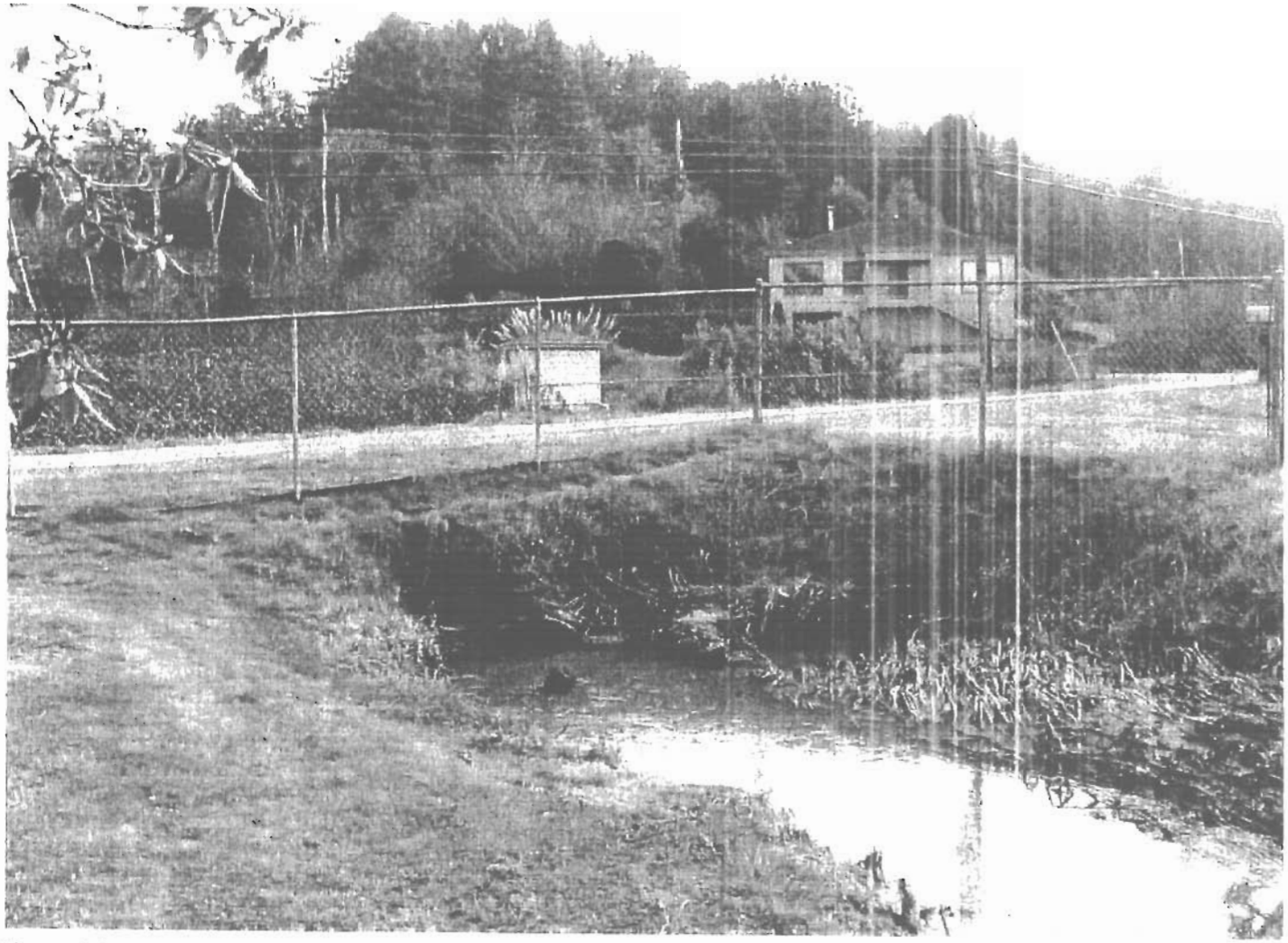


Figure 4. Downstream view of primary culverts and main channel culverts passing under Old Arcata Road. The second culvert is underwater in this photo.

Figure 5. Floodwaters overtopping Old Arcata Road during the November 1998 flood. Photograph taken at the foot of Rocky Creek Road looking south. The main channel is in the distance; the secondary culvert entrance is in the foreground.

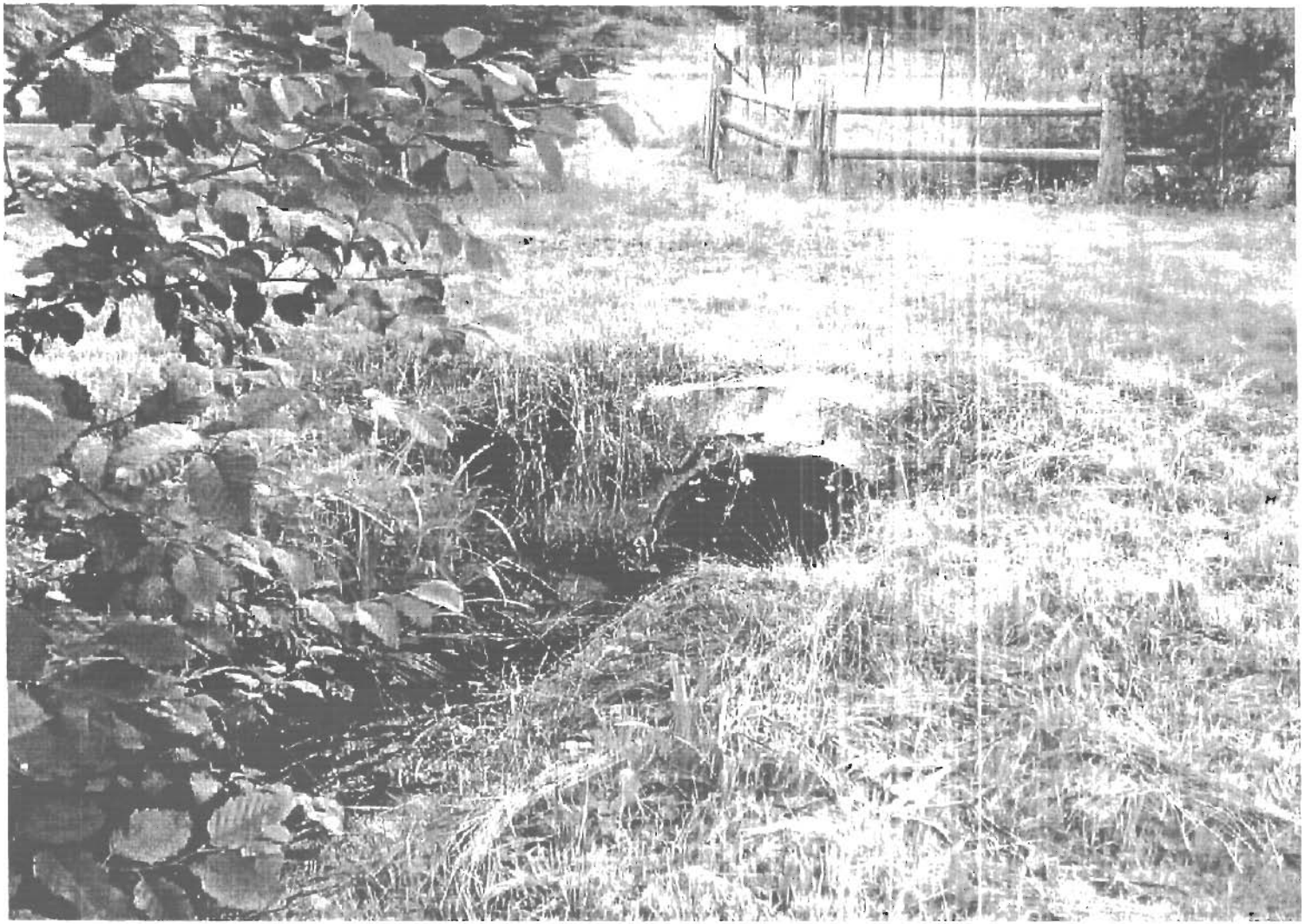


Figure 6. The downstream crossing culverts on Ginni Hassrick's property. The culverts were installed by a previous landowner, and are too small to convey large floods.

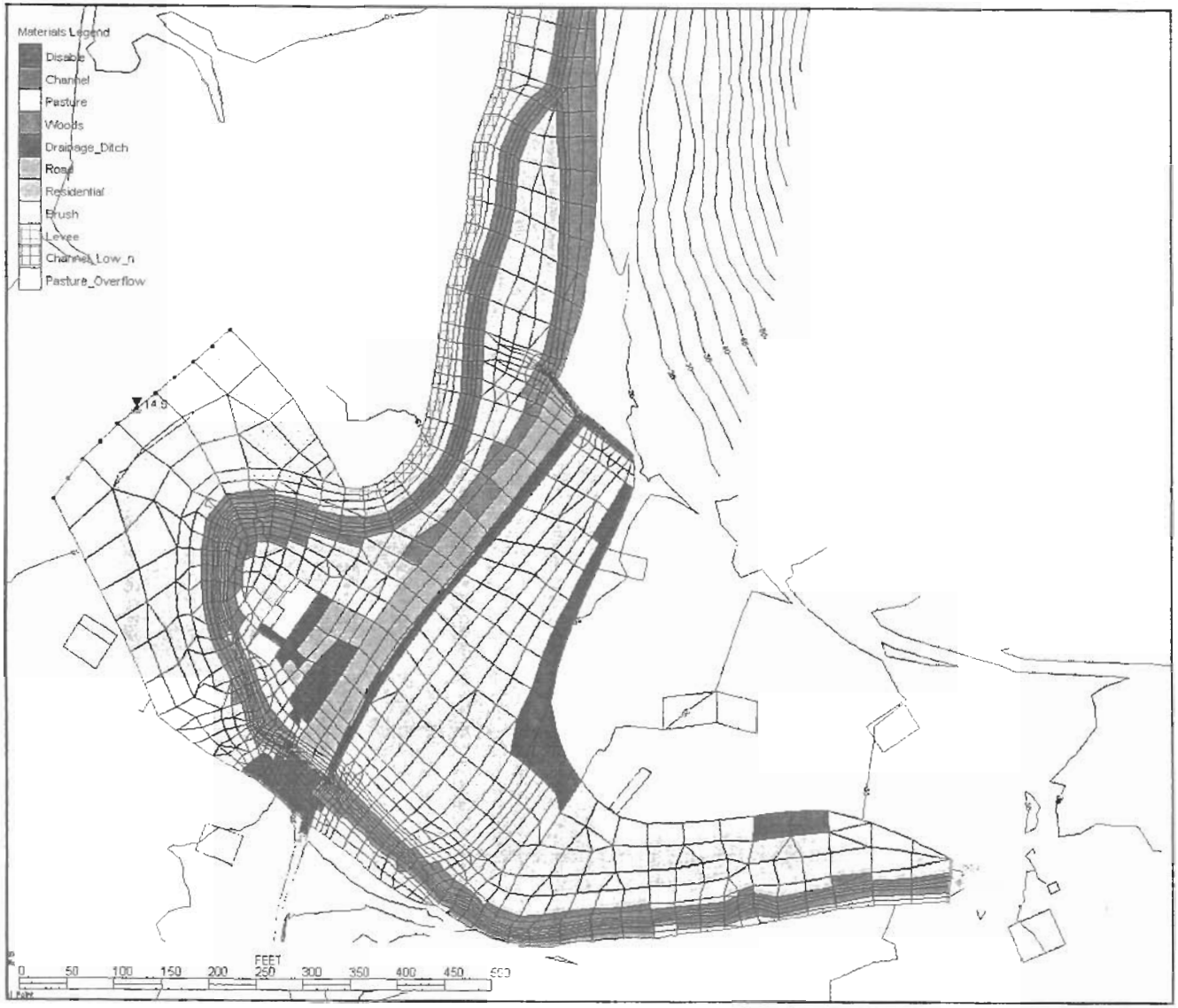


Figure 7. Plan view of material types and mesh for 2D modeled project area.

