TUOLUMNE RIVER SPECIAL RUN POOL 9 RESTORATION

Project Manager
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Turlock, CA 95380

FI -134

Wilton Fryer
Water Planning Department Manager
209-883-8316
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APPLICANT:

The Turlock Irrigation District (TID) is a California irrigation district, a political subdivision of the State of California. TID is a tax exempt public agency.

CONTACTS:

For contract and project administration:	Wilton Fryer
For fishery and habitat details:	Tim Ford 209-883-8275 FAX 209-632-3864 e-mail: tjford@ainet.com

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PARTICIPANTS:

Tuolumne River Technical Advisory Committee (TRTAC) made up of the Turlock Irrigation District, Modesto Irrigation District (ModID), City & County of San Francisco (CCSF), California Dept. Of Fish & Game (CDFG), and the US Fish & Wildlife Service (USFWS). Collaborating stakeholder groups with TRTAC are the Tuolumne River Preservation Trust, Friends of the Tuolumne, California Sports Fishing Alliance , Bay Area Water Users Association, National Resource Conservation Districts, and local landowners.

COST SHARE PARTICIPANTS:

Turlock Irrigation District, Modesto Irrigation District, and City & County of San Francisco through the TRTAC and the US Fish & Wildlife Service AFRP.

PROJECT GROUP:

Group 1 The CALFED is being asked to only fund the public works construction portion of this project.

TUOLUMNE RIVER SPECIAL RUN POOL 9 RESTORATION

II. EXECUTIVE SUMMARY

SUBMITTED BY: TURLOCK IRRIGATION DISTRICT

DESCRIPTION:

The Special Run Pool (SRP) 9 Restoration Project involves restoration of instream aquatic habitat and shaded riverine aquatic habitat and reduction of predatory fish habitat for the primary benefit of San Joaquin River fall-run chinook salmon. The project will rebuild a select portion of the Tuolumne River channel, at river mile 25.9, (approximately 15 miles east of Modesto) where past instream gravel mining created a large deep lake area in the main channel. That changed the habitat to one favoring warmwater predator species like largemouth bass. This project will return this portion of the river to a more natural, dynamic morphology that will improve, restore and protect instream and riparian habitat for fall run chinook salmon survival, including restoring hydrological and geomorphic processes. The channel will be reformed into a 400 to 500 foot wide riparian flood plain re-creating a riffle and run pattern that follows the restored meander channel of the river along with native vegetation planted on fill terraces in a mix similar to that found on undisturbed segments of the river.

BIOLOGICAL OBJECTIVES:

1. Reduce salmonid fish predator habitat.
2. Restore and increase habitat for natural salmon production.
3. Reconstruct a natural channel geometry scaled to current channel forming flows.
4. Restore native riparian plant communities within their predicted hydrological regime.

TASKS & SCHEDULES:

1. to 3.	Non CALFED funded tasks from Aug 97 to Mar 98	
4.	Construction bidding:	Apr 98
5.	Construction:	Jun 98 through Oct 98
6.	Revegetation bidding:	Oct 98
7.	Revegetation:	Dec 98 through Feb 99

JUSTIFICATION:

The fall run chinook salmon in the tributaries of the San Joaquin River are currently listed as a species of concern by the USFWS. Anadromous salmonid populations in the lower Tuolumne River require adequate ecosystem health to achieve and sustain their potential productivity. Restoring and maintaining dynamic geomorphic processes are crucial for insuring healthy river ecosystems with natural productive salmonid populations. When complete restoration of a river ecosystem is infeasible, as for alluvial rivers regulated by dams, limiting factors, like predator habitat reduction, must be identified for prioritizing actions that would best improve the ecosystem, particularly salmonid habitat. Predation on juvenile salmon has been identified through field studies in the Tuolumne River as having a significant impact on survival of salmon in the Tuolumne River. Currently nearly all naturally produced salmon juveniles and smolts must pass through SRP 9 on their out migration.

