

SOLDIER CREEK MIGRATION BARRIER REMOVAL PROJECT



Evans Bar Road - Soldier Creek - October 2005

FINAL REPORT

**CA Department of Fish and Game Fisheries Restoration Grant Program
Contract # P0310333**

CDFG Fisheries Restoration Grant Program #P0210415, # P0110309

National Fish and Wildlife Foundation Project # 2003-0122-001

Coastal Conservancy Grant #03051

NOAA American Rivers Grant Program #AMR58

Trinity County Department of Transportation

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Five Counties Salmonid Conservation Program

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Summary:

The purpose of this project was to provide for passage of all life stages of coho salmon and steelhead trout to the natural limits of anadromy of Soldier Creek, while increasing the flood flow capacity of two Trinity County road crossings (Dutch Creek and Evans Bar Roads). The design for the Soldier Creek project was completed in consultation with Jon Mann of the National Oceanic and Atmospheric Administration (NOAA) fisheries branch, Jim Thompson of the CA Department of Fish and Game, and the Engineering staff at the Trinity County Department of Transportation, who assisted in structural and hydrological design and project implementation inspections. A full stream simulation replacement design was determined the most appropriate based on the hydraulic and engineering analysis of conveying the 100-year flows and the biological review for allowing salmonid access to the upstream reaches of Soldier Creek. The original construction methodology was divided into two phases: 1) fish relocation, removal of the culverts at both Crossings (#1 - Evans Bar Road and #2 - Dutch Creek Road), and installation of the detour bridges to allow the crossings to overwinter during 2004; and, 2) fish relocation and diversions, installation of the concrete footings and metal arches, removal of the detour bridges, erosion control, and revegetation of the disturbed areas during the 2005 construction season. Phase 1 was partially completed by October 15, 2004 with the culvert at Crossing #1 being removed and the detour bridge installed. Crossing #1 was the only site treated in 2004 due to: higher than expected flows during the construction season that precluded an earlier start and, the unavailability of a second detour bridge to install on Crossing #2. Phase 2, which now included the removal of the existing culvert on Crossing #2 and installation of a detour bridge, in addition to the aforementioned tasks, was completed from June 2 to October 31, 2005.

This project utilized a variety of funding sources including: the California Department of Fish and Game's Fisheries Restoration grant program; the Pacific States Marine Fisheries Commission; NOAA American Rivers; the California Coastal Conservancy; the National Fish and Wildlife Foundation; and, the Trinity County Department of Transportation (Attachment 1 - Table 1).

Purpose and Need:

This project was part of a larger effort known as the Five Counties Salmonid Conservation Program (5C). 5C is a conservation strategy formed by the counties of Del Norte, Humboldt, Mendocino, Siskiyou and Trinity to develop land use conservation standards and implement changes in practices to reduce erosion and restore anadromous salmonid fisheries habitat within the Southern Oregon-Northern California Coho Evolutionarily Significant Unit. Developed in 1997 as a result of the listing of coho salmon as Threatened under the federal Endangered Species Act, the Program's implementation of the migration barrier component has been, and continues to be, an essential step toward the delisting of the coho salmon as a Federal and State listed Threatened species. This project also continued a series of many 5C projects also aimed at maintaining and restoring steelhead habitat to avoid the listing of this species as Threatened or Endangered.

This project removed two culverts on Soldier Creek that historically blocked access to

approximately 2.1 miles of anadromous fishery habitat upstream of Evans Bar Road in Junction City, California. Both barriers are County maintained culverts that were replaced with aluminum arches, implementing a full stream simulation design through the road crossings. The old culvert structures did not allow for the passage of bedload and debris associated with the high flows on Soldier Creek and flooding at both sites was a common occurrence during winter storm events. The full stream simulation design complied with the *NMFS Guidelines for Salmonid Passage at Stream Crossings* (September 2001), allowing for the 100-year flood flows and associated bedload and debris to pass safely through the replacement structures. This treatment has prevented future culvert failures, reduced maintenance costs associated with storm flows and culvert plugging, and eliminated the potential delivery of over 1,350 cubic yards of sediment into the downstream reaches of Soldier Creek and the Trinity River (located approximately 500 feet downstream of Crossing #1). By removing the potential for sediment delivery and allowing access to important coho and steelhead spawning and rearing habitat, this project has also contributed to the overall restoration of the Trinity River and its fishery.