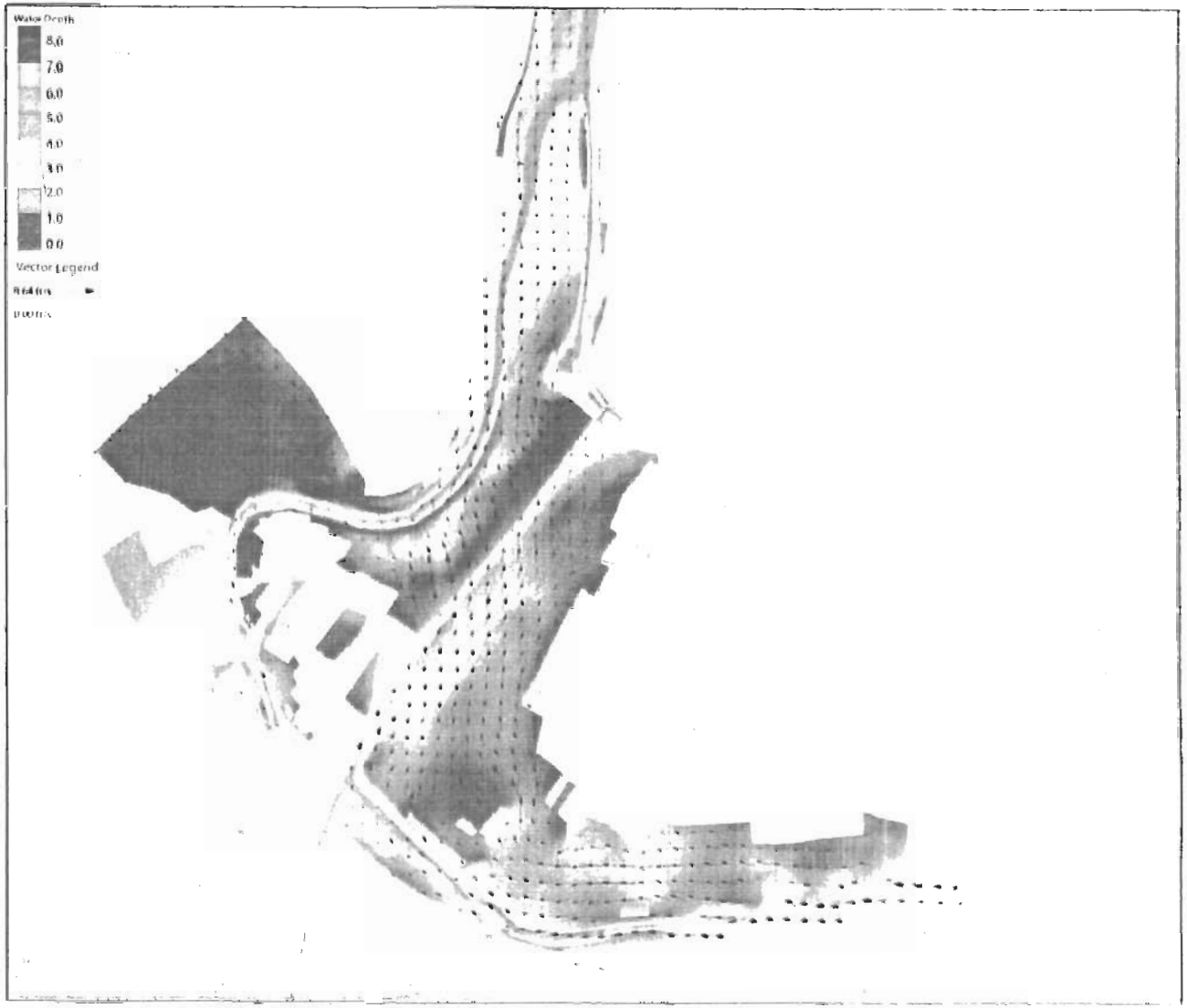


Figure 8. Preliminary 2D model results for depth and velocity vectors at 100-yr flood (Q100 = 445cfs).

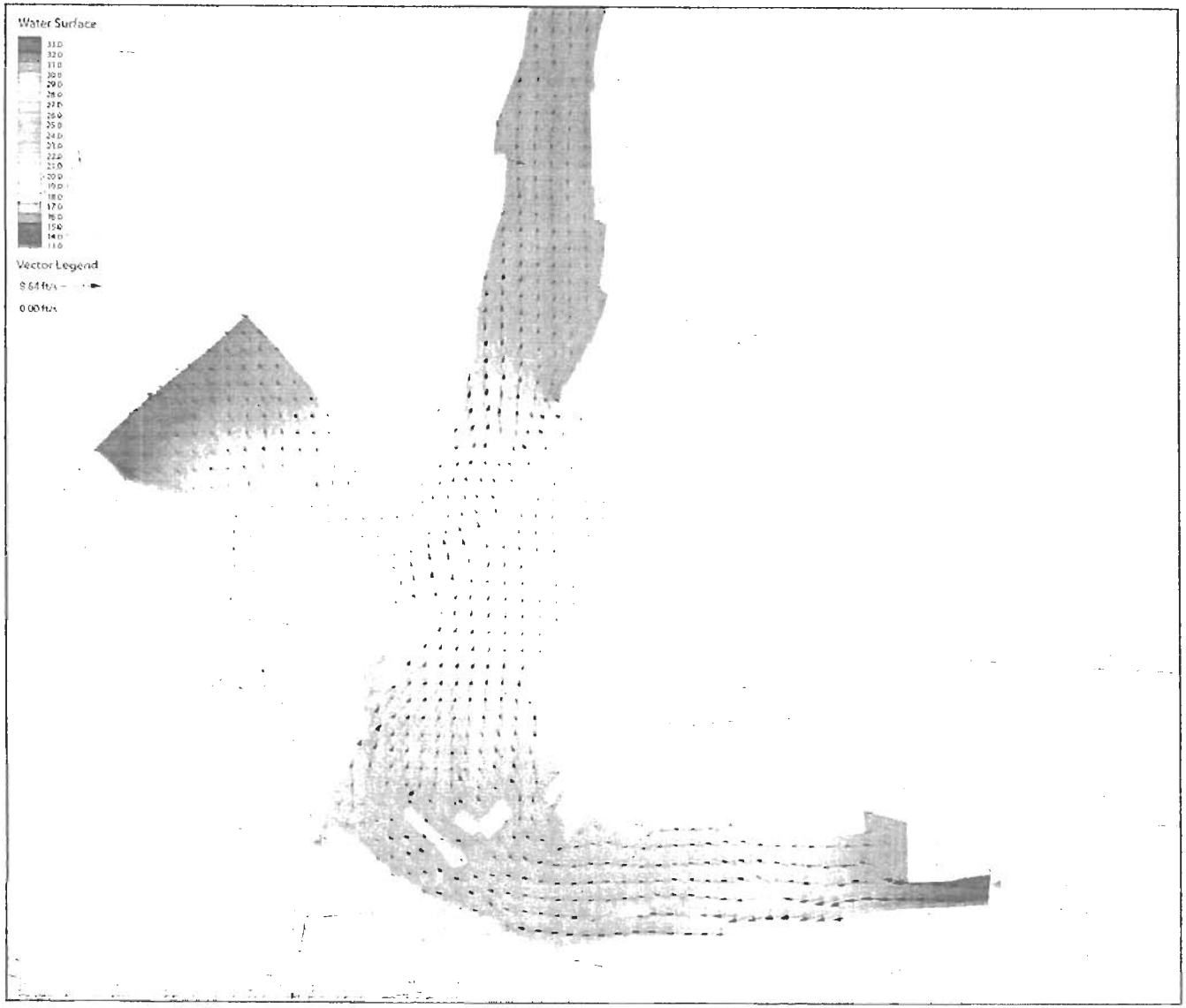


Figure 9. Preliminary 2D model results for water surface elevation and velocity vectors at 100-yr flood (Q100 = 445cfs).

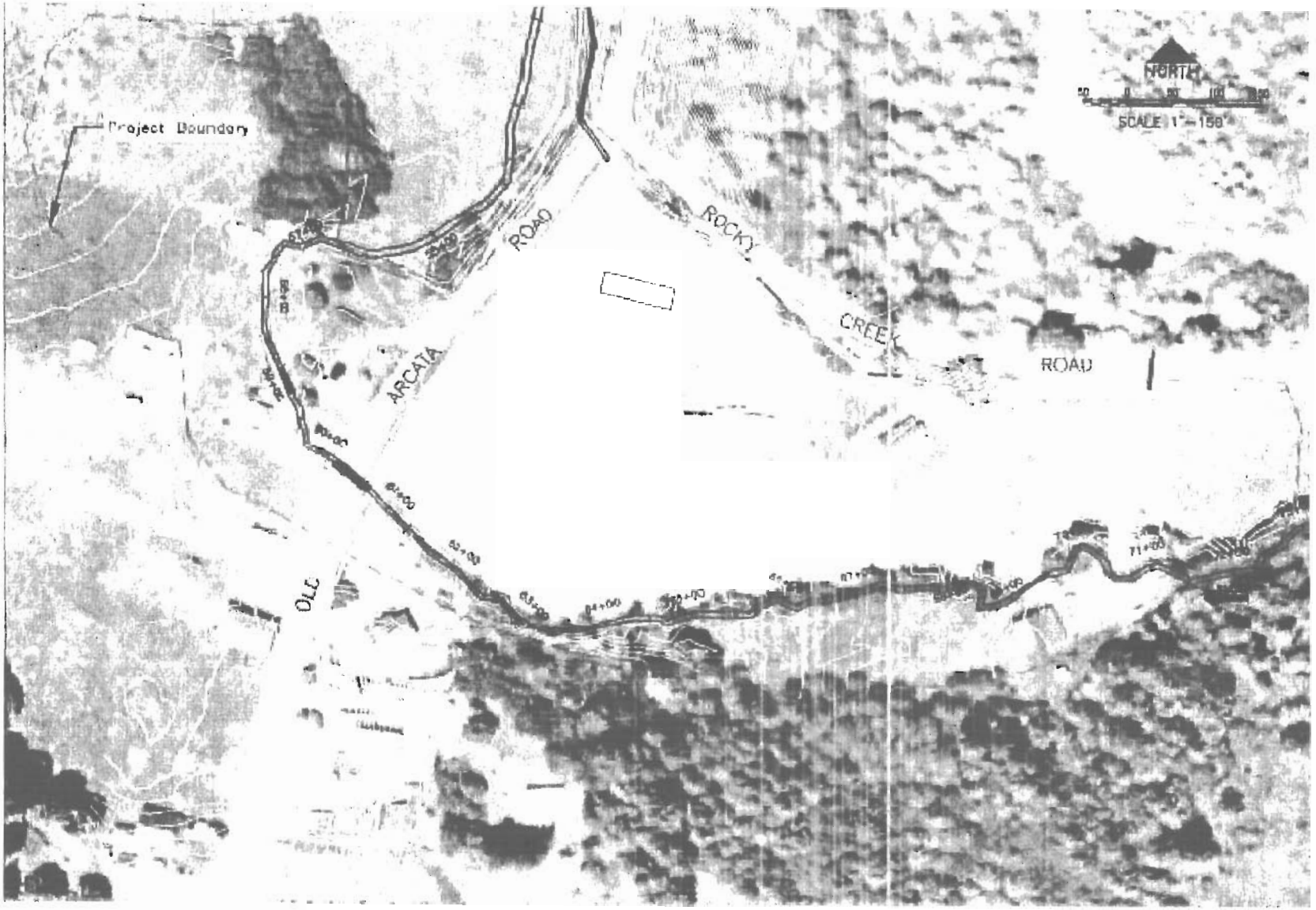


Figure 10. Contour map showing extent of topographic surveys conducted for the project conceptual design and hydraulic modeling.