BUDGET:

The CALFED is being asked to fund the construction and revegetation portions of th project. The total amount requested from CALFED is $2,353,100. This is $1,965,300 for construction, $117,100 for Revegetation, and $270,700 for project and construction manage The CEQA, NEPA, permitting, and construction design needed prior to construction will b with cost share funds by TID, ModID & CCSF and USFWS-AFRP.

APPLICANT QUALIFICATIONS:

Since 1971, TID, ModID, and CCSF have, in cooperation with DFG and USFWS, monitored river conditions and developed programs that enhance natural production of fall salmon. Tim Ford has been the staff biologist for the TID and ModID since 1981. Biol consultants, such as those with the firms EA Engineering and Stillwater Science , have bee conducting numerous studies for the Districts on the current salmon habitat since 1987. of McBain & Trush have experience in developing restoration plans for river systems in California.

MONITORING PLAN:

The monitoring plan can be grouped into three basic areas.

1. Physical habitat changes: Pre and post construction changes will be r from the as-built engineering drawings. This assures that the desired chan contours and cross sections were built as designed and these as-built reco be used to assess future geomorphological changes after major flood even
2. Riparian habitat changes: Revegetation will require annual inspections the first three years to confirm survival of planted materials, perform repla deemed necessary, and to assess natural changes in the vegetation mix. Monitoring vegetation would then be reduced to evaluations after significa flood events.
3. Fish population changes: This will involve evaluation of pre and post changes in habitat conditions for both fish predators and salmon. Monitorin criteria would include items such as flow velocity, temperature, comparison estimated transit time through the old vs new stream channel, combined sampling and observations of fish populations and riffle spawning conditi

LOCAL SUPPORT; COORDINATION WITH OTHER PROGRAMS

The overall SRP 9 and adjacent SRP 10 projects have been approved by the TR participants. The TRTAC has allocated $50,000 in cost share funds to be provided by TI ModID, and CCSF for this project. Coordination meetings have already been held with the affected landowners in the project area and with federal, state and county agencies. Recognizing that their individual concerns need to be addressed, the land owners have cooperative and supportive of the project. USFWS has been supportive of the project working with TID to obtain AFRP funding for portions of the overall project.

III. PROJECT DESCRIPTION

PROJECT DESCRIPTION AND APPROACH

The Tuolumne River Technical Advisory Committee (TRTAC), under the auspices of the 1995 Don Pedro Project Settlement Agreement (FERC License No. 2299), is developing a plan to restore instream aquatic habitat and shaded riverine aquatic habitat for the primary benefit of San Joaquin fall-run chinook salmon in the Tuolumne River below La Grange dam. The TRTAC specifically identified both SRP 9 & SRP 10 as prime "predator isolation" projects for the Tuolumne River. The geomorphological firm of McBain & Trush has developed a detailed description of the proposed restoration work for the TRTAC; a copy is attached for your information and reference.

There are two adjacent restoration construction segments, with their associated revegetation, over a two year period, with SRP 9 to be reconstructed first in 1998 and hopefully followed the next year by SRP 10. These two are stand alone projects, however the CEQA, NEPA, permitting, civil design, and revegetation design are being done together in anticipation of future CALFED and AFRP funding for the SRP 10 restoration construction. The work consists of filling in deep (6 to 19 feet below normal channel grade in SRP 9), lake like, pool areas created by past instream gravel mining and re-creating the riffle and run pattern that follows the restored meander channel of the river. The channel will be reformed into a 400 to 500 foot wide riparian flood plain complete with native vegetation planted on fill terraces in a mix similar to that found along undisturbed segments of the river. Figures 4 and 5 (from the McBain & Trush design report) show typical cross-sections through the restored area. The aerial extent of the project area is shown in Figure 5 and the restoration work proposed is shown in Figure 6. The reconstructed floodway channel cross-section will be hydraulically sized to be an active riverine channel at currently regulated flows. These flows periodically could reach as high as 15,000 to 20,000 cfs for short periods. The rebuilt channel is sized assuming a river stage elevation that results from full grown riparian forest vegetation at design flows. It is anticipated and planned that during these high flow events there will be some movement of the channel within the flood plain to expose added spawning materials and clean existing spawning gravels. To minimize long term future maintenance expenditures, this restoration work is being designed with the intent to provide a self maintaining riparian floodway channel once the revegetation is completed and established.