Crossing #1 and #2 were ranked as the 7th and 8th highest priority migration barrier removal projects in Trinity County, using the 5C priority ranking process (refer to the 5C website, www.5counties.org for the culvert inventory and prioritization process). The ranking was based on the quantity and quality of available upstream habitat, the consistent presence of steelhead in the stream system, the undersized culverts, and the potential coho refugia that would be made available by treatment of the crossings. According to the California Coho Recovery Strategy (February 2004), some of the problems facing coho salmon in the Trinity River Hydrologic Unit include degradation of spawning and winter rearing habitat due to sedimentation and past land-use practices, lack of deep pools, migration barriers, and water quality problems. Replacing the barriers on Soldier Creek has affected several of these impediments as the Soldier Creek watershed is a high priority watershed for coho salmon based on population, habitat condition, and at-risk factors.

Project Location and Analysis of Barrier:

The project sites were located within ¼ mile of each other with Crossing # 1 located on Evans Bar Road (County Road #414) and Crossing # 2 located upstream on Dutch Creek Road (County Road # 413) near Junction City, CA. The project area was located near the terminus of the Soldier Creek watershed where it meets the Trinity River. Crossing # 1 Lat/Long point is: **40°41' 25.04" / 123° 01' 40.86"** and Crossing #2 Lat/Long point is: **40°41' 25.29" / 123° 02' 10.09"** of Sections 29 and 30 of T33N, R10W, MDBM (Attachment 2 – Project Location Map).

This project was identified as a priority barrier site in 2002 by Ross Taylor & Associates during the *Trinity County Culvert Inventory and Fish Passage Evaluation* conducted on County roads throughout Trinity County. The existing culvert at Crossing #1 was a 96-inch diameter (8-foot), 30-foot long corrugated metal pipe installed at a 2.98% grade with 4 ineffective railroad baffles. This crossing is located approximately 500 feet upstream of the confluence with the Trinity River. Crossing #2 also consisted of an 8-foot diameter, 51-foot long corrugated metal pipe set at 3.46% grade with four ineffective railroad baffles, located approximately 2400 feet upstream of Crossing #1.

Both culverts were identified with Fish Xing© as complete migration barriers to juvenile anadromous salmonid fish species due to the perched outlets and flow velocities. Fish Xing© estimated that Crossing #1 met passage criteria on approximately 22% and Crossing #2 met passage criteria on 13% of the range of migration flows for all species of adult salmonids. Both crossings were rated as extremely undersized, overtopping the road on approximately 20-year or lower storm flows.

The Shasta-Trinity National Forest, Trinity River Management Unit (TRMU) Road 33N47 has a barrier located approximately one mile upstream of Crossing #2. The barrier consists of a CMP pipe-arch with perched outlet and ineffective baffles. A replacement project is currently on the Forest Service Regional List for funding (Loren Everest, TRMU fishery biologist, 2006). Approximately one-half mile of good potential fish bearing habitat exists upstream of this crossing that will be made accessible once the USFS barrier is treated.

The planning process for this project was initiated in 2003 with the development and use of existing funding sources including grants from the National Fish and Wildlife Foundation, the California Department of Fish and Game-Fisheries Restoration Grant Program, the State Coastal Conservancy, and NOAA American Rivers. An additional funding source was sought in August 2005 through the Pacific States Marine Fisheries Commission (CDFG Adaptive Management program) for the necessary detour bridge funding at Crossing #2. The Trinity County Department of Transportation has also provided in-kind services and funds throughout project planning and implementation.

Project Implementation:

The project was completed in three phases. Phase One (June 2003 to October 2004) consisted of design, engineering and permitting. The design was completed through consultation with Jon Mann (formerly of NOAA Fisheries), Jim Thompson of the CA Department of Fish and Game, and the Trinity County Department of Transportation Engineering staff. Progress Reports detail the completion of tasks necessary to begin construction, including: CEQA and NEPA analysis, ACOE and CDFG permitting, topographical and thalweg surveys, hydrological analysis, geotechnical investigations and structural engineering. Phase Two consisted of project implementation including: fish relocation and diversion installation, excavation of the existing culverts, framing and pouring of the concrete footing, headwall and wingwall structures, assembly and installation of the aluminum arches, removal of the temporary fills and diversion structures, resurfacing the roads, installation of guardrails and pavement striping, and removal of the detour bridges.