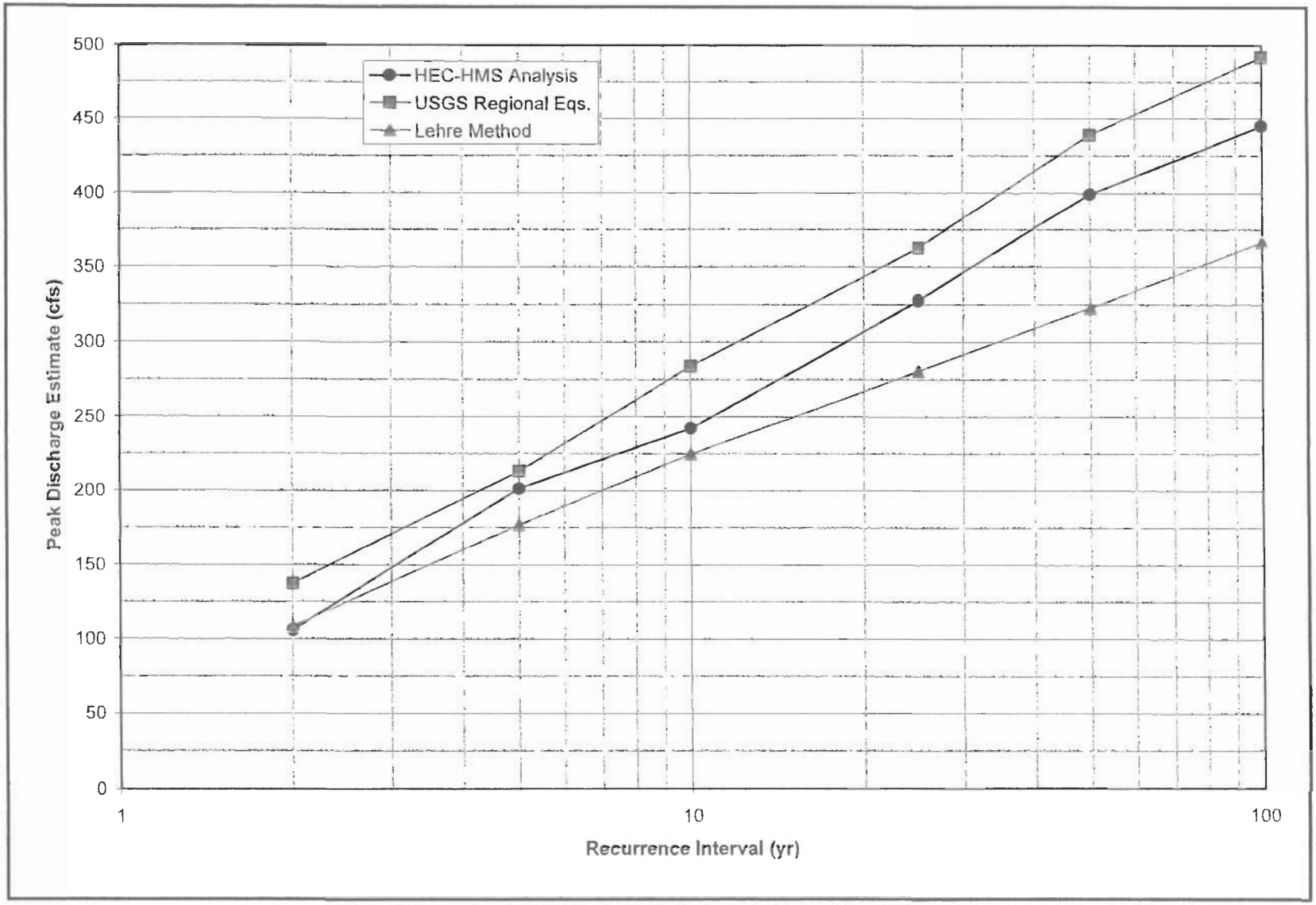


Figure 11. Peak flood discharge estimates for Rocky Gulch project area.

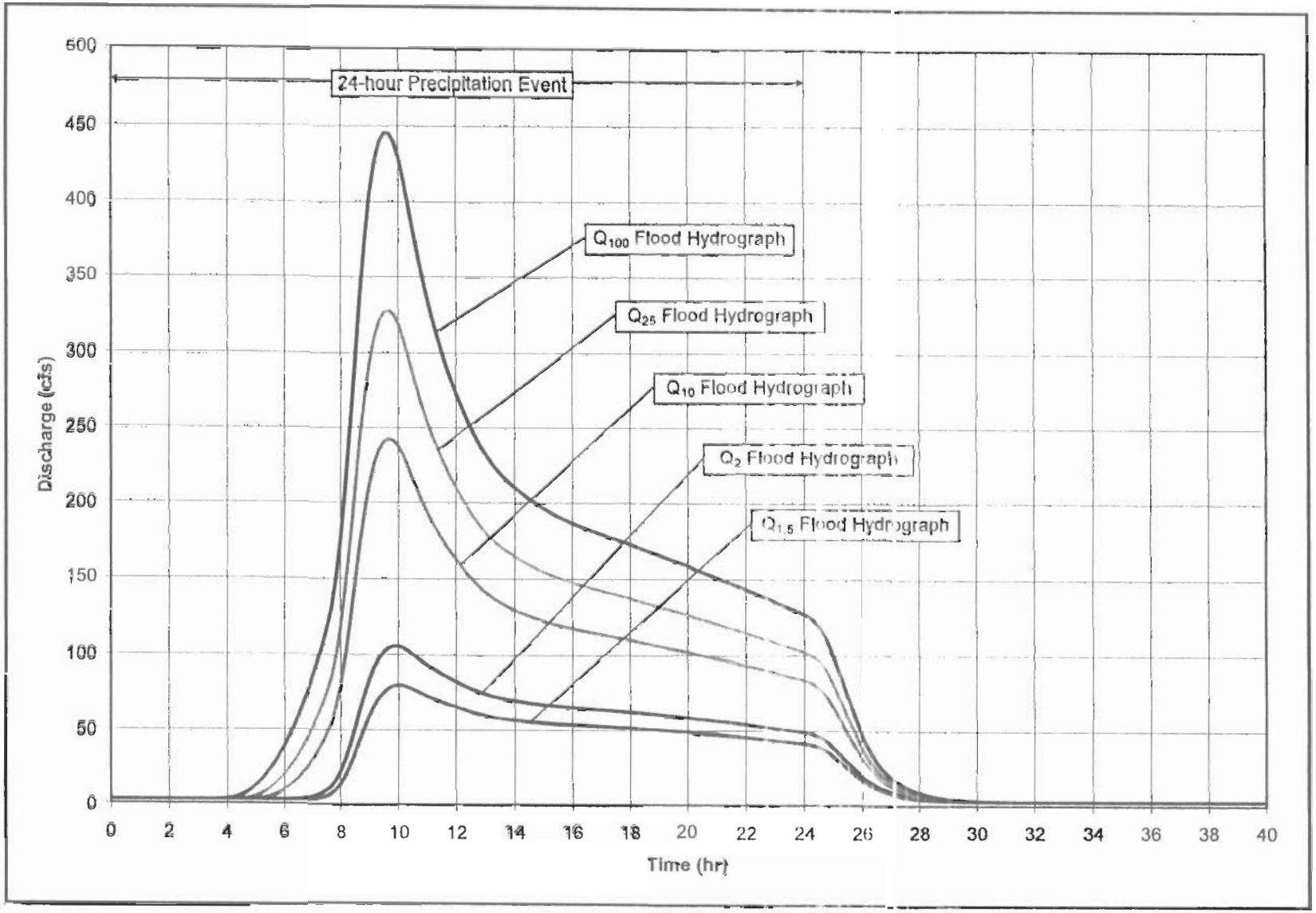


Figure 12. Flood hydrographs at Old Arcata Road Culvert.

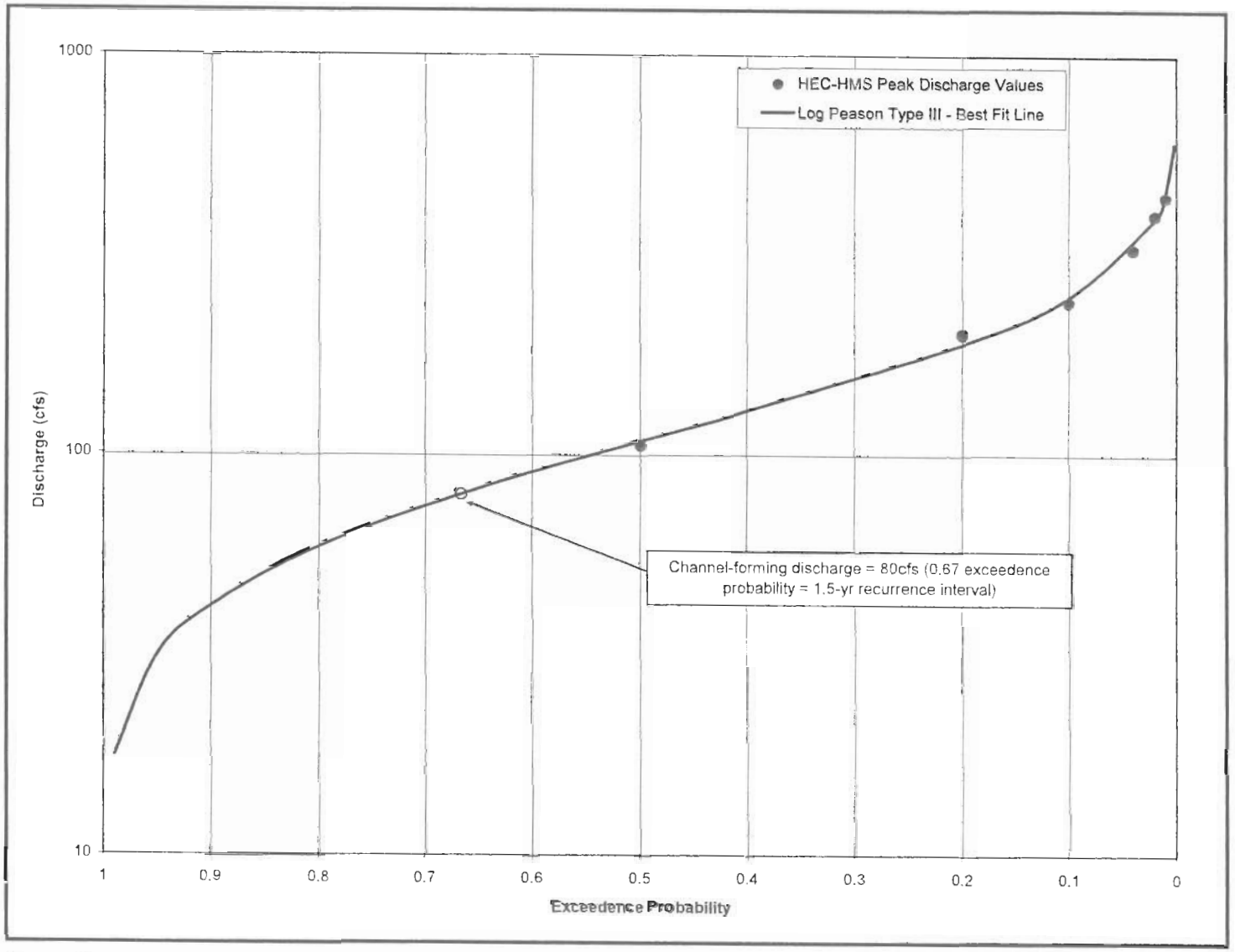


Figure 13. Best fit Log Pearson Type III distribution for the estimated HEC-RAS peak discharge events.