LOCATION

The Special Run Pool 9 Restoration Project will rebuild a 1,200 foot long select portion of the Tuolumne River channel, starting at river mile 25.9, just downstream of the Geer Road bridge crossing the Tuolumne River, approximately 15 miles east of Modesto in Stanislaus County. The project location is shown in Figure 1 from the McBain & Trush design report.

EXPECTED BENEFITS

1. Reduce salmonid fish predator habitat.

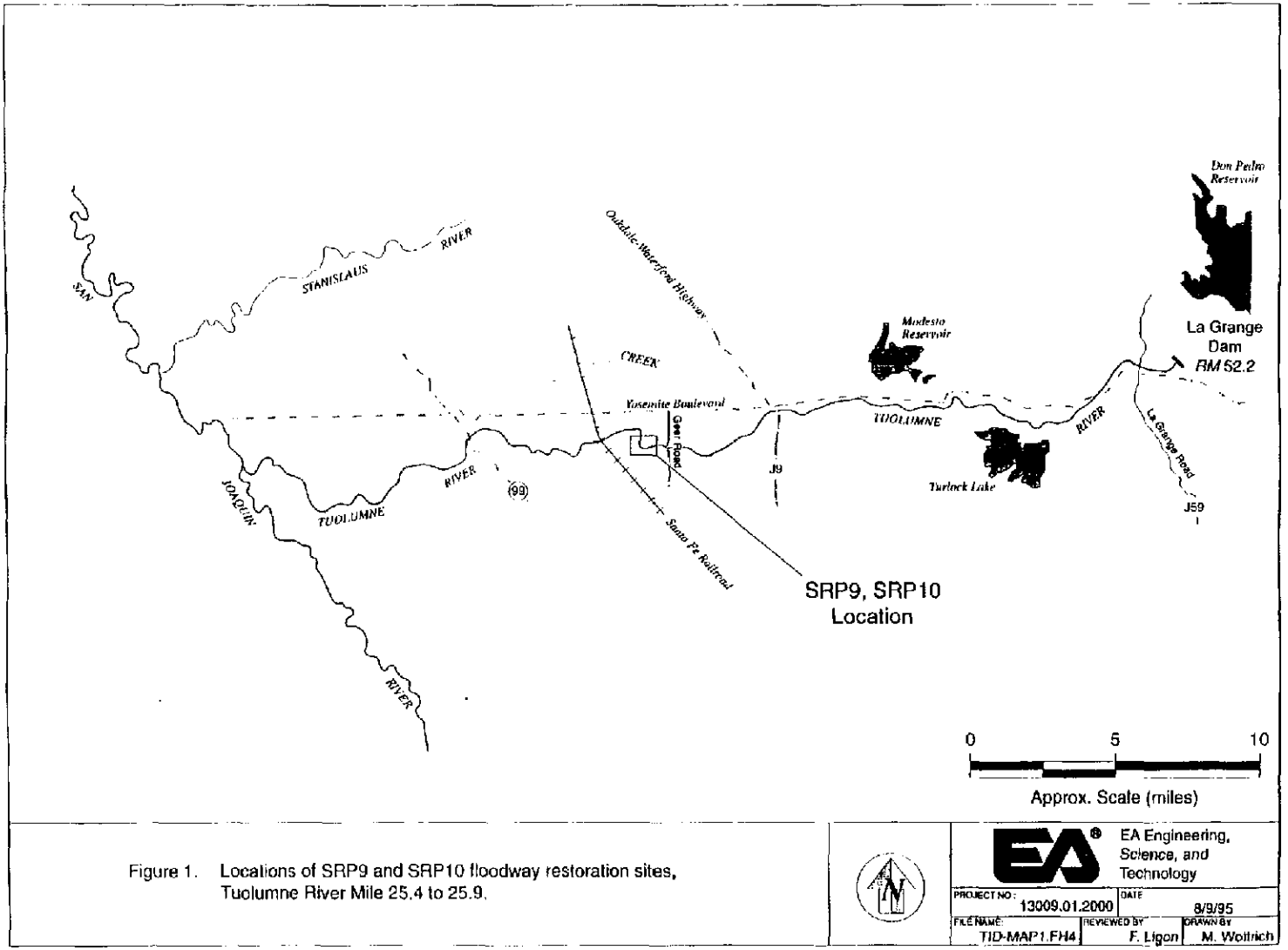

Figure 1. Locations of SRP9 and SRP10 floodway restoration sites, Tuolumne River Mile 25.4 to 25.9.

EA Engineering, Science, and Technology

PROJECT NO:	DATE	
13009.01.2000	8/9/95	
FILE NAME:	REVIEWED BY:	DRAWN BY:
TID-MAP1.FH4	F. Ligon	M. Woltrich

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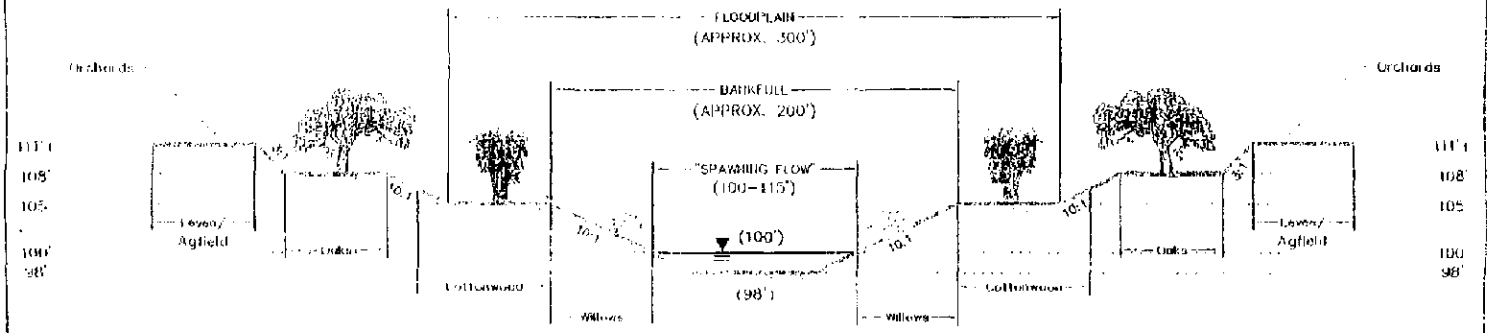
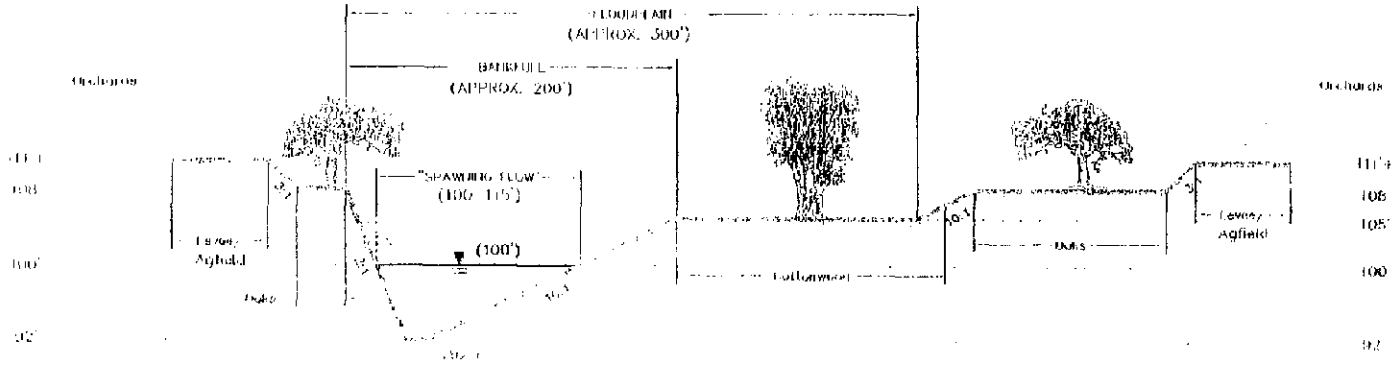