This project consisted of replacing two culverts within the same stream system, providing the unique opportunity of installing two detour bridges at once. The original project plan was to remove both culverts and place detour bridges in 2004, allowing the entire stretch of treated stream to overwinter and cut down to natural stream grade. Due to the unavailability of a second detour bridge for Crossing #2, and higher than expected flows during the 2004 construction season, only Crossing #1 received this "treatment". The culvert on Crossing #1 was removed in September 2004 and the detour bridge was installed allowing for overwintering and more natural streambed conditions at the time of arch installation. This site was stabilized with mulch and

monitored throughout the 2004 winter and spring 2005 for bank slope stability. The remaining tasks under Phase Two were completed from August to October 2005. These activities are outlined in several Progress Reports. Phase Three, implementation of the final revegetation and erosion control measures and drafting and completion of the final reports, was completed from October 2005 to March 2006. For the complete as-built project description, refer to Attachment 4.

Project monitoring consisted of pre, during and post photo-monitoring. Spawning surveys for adult Coho salmon occurred in early and mid November 2005 after project implementation with no adults or redds located. Since project completion, several winter storms have hit the Northwestern part of California, causing major flooding and road failures on County and State roads. The structures at both Soldier Creek crossings were monitored during these events and problems with flooding and debris loading that had occurred in past events were not witnessed. The USFS will continue to monitor Soldier Creek for spawning activity over the next 10 to 20 years. The 5C Program will conduct post project monitoring for the next three years, including: spawning surveys, photo monitoring of up and downstream conditions, and inspection of the revegetation efforts. The TCDOT will monitor the structural integrity of the new structures for the next ten years.

Project Results

Completion of the project provided the following benefits:

- Providing 100% juvenile and adult salmonid passage to approximately 2.1 miles of upstream habitat during all flows where previous passage had been precluded by high velocities and >4-foot outlet jumps at the culverts;
- Eliminating the potential for approximately 1,350 cubic yards of sediment delivery to the stream system and downstream Trinity River through removal of the culvert backfill material;
- Increasing the flow capacities through the road crossings by allowing for unimpeded flow of the 100-year flows and associated bedload and debris while eliminating the potential for flooding, seen previously with the culvert structures;
- Preventing and minimizing the time and funds expended by the Trinity County Department of Transportation on maintenance and emergency efforts during high flow events to remove debris and implement clean-up efforts;
- Implementing the Trinity River Record of Decision (ROD), by providing:
 - Sediment management, including the supplementation of spawning gravels below the Trinity River Dam and reduction in fine sediments which degrade coho salmon habitat;
 - Watershed restoration efforts, addressing negative impacts which have resulted from land use practices in the basin.

Acknowledgements

The Five Counties Salmonid Conservation Program succeeds because so many people believe in the effort and the collaborative restoration for which it stands. The 5C has worked hard to build a bridge between restoration and local communities, often emphasizing the economic and regulatory benefit of effective restoration projects. This project is no exception.

Jon Mann (previously of NOAA Fisheries) devoted time and effort for the design and review that was above and beyond the call of duty. Jim Thompson of the California Department of Fish and Game contributed tremendous hours, experience, labor and equipment that was not required of him in order to accomplish many project tasks. Janet Clements (the 5C Planner for this project who returned to Graduate school in July 2004) dedicated tremendous time, effort and dedication into planning this project and securing funding. Janet put in late hours and long days toward preparing contracts, writing grants, getting permits, measuring water temperatures, wading in the stream, and every task it takes to get the job done. Christine Jordan assumed Janet's role in the 5C program in March 2005 and quickly learned the aspects of project implementation. Christine organized meetings, assisted with fish relocation, managed the project's various grants, monitored project implementation practices, and conducted spawning surveys after project completion. Mark Lancaster, the 5C Program Director, was an integral part of all aspects of project planning and implementation, bringing together the many agencies, minds and funding that made this project possible.

The Trinity County Department of Transportation - Engineering Department, notably Andrew Pence and Randy Cessna, were integral in project design, hydraulic modeling, and structural engineering. Andrew Pence dedicated every day from mid-August to November 2005 to this project, conducting on-site engineering inspections and general project construction oversight. Jan Smith, also of the DOT, assisted with the environmental permitting for this project and was dedicated to all aspects of sediment reduction and water quality control. Roger Brown Construction, and the subcontractors who worked the long hours to allow access to 2.1 miles of spawning and rearing habitat for steelhead trout and coho salmon, are acknowledged for their timeliness and quality of workmanship throughout project implementation.