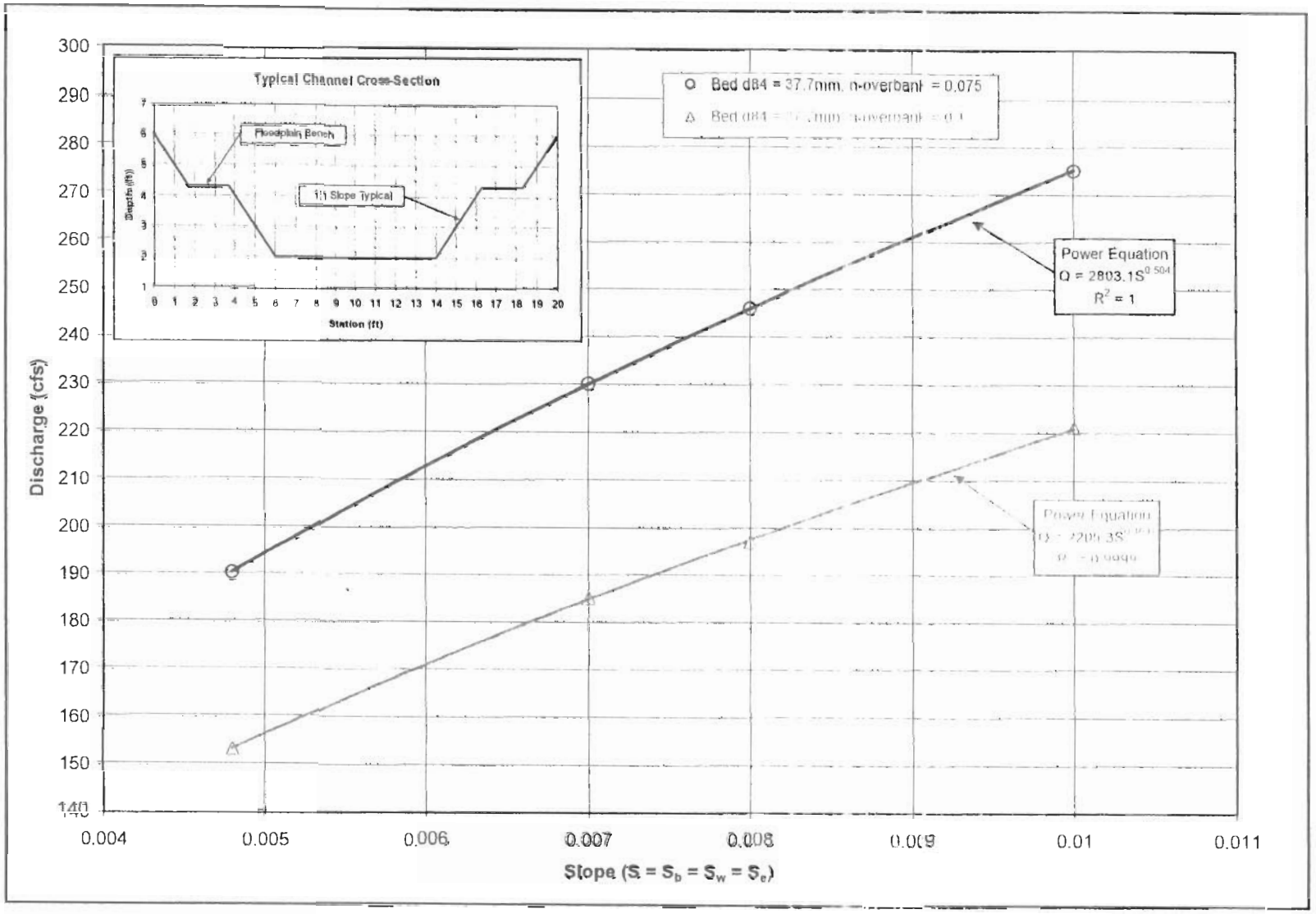


Figure 15. Proposed design channel discharge versus slope at uniform flow for different Manning's roughness conditions.

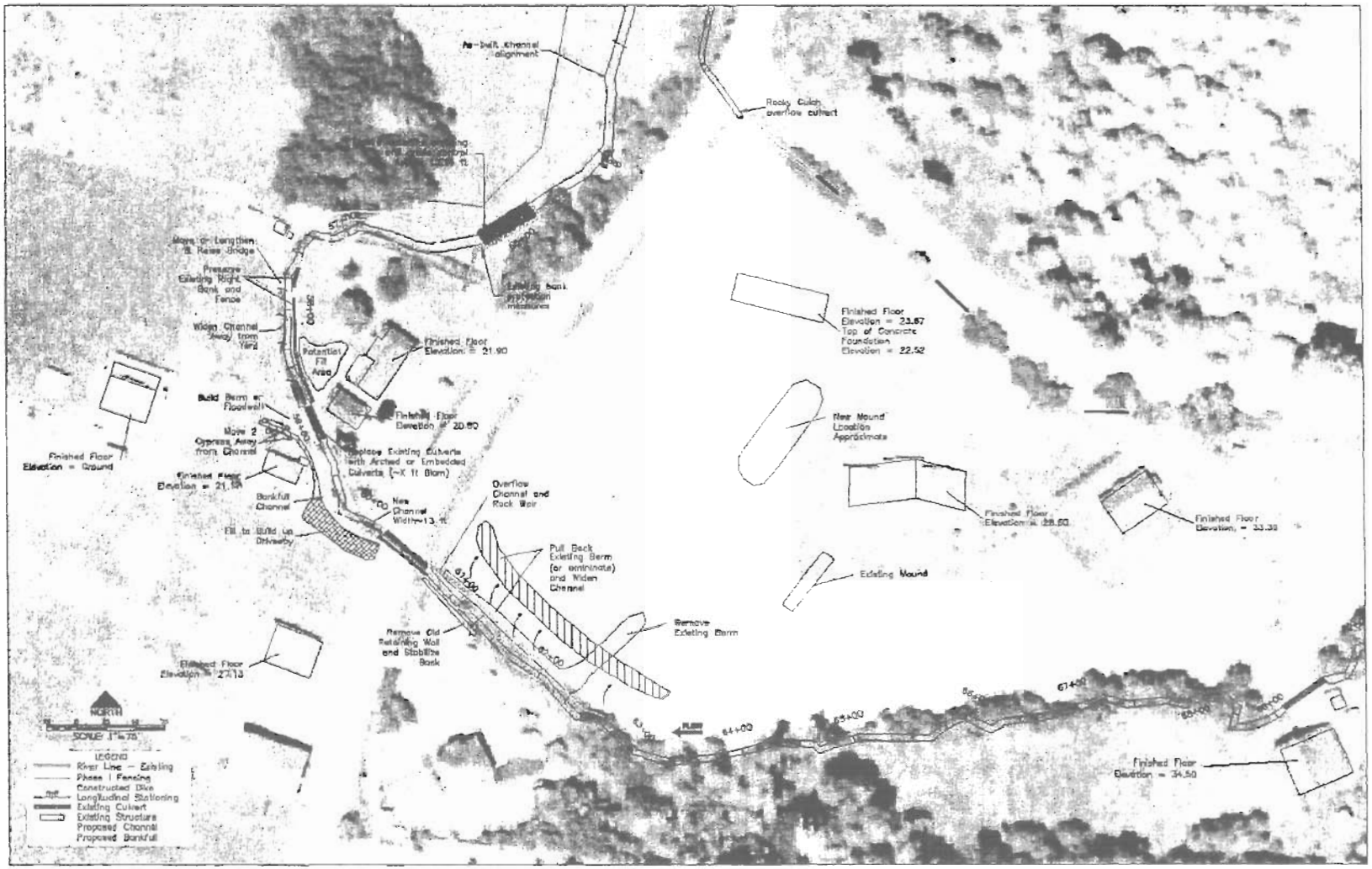


Figure 16. Conceptual design elements for the project area, including parcels upstream and downstream of the Old Arcata Road culvert

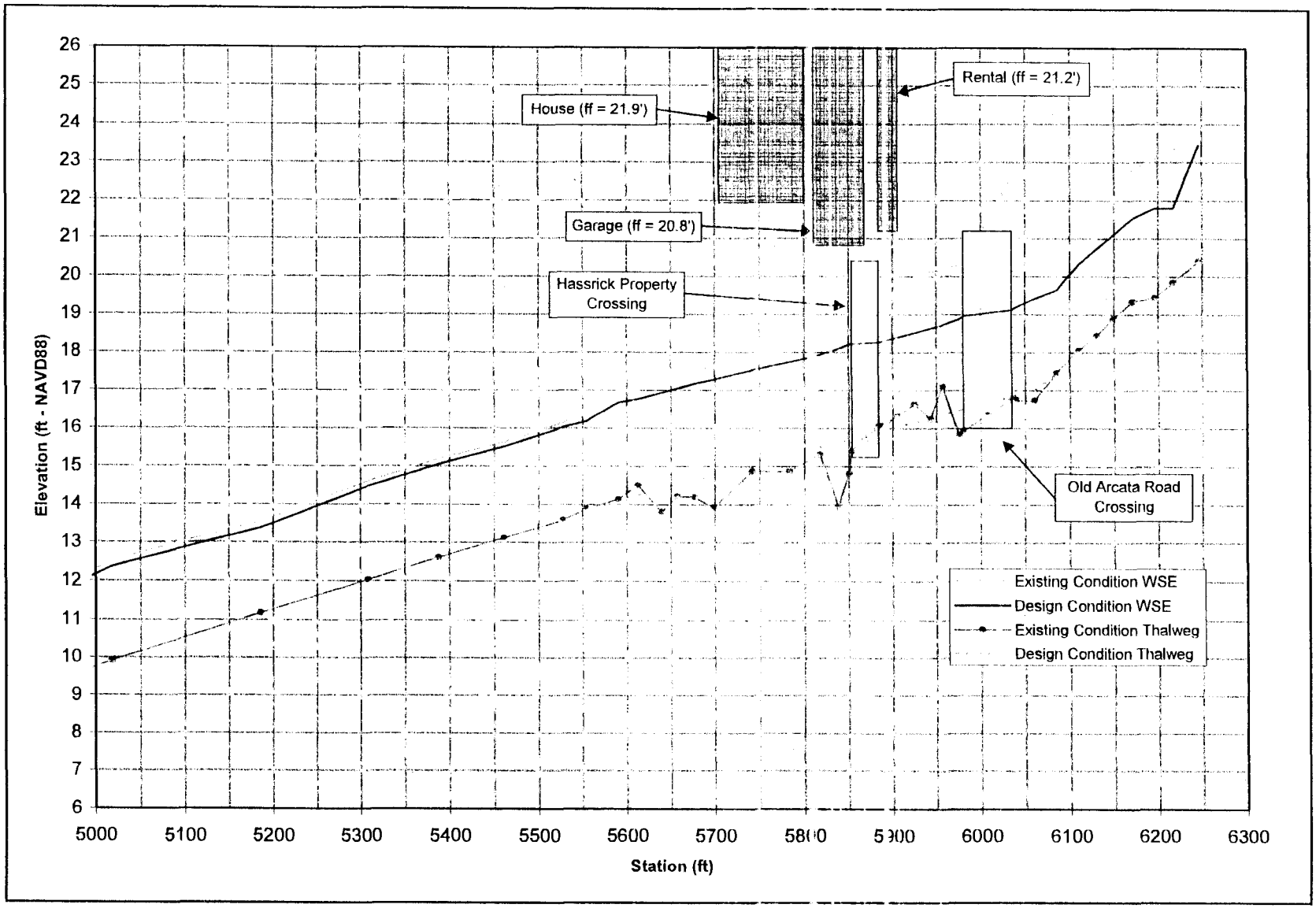


Figure 17. Profile showing existing and design condition water surface elevations (WSE) at 1.5-yr flood (Q5 = 80cfs).