NOTES:
SIDE SLOPE: Horizontal:Vertical
ELEVATION: Arbitrary Datum
5X Vertical Exaggeration

Figure 1 Conceptual Design Cross-Section through riffle (alternate bar crossover).

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

PROJECT NO: 13009.01.2000	DATE: 7/25/95
FILE NAME: EA-RESXS.DWG	REVIEWED BY: F. Ligon



NOTES:
SIDE SLOPE: Horizontal:Vertical
ELEVATION: Arbitrary Datum
5X Vertical Exaggeration

Figure 5. Conceptual Design Cross Section through apex of pond bar.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

PROJECT NO.: 13009.01 2000	DATE: 7/25/95
FILE NAME: EA-PTBAR.DWG	REVIEWED BY: [illegible]

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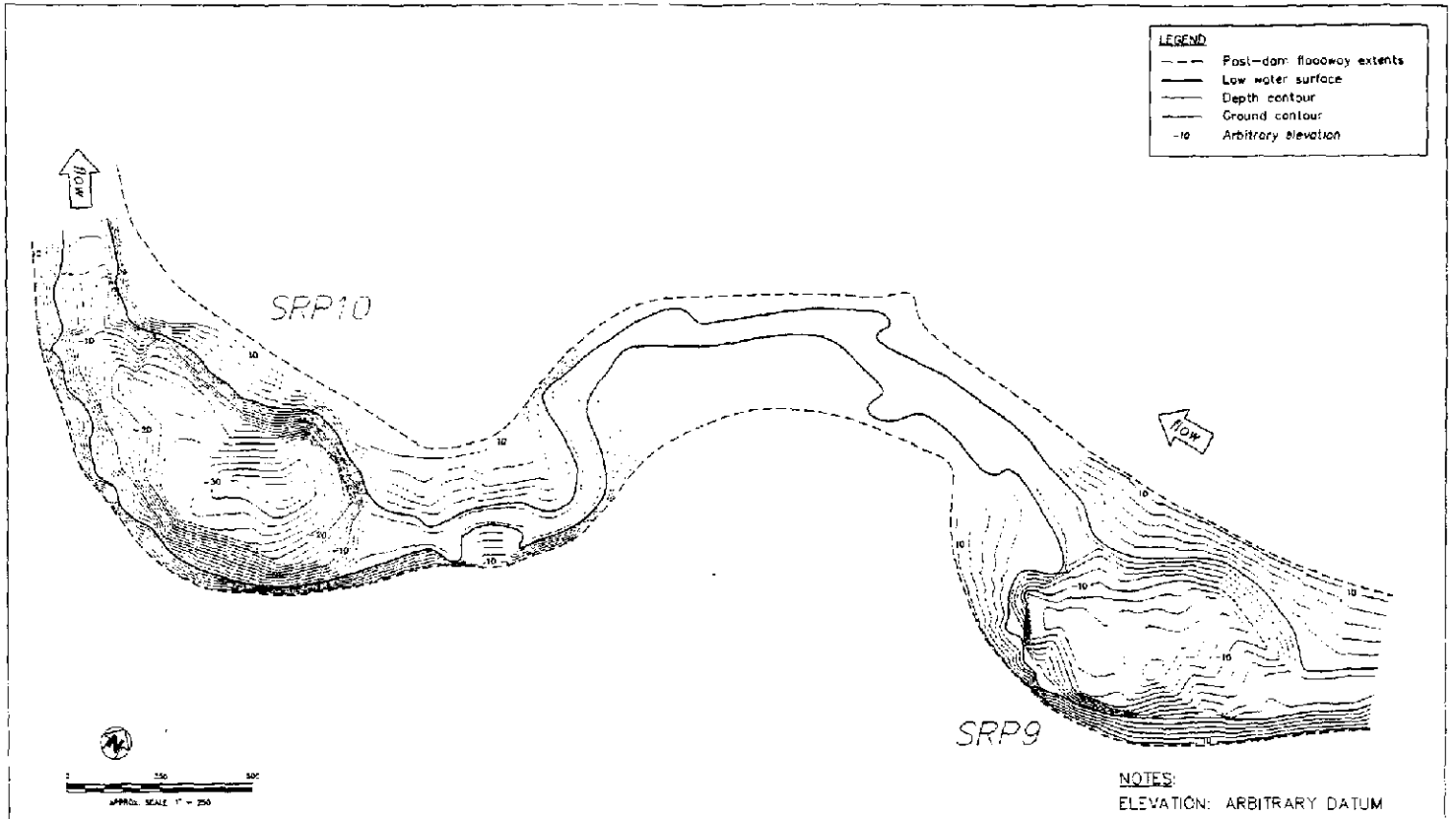