Attachment 1

Table 1: Grant Fund Allocation by Project Phase

Partners	Expense By Project Phase			
	Phase I	Phase 2	Phase 3 & Final Reports	Total
Trinity County Department of Transportation (TC DOT)	\$22,557	\$176,701	\$8,063	\$207,321
California Department of Fish and Game Grant (P0310333)	\$140,914	\$161,399	\$3,000	\$305,313
California Department of Fish and Game Grant (P00210415)	\$0	\$2,034	\$0	\$2,034
State Coastal Conservancy (03051)	\$16,646	\$0	\$0	\$16,646
American Rivers (AMR58)	\$25,000	\$0	\$0	\$25,000
Pacific States Marine Fisheries Commission (P0310531)	\$0	\$25,000	\$0	\$25,000
California Department of Fish and Game grant (P0110309)	\$8,264	\$0	\$0	\$8,264
National Fish and Wildlife Foundation (2003-0122-001)	\$10,000	\$38,000	\$2,000	\$50,000
Total	\$223,381	\$403,134	\$13,063	\$639,578

From June 2003 through March 2006, 26 people worked on this project for a total of 6,535 hours. Table 2 lists personnel and hours worked throughout the entire project - including hours funded by the other grant sources listed in Table 1 above.

Table 2: Dates Worked and Person Hours Expended

	Hrs Worked
Phase 1 - June 2003 through October 2004	
1 Principal Planner – TCPD	186
1 Assistant Planner - TCPD	200
1 Engineer - TCDOT	20
1 Associate Engineer- TCDOT	80
1 Environmental Permitting Official – TCDOT	70
1 Engineer - TCBDS	40
1 Fisheries Consultant - Ross Taylor & Associates	10
2 Natural Resources Technicians at 40 hours each– TCPD	80
1 Botanist – TCPD	12
1 Botanist – TCRCD	20
1 Archaeologist – USFS Hayfork Ranger District	5
Phase 2 – September 2004 & August 2005 through October 2005	
1 Principal Planner –TCPD	100
1 Assistant Planner – TCPD	290
1 Associate Planner – TCPD	4
1 Engineer - TCDOT	40
1 Associate Engineer - TCDOT	600
1 Environmental Permitting Official – TCDOT	50
1 Fisheries Consultant – Ross Taylor & Associates	30
8 Construction Crew Members at 520 hours each (Subcontractors–13 wks)	4160
8 Construction Crew Members at 55 hrs each - TCDOT	440
Phase 3 - November 2005 through March 2006	
1 Assistant Planner – TCPD	18
8 Construction Crew Members at 10 hrs each (TCDOT & Subcontractors)	80
TCDOT = Trinity County Department of Transportation; TCRCD = Trinity County Resource Conservation District; TCPD = Trinity County Planning Department-Natural Resources Division; TCBDS = Trinity County Building and Development Services; Ross Taylor & Associates	

Attachment 2

Photo-Documentation log

Project Location 7.5 minute quadrangle map

Project watershed map

Attachment 3

Project Access Information and Landowners

All construction activity took place within the County Road right-of-way. The property ownership adjacent the project area consists of private and US Forest Service lands. Due to the proximity of the project area to several residences, 5C staff mailed notification to landowners in October 2003 that detailed the project activities and construction plans. Several articles were also published in the Trinity County Journal, notifying the public of proposed activities and project progress. A public meeting was held at the Trinity County Public Library to discuss project permitting and answer any questions. Landowners were notified by letter of this public meeting and notification was also published in the Trinity County Journal.

In August 2005, prior to construction, adjacent landowners were notified by letter of the proposed construction timeline and detour information. The United States Forest Service was also notified as they are the primary landowner upstream of Crossing #2.

Adjacent Landowner Names and Address Information:

Frank Chapman

PO Box 73
Junction City, CA 96048

Andrew Franklin

PO Box 1676
Weaverville, CA 96093

Steve and Colleen Ryberg

PO Box 713
Weaverville, CA 96093

Randall Steinbeck

PO Box 397
Junction City, CA 96048

John and Kathleen Dunn

PO Box 285
Junction City, CA 96048

USDA Forest Service

Shasta-Trinity NF – TRMU
200 Main Street
Weaverville, CA 96093

Attachment 4

Complete As-Built Project Description

Crossing #1=Evans Bar Road - Crossing #2 = Dutch Creek Road

Phase 1: Preparation for field work by initiating engineering design, hydrologic analysis, geotechnical investigation, permitting and landowner outreach.