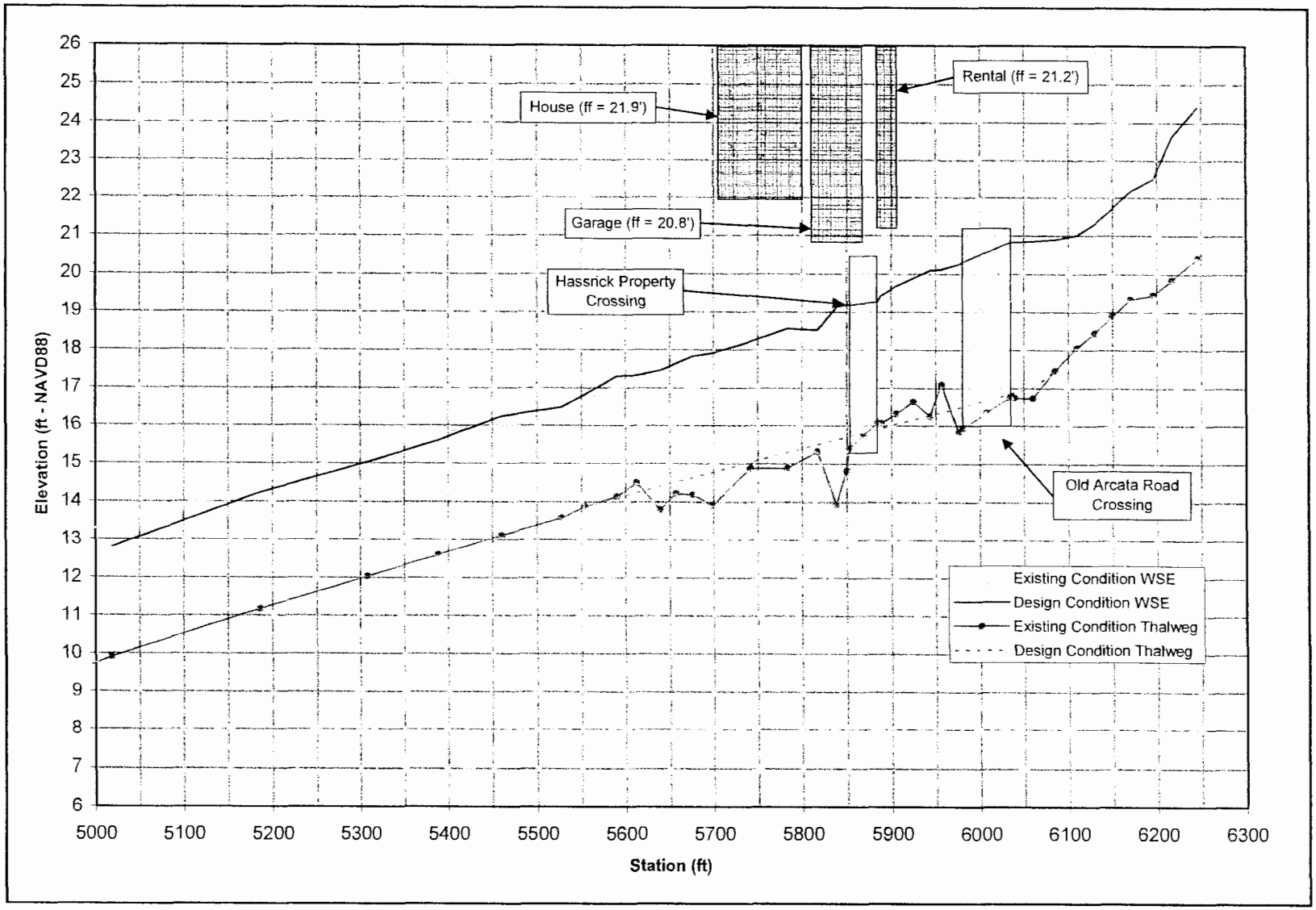


Figure 18. Profile showing existing and design condition water surface elevations (WSE) at 5-yr flood (Q5 = 201cfs).

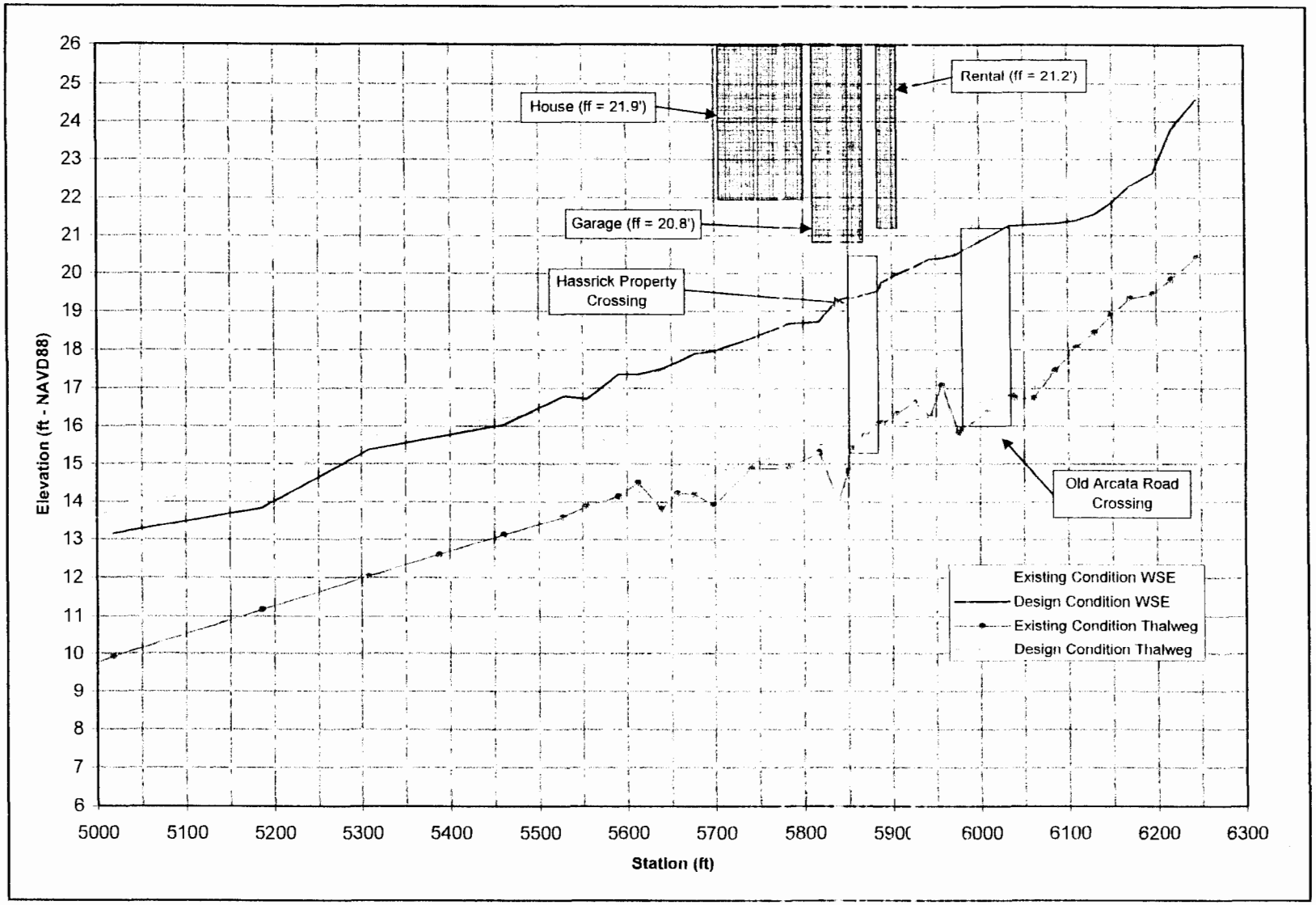


Figure 19. Profile showing existing and design condition water surface elevations (WSE) at 10-yr flood (Q10 = 242cfs).