Figure 6 SRP9-10 - Existing Topography

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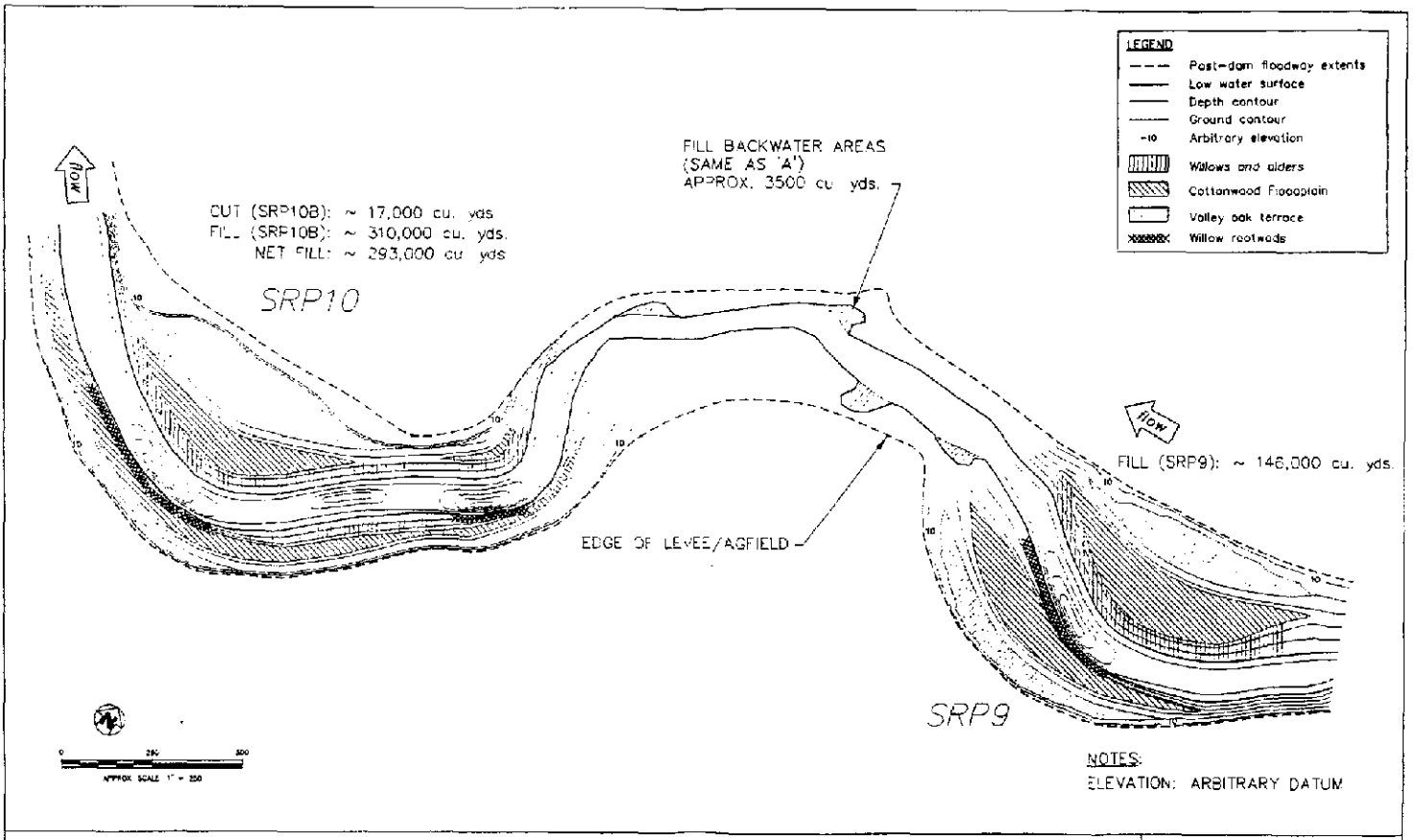