- 1) Landowner agreements were signed and a field meeting was completed.
- 2) Rare plant surveys were completed by the Trinity County Resource Conservation District (TCRCD) and the Trinity County Planning Department (TCPD) botanist.
- 3) Archaeological surveys were completed by Mark Arnold, (USFS consulting archaeologist) in July 2004.
- 4) An evaluation of Environmental Impacts (Initial Study) was completed on December 17, 2003 pursuant to the California Environmental Quality Act (CEQA). The document was routed for comment through the State Clearinghouse and distributed to interested agencies. A Notice of Public Hearing was published in the Trinity Journal. The public comment period officially closed on January 22, 2004.
- 5) Through preparation of the Initial Study, it was determined that the project, with the proposed mitigation, would not have a significant adverse effect on the environment. A Mitigated Negative Declaration was generated and approved by the Trinity County Planning Commission on February 12, 2004. A Notice of Determination was subsequently posted at the Trinity County Courthouse and with the Office of Public Research, California State Clearinghouse.
- 6) Right-of-Entry agreements were obtained from each landowner for access during the topographic/hydrologic surveys and throughout the construction period.
- 7) A geo-technical investigation was conducted and preliminary results were prepared by Blackburn Consulting, Inc in mid January, 2004. A final report was provided in April, 2004.
- 8) On-site meetings with biologists and engineers from the California Department of Fish and Game (CDFG) and the National Oceanic and Atmospheric Administration-Fisheries (NOAA-Fisheries) were held to review engineering and design factors.
- 9) Topographic and hydrologic surveys were conducted by TCPD and Trinity County Building and Development Services (TCBDS) staff. Survey data was entered into AutoCad for further hydraulic/hydrologic analysis.
- 10) Initial design concepts were developed in cooperation with the Trinity County Department of Transportation (TCDoT) and the TCBDS.
- 11) Natural Resources staff met with representatives from the USFS Weaverville Ranger District to initiate the National Environmental Policy Act (NEPA) process. The USFS determined that a Categorical Exclusion (CE) would serve as the appropriate level of NEPA documentation for this project. Natural Resources staff from TCPD completed the CE.
- 12) The USFS, Weaverville Ranger District, concurred with the TCPD NEPA analysis and issued a Decision Memo on August 30, 2004.
- 13) A bid package was prepared, advertised and approved by the Trinity County Board

of Supervisors in Fall 2004 and a contract to construct both projects was awarded to Roger Brown Construction of Willow Creek, CA.

- 14) The metal arch structures and other materials were ordered from Big "R" Manufacturing.
- 15) A "Tiering" letter from the NOAA-Fisheries branch was received on September 16, 2004.
- 16) A CDFG 1601 Streambed Alteration Agreement, filed by CDFG, was received on September 15, 2004.
- 17) The US Army Corp of Engineers (ACOE) issued a letter authorizing the project under Regional General Permit for Fish Passage/Sediment Reduction Projects at Water Crossings, RGP-01, pursuant to Section 404 of the Clean Water Act on November 8, 2004.
- 18) The Trinity Journal, a local newspaper, was contacted and began a photo series of the project from concept to completion.

Phase 2: Diversion structure, fish relocation, structural excavation, footing and arch construction, placement of rip-rap, removal of unnatural fills and diversions.

1) Diversion Structure, Fish Relocation & Structural Excavation:

After installing fish screens upstream of the overall project area, an area was excavated between the upstream screen and the actual zone of construction. This area was lined with plastic sheeting to collect and direct flow into a 15"- HDPE diversion pipe within the 96"-culvert. The diversion pipe outlet was located in a pool, downstream of the work area. After installing the diversion pipes, the upstream and downstream pool areas were electrofished and species were catalogued and released downstream of the work area. No fatalities occurred during the fish relocation efforts at either crossing. Crossing #1 was unique in that the diversion structure, fish relocation, culvert excavation and detour bridge placement all occurred in September 2004. Excavating the culvert in 2004 allowed the stream to overwinter and cut down to more natural grade by August 2005 when the arch installation phase began. The excavations of both culverts began with the same process of fish screening, diversion installation and electrofishing the work area. At both crossings, minimal tree removal was necessary (some mature alder and 10-foot tall willow tees). An excavator was used to break up the road material over the culverts and remove the backfill material to a suitable predetermined spoils location outside of the high water mark. As stated previously, Crossing # 1 was excavated in September 2004 and Crossing # 2 was excavated in August 2005.