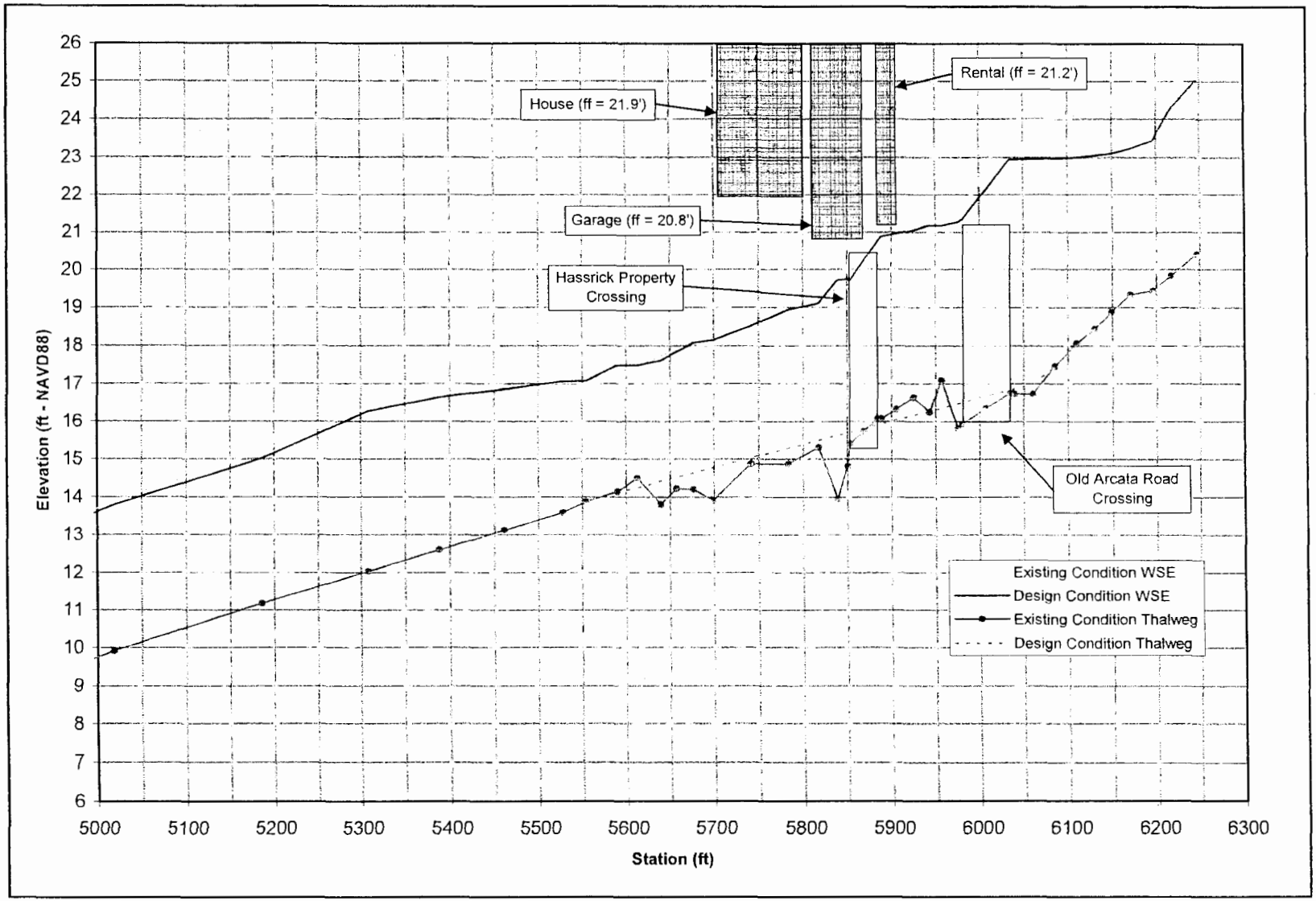


Figure 20. Profile showing existing and design condition water surface elevations (WSE) at 100-yr flood (Q100 = 445cfs).

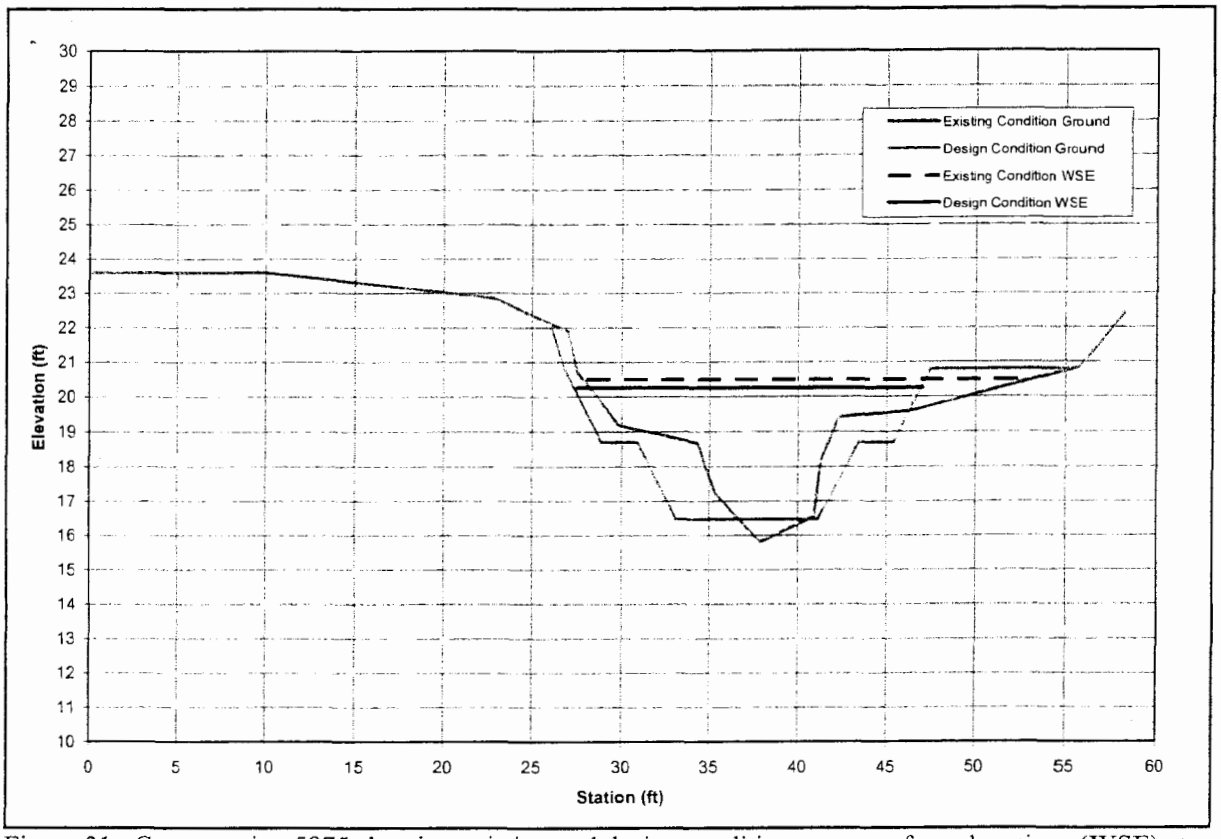


Figure 21. Cross-section 5975 showing existing and design condition water surface elevations (WSE) at 5-yr flood (Q5 = 201cfs).

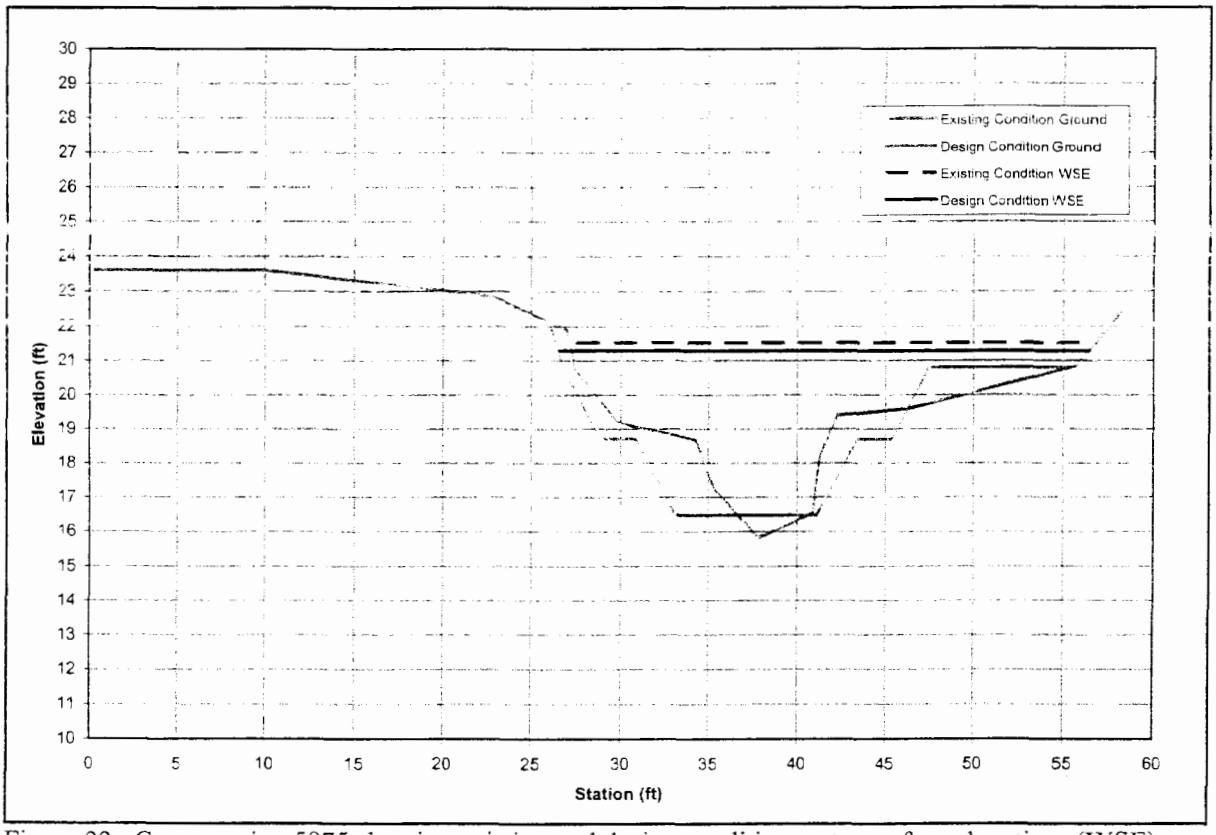


Figure 22. Cross-section 5975 showing existing and design condition water surface elevations (WSE) at 100-yr flood (Q100 = 445cfs).

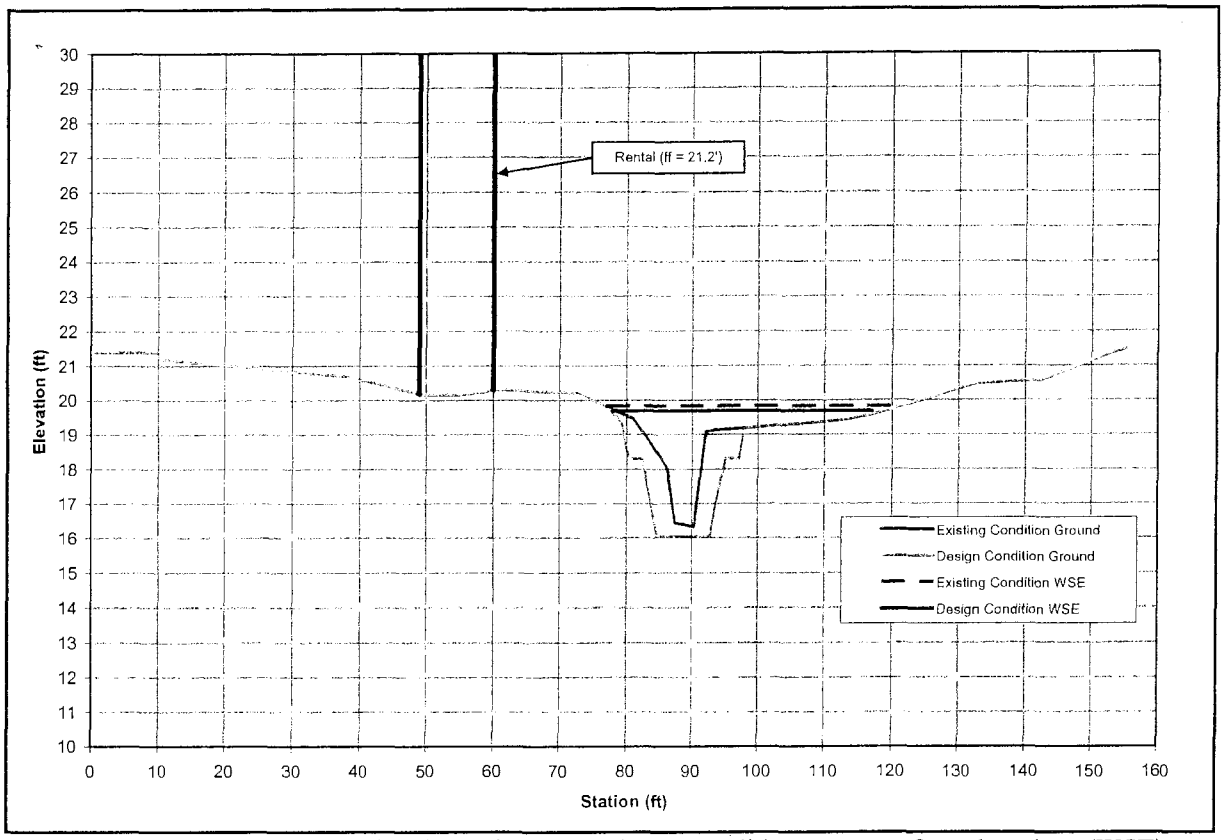


Figure 23. Cross-section 5905 showing existing and design condition water surface elevations (WSE) at 5-yr flood (Q5 = 201cfs).