Figure 7. SRP9-10 - Design 'B'

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2. Restore and increase habitat for natural salmon production.
3. Reconstruct a natural channel geometry scaled to current channel forming flows.
4. Restore native riparian plant communities within their predicted hydrological regime.

BACKGROUND & TECHNICAL JUSTIFICATION

The Tuolumne River is a major tributary of the San Joaquin River. The Don Pedro Project is the largest reservoir located above the fall-run chinook salmon spawning reach on the Tuolumne. Don Pedro Reservoir is owned by the Turlock Irrigation District (TID) and the Modesto Irrigation District (ModID) and is licensed by the Federal Energy Regulatory Commission (FERC).

The fall run chinook salmon in the tributaries of the San Joaquin River are currently listed as a species of concern by the USFWS. Anadromous salmonid populations in the lower Tuolumne River require adequate ecosystem health to achieve and sustain their potential productivity. Restoring and maintaining dynamic geomorphic processes are crucial for insuring healthy river ecosystems with natural productive salmonid populations. When complete restoration of a river ecosystem is infeasible, as for alluvial rivers regulated by dams, limiting factors, like predator habitat reduction, must be identified for prioritizing actions that would best improve the ecosystem, particularly salmonid habitat. Predation on juvinile salmon and smolts has been identified through field studies as having a significant impact on survival of salmon in the Tuolumne River. Currently nearly all naturally produced juvinile salmon must pass through SRP 9 and SRP 10.

The TRTAC specifically identified habitat conditions to be improved to enhance natural salmon production in the Tuolumne River. The TRTAC is developing an integrated, long-term restoration plan and monitoring program that utilizes adaptive management for enhancing the natural production of salmon. The TRTAC and the AFRP are each funding $105,000 towards this integrated restoration plan that will be completed in December 1997. The river has been divided into four reaches with 14 segments representing specific types of restoration projects within each reach. There are projects that focus on restoration of geomorphic processes, others for riparian restoration, and still others deal with gravel re-introduction and cleaning.