2) Framing & Pouring the Footings:

In order to achieve a solid structure, additional concrete was required at Crossing #1 due to a critical error in the geotechnical investigation. Approximately 6 additional feet of depth on the south side and 3 additional feet of depth on the north side had to be filled in with concrete in order to bring the area for the footing base "down" to bedrock. *The following information refers to both*

Crossings (Crossing #1 was completed first): wood framing was used to form the concrete footings, wingwalls and headwall structures. Structural rebar (3/4") was used within the footing frames and 5/8" rebar was used within the headwall and wingwall frames. Rebar was tied to the Project Engineer's specifications and thoroughly inspected before concrete was poured. Long extension hose attached to concrete pump trucks were utilized to pour the footings, wingwalls and headwalls. Utilizing the hoses reduced the potential for spilled concrete in the work area. After a section of concrete was poured along the bottom of the footing frame, a vibrator was used to shake the slurry, insuring uniform settling within the frames. This process was repeated across the length of the footing forms until the required amount of concrete was poured. Six-sack concrete mix was used for this project since it has a thicker consistency and settles/cures faster and the late start in construction warranted its use. After the footing concrete cured, the wooden forms were removed and used at Crossing #2, where the same process for framing, rebar installation and concrete pouring was followed. Throughout this process, and the whole of construction, all excess water in the project area was consistently pumped to a pre-approved flat, vegetated area. After the footing surfaces were cured, the assembled arch structures were bolted to the top of the footings (discussed below). The wood framing that was used for the footings was used for the upper part of the wingwall and headwall framing. The wingwall footings were poured at the same time as the arch footings and structural rebar for the wingwalls was exposed until after the arches were installed and the wingwall and headwall concrete as poured following the same procedure as the footings. A straw bale enclosure lined with thick plastic sheeting was constructed well outside of the high water mark and used as a concrete washout area for the pump trucks and tools. After all of the concrete cured, backfill material was compacted around the concrete footings and the Project Engineer inspected compaction to insure it complied with the design and engineering standards.

3) Placing rip-rap at both Crossings:

During the excavation of the 96"-culverts, several large boulders and rock material were recovered from the crossing backfill. This material was stored in proximity to the work area and used as streambank and footing rip-rap abutment material. After the footings were poured and the framing was removed, an excavator, working from outside of the stream channel, placed rock along the inner walls of the concrete footings. Rock was placed along the interior footing bases prior to the installation of the arches, allowing for increased accuracy and ease of placement. Rock was also placed along the base of the wingwall footings and upstream of the arches, along the streambanks.

4) Assembling and Installing the Arch Structures at both Crossings:

Two metal arch structures, measuring 23-feet wide, 60-feet long and 6-feet high, had been delivered to the project site in several sections. The construction crew assembled the arch structures on site by bolting segments together. Bolt torque was inspected to specifications by the Project Engineer. Attachment bolts were set in the footings prior to the concrete pours and cleaned prior to structure attachment. The arch bases were secured to the footing attachment bolts and torque was inspected by the Project Engineer to specifications.

5) Removing all temporary fills, detour roads and diversions installed for construction purposes:

A temporary fill was installed at each crossing when the diversion structures were installed that allowed access for excavators, concrete pump trucks, and foot traffic during construction. The fills were excavated prior to removal of the diversion structure by excavating material back to natural stream bank slope. The diversion culverts and all sandbags, plastic sheeting and the oil absorbing boom structures at the outlet pools were removed. The final steps in this process was removal of the fine-meshed block nets that were installed prior to fish relocation and removal of the concrete washout stations.

6) Surfacing of the road with 0.2-foot asphalt concrete, fog line/center stripe/guardrail installation, removal of the temporary detour bridges, and maintaining traffic control throughout project construction:

Asphalt concrete material was applied to the backfilled crossing areas once the average ambient temperature exceeded the degree requirement necessary for curing. The surface area was rolled smooth with compaction equipment and the guardrails were installed once the concrete was cured. The center line striping and foglines will be installed by the Trinity County Department of Transportation once weather and temperature conditions allow for it. Once guardrails installed, the detour bridges were removed and their previous approaches were blocked with concrete K-rails. Traffic control throughout the construction period was maintained by signage and the construction crew. K-rails were installed to direct traffic onto the detour bridges and all landowners were notified prior to detour installation with a timeframe for the project duration and contact information.

Phase 3: Final Erosion Control Measures and Revegetation Efforts.

The excavated material that was not utilized to backfill the arch structures was relocated to a pre-approved permanent spoils disposal site outside of the high water mark of the stream. The area is a flat and vegetated. The spoil material was flattened out, hand-seeded with native grass species and mulched. The detour bridge approaches, work areas, and streambank approaches at both crossings were also hand-seeded with native species and mulched.