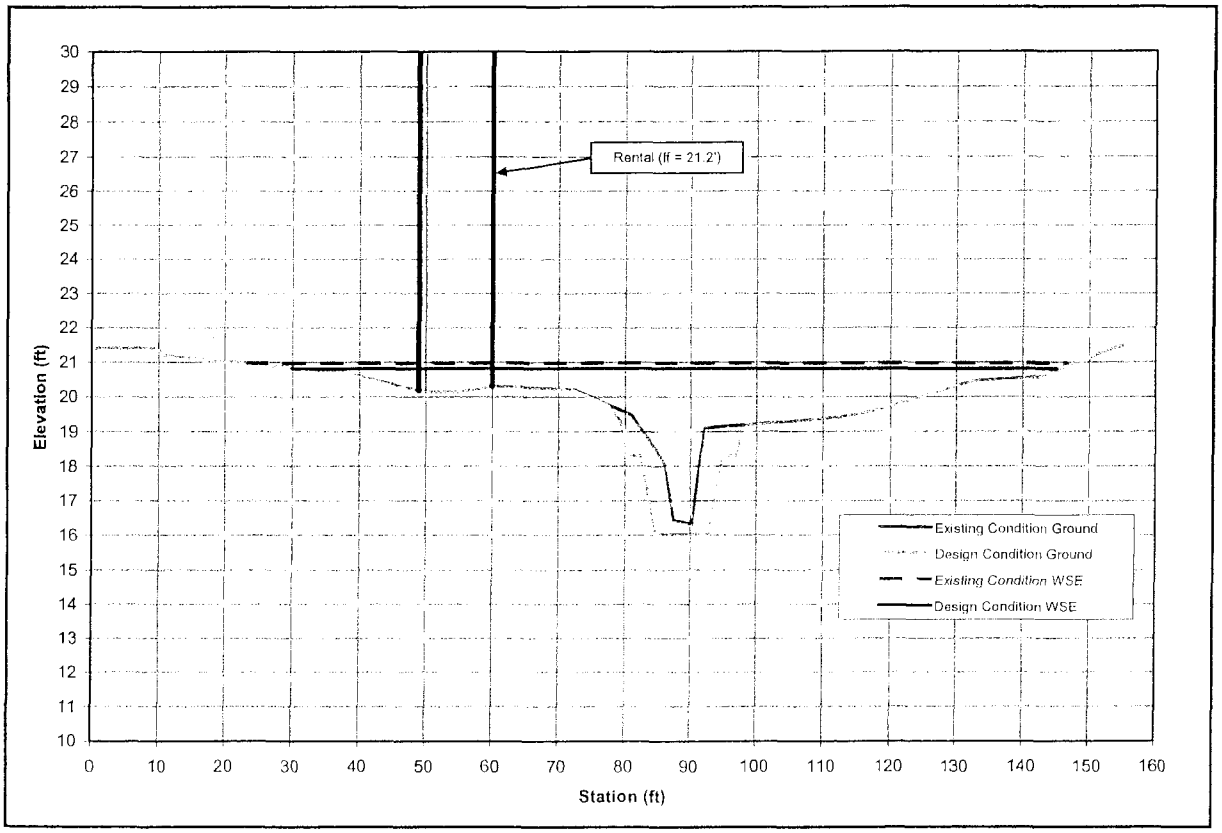


Figure 24. Cross-section 5905 showing existing and design condition water surface elevations (WSE) at 100-yr flood (Q100 = 445cfs).

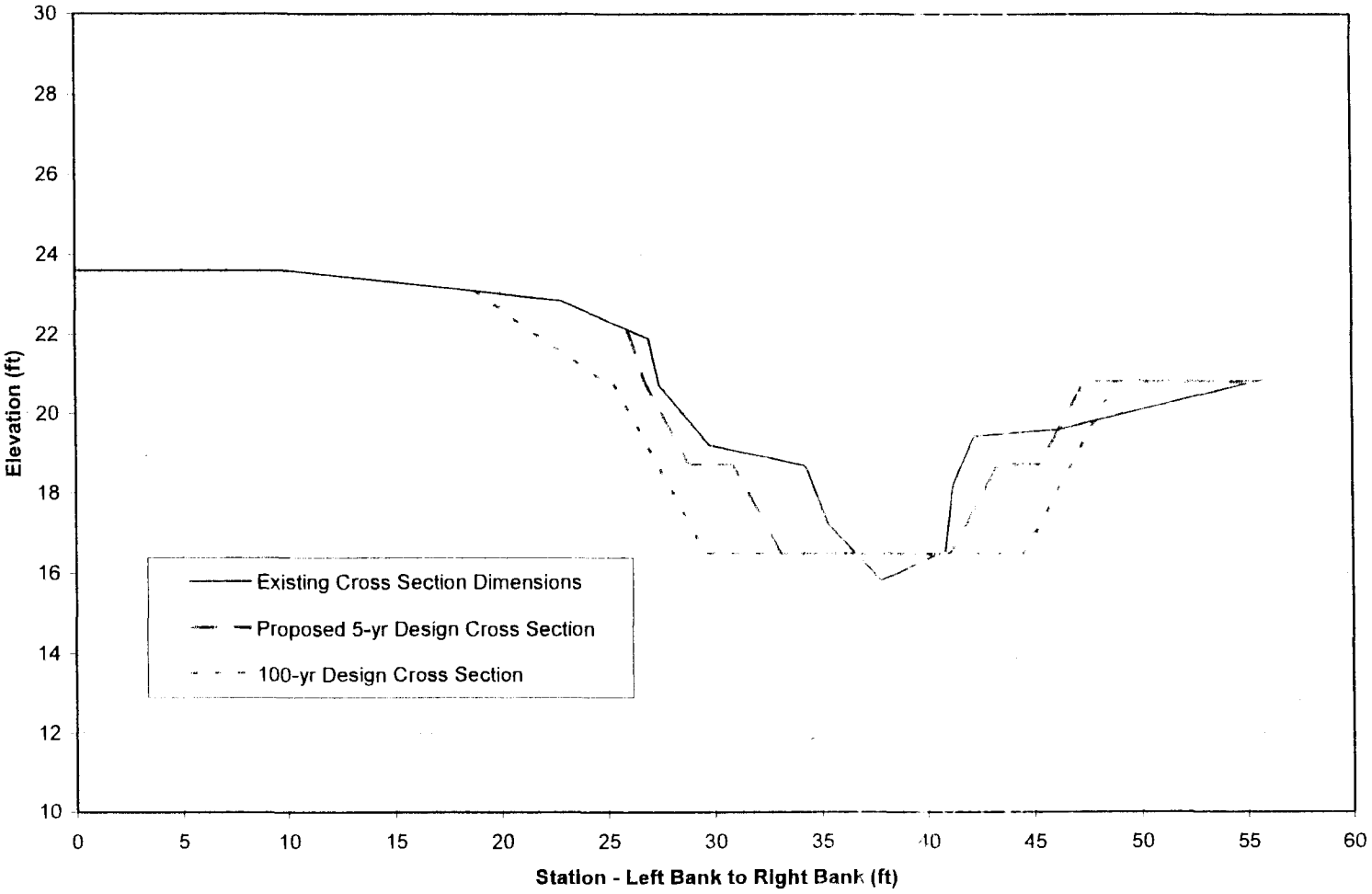


Figure 14. Cross section dimensions of the existing channel, the proposed 5-yr design channel, and an example cross section that would pass the 100-yr flood.

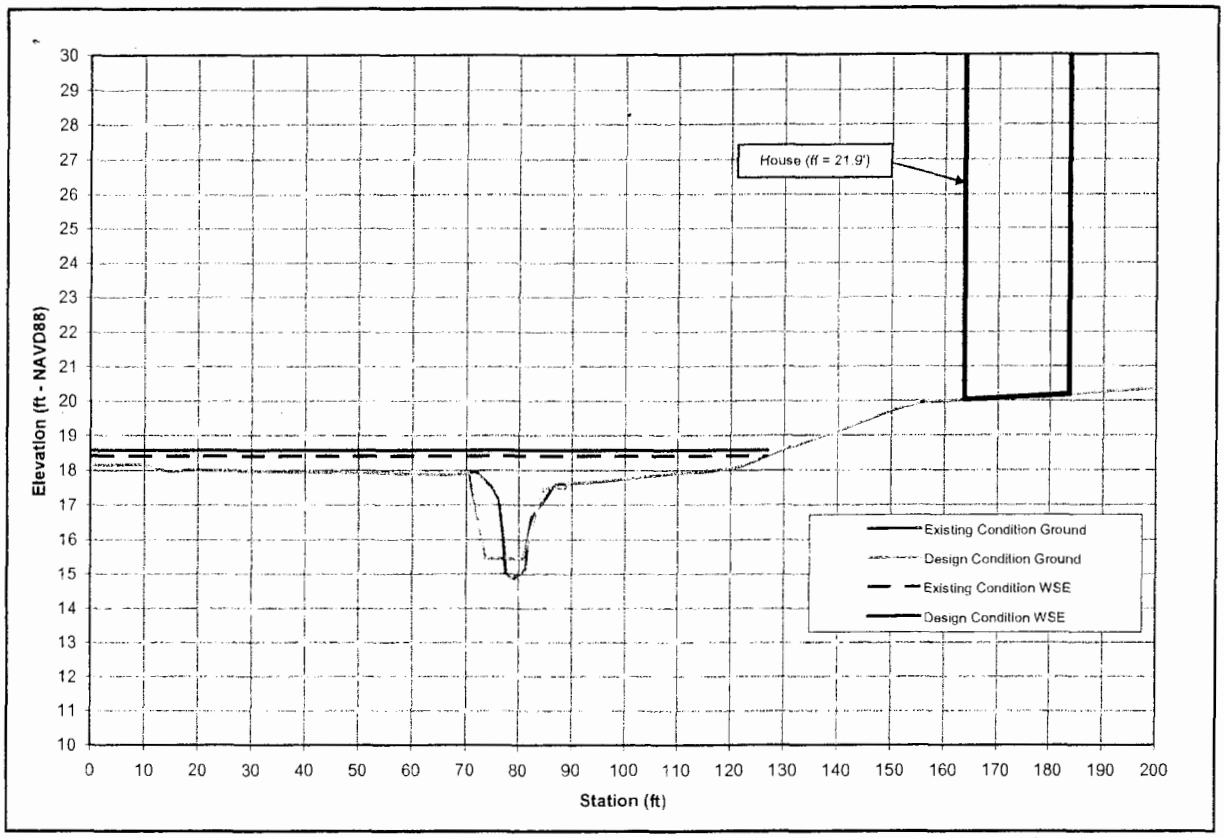


Figure 25. Cross-section 5783 showing existing and design condition water surface elevations (WSE) at 5-yr flood (Q5 = 201cfs).

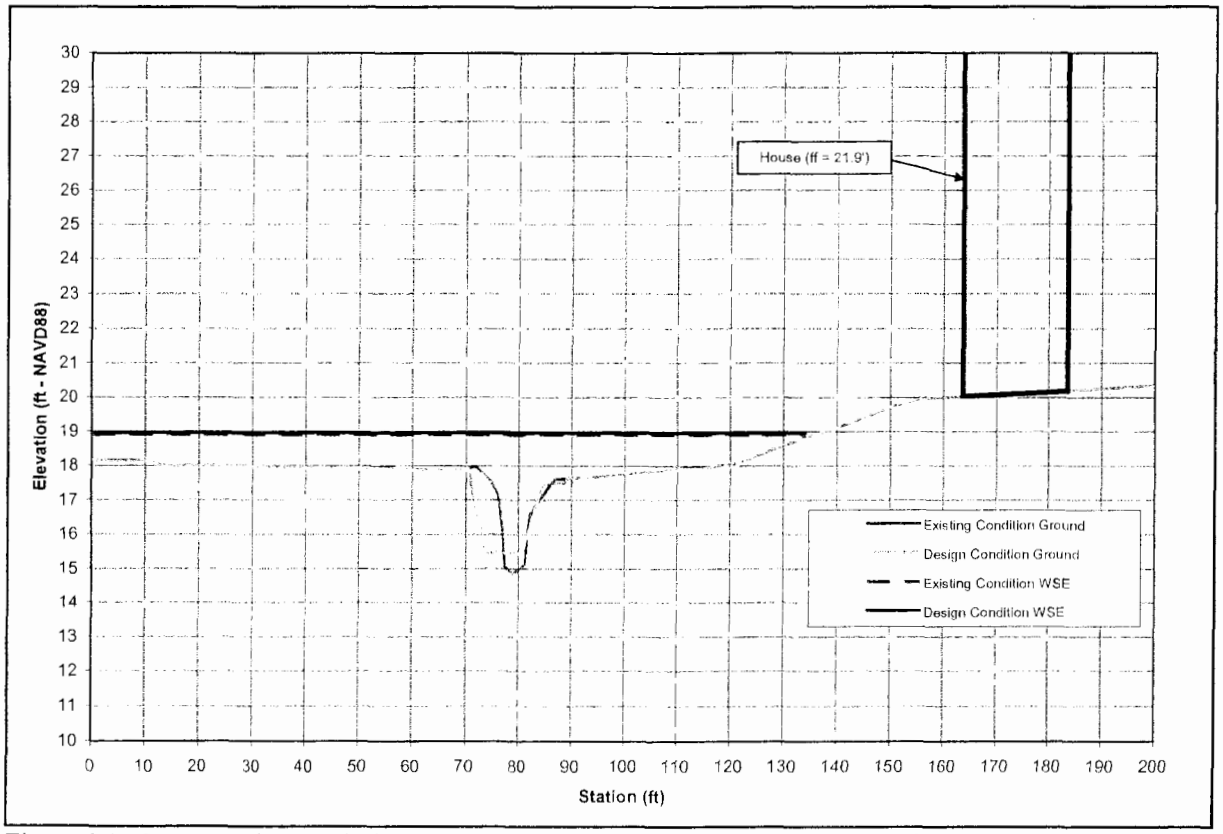


Figure 26. Cross-section 5783 showing existing and design condition water surface elevations (WSE) at 100-yr flood (Q100 = 445cfs).

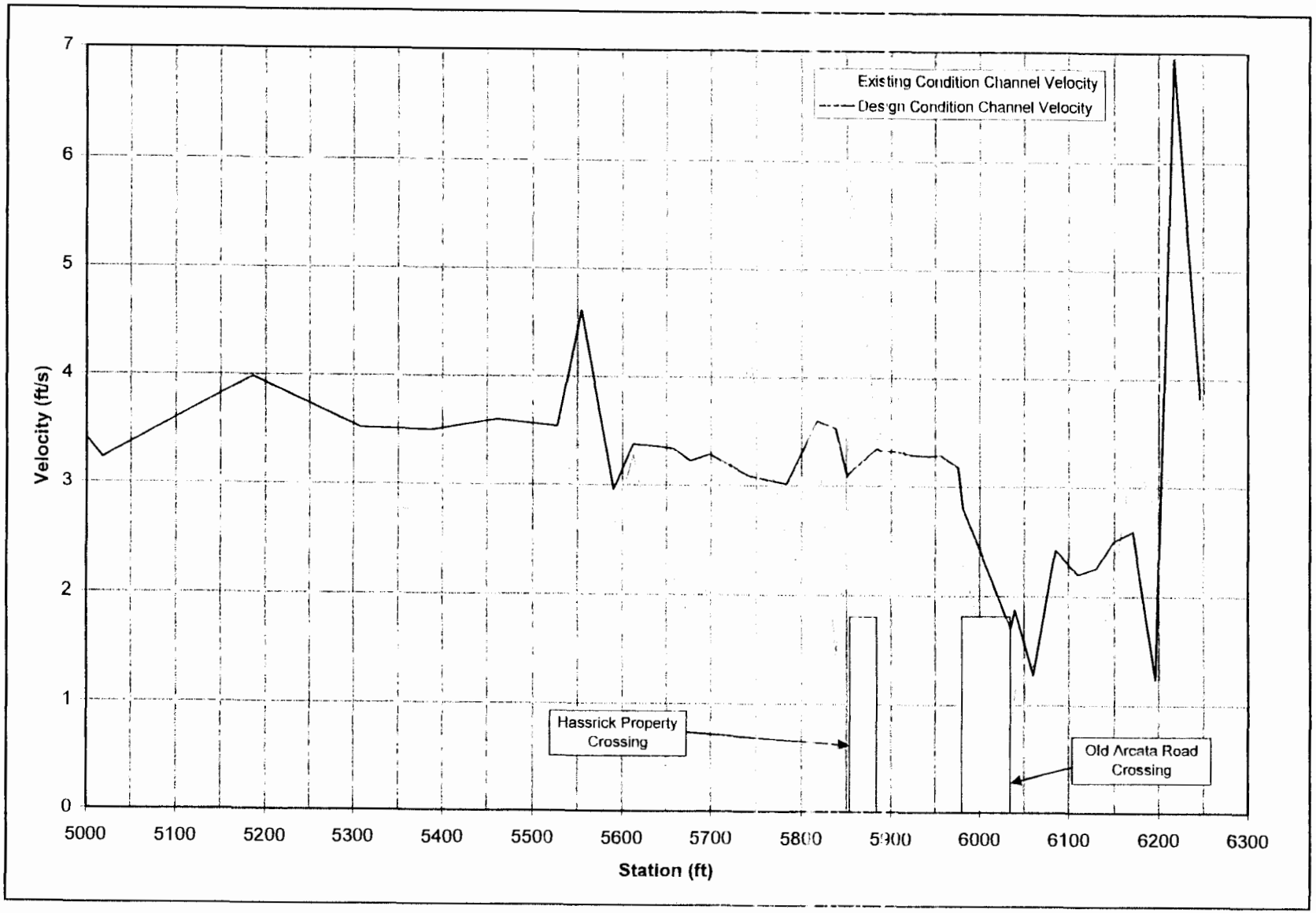


Figure 27. Channel velocities for existing and design conditions at bankfull (channel-forming) discharge (Q1.5 = 80cfs).

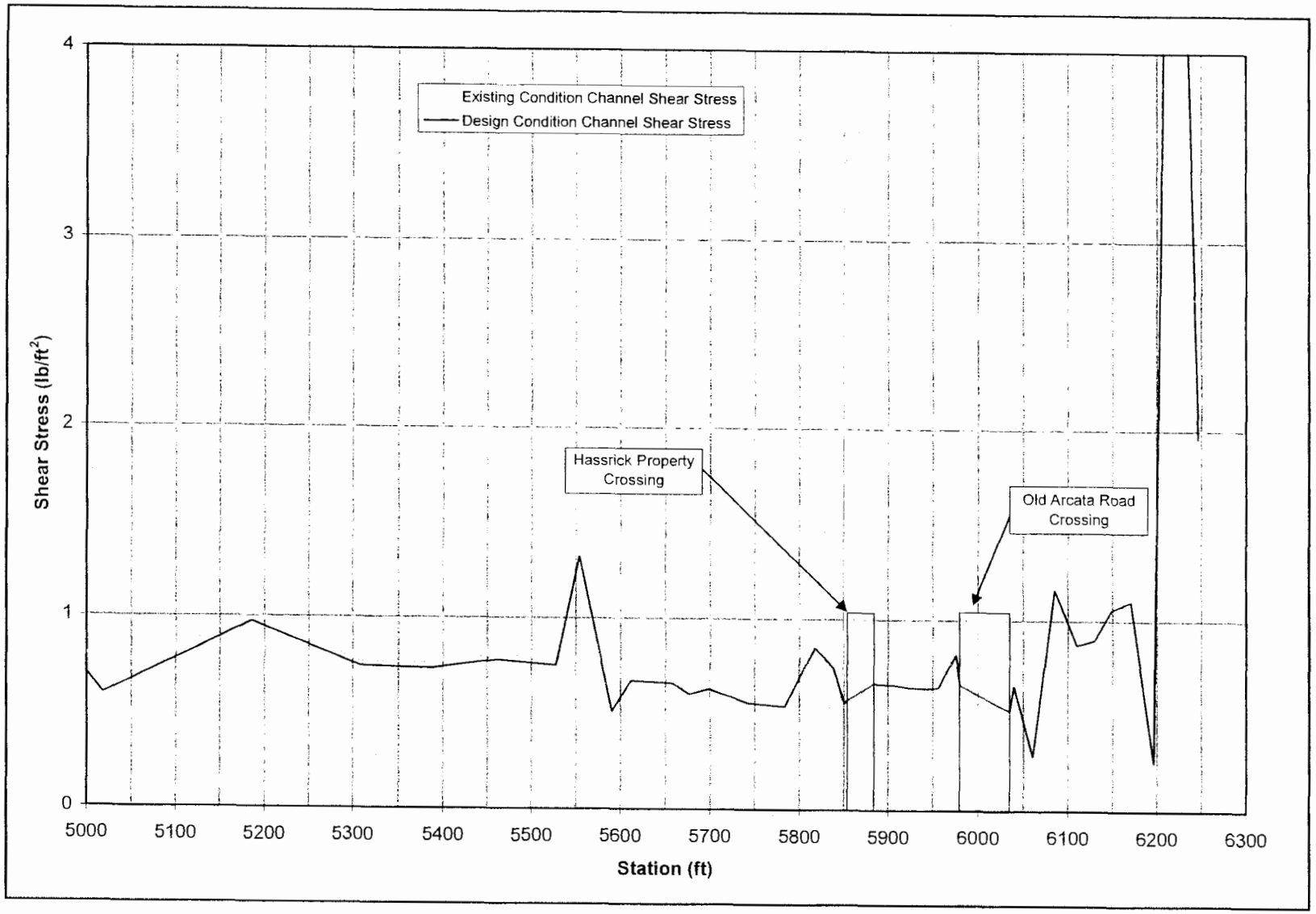


Figure 28. Channel shear stress for existing and design conditions at bankfull (channel-forming) discharge (Q1.5 = 80cfs).