The Tuolumne River supports a population of fall-run chinook salmon, whose numbers have fluctuated from 40,000 fish in 1985, to a low of 100 fish in 1991, and is on another upward swing with 3,000 spawners in 1996. The underlying premise of this project is that by creating the proposed sustainable riverine habitat both the native fishery and riparian species will benefit and stressors will be reduced. The prime target of this project is to improve the survival of juvinile salmon and smolts by reducing the habitat of introduced predator species, primarily largemouth bass. The impacts of predators on smolt survival are based on feeding studies conducted by EA Engineering for the Districts. The riparian reforestation is intended to provide food and shade for the juvinile salmon. There is the added benefit to terrestrial species in providing a more continuous corridor of riparian habitat in the restored areas. The restored channel sinuosity is intended to provide a sustainable and dynamic river morphology, i.e. infrequent flood-related channel-bed movement with periodic scour, that partially or fully

restores the processes associated with natural salmon production and survival.

This proposed restoration project provides long term low maintenance predator control combined with habitat restoration. This can be contrasted with an annual system of non-selective predator control, such as electroshocking, tournament fishing, poisoning, etc., that has a lower up front cost. However, this alternative solution requires continued annual expenses, is of limited effectiveness in targeting the primary predators, has unfavorable social consequences, and does not meet the intent of the CALFED solutions by providing an improved self sustaining riverine habitat for salmon. Such alternatives will not be considered further.

PROPOSED SCOPE OF WORK

TASKS & SCHEDULES:

1.	Preliminary project design:	Complete
2.	CEQA, NEPA, & permitting:	Aug 97 through Dec 97
3.	Civil design for construction:	Jan 98 through Mar 98
4.	Construction bidding:	Apr 98
5.	Construction:	Jun 98 through Oct 98
6.	Revegetation bidding:	Oct 98
7.	Revegetation:	Dec 98 through Feb 99

The SRP 9 & SRP 10 projects were originally developed as one project because of their proximity to each other along the river. From a practical construction and funding view point they are two projects, each with a very similar scope of work. The lessons learned in first constructing the smaller SRP 9, will be incorporated in adjusting the final design of SRP 10. The SRP 10 project will be submitted later as a future CALFED cost share proposal.

The heavy reconstruction work in the river is anticipated to be limited for fishery reasons to an annual opportunity window of about 90 work days from mid-June through September when salmon are not as abundant in the river. It may be possible to stockpile fill materials at the site before the 90 day period to reduce the truck traffic during the construction period. Construction above the water level can proceed after September, but should be completed before about December to avoid the potential of early flood releases damaging incomplete work. The restoration plantings are also seasonally restricted to the winter months when planting materials are dormant. It is hoped that the agencies involved with the permitting will work with the District in meeting these operational restrictions. Design and permitting will be done for both SRP 9 & 10 at the same time. The funding requests are divided along the different design, construction, and revegetation phases of the project for ease of managing and tracking.

The materials for this project will need to be imported into the site. There are deposits of dredger tailings along the upper Tuolumne River and near Snelling along the Merced River. We will also utilize some of the clean rock materials from January 1997 flood debris excavated from La Grange reservoir. Alternatively, the material could come from active off channel and off site gravel mining areas between Geer Road and La Grange. The materials cost estimates are based on the La Grange reservoir source and include excavation, hauling, and haul road construction costs. The materials are owned by TID and ModID and they will donate the available material as

a cost share contribution. The restoration fill materials will need to hauled to the site over public roads, and this is anticipated to be one of the short term environmental concerns to be mitigated.

Recreation of the riparian floodway habitat zone raises an issue of long term maintenance of project improvements. TID and ModID are looking into developing some form of locally administered conservation easement process that protects the public investment, but at the same time protects the land owner's property rights.

MONITORING PLAN

The monitoring plan can be grouped into three basic areas.

1. Physical habitat changes: Pre and post construction changes will be recorded from the as-built engineering drawings. This assures that the desired channel contours and cross sections were built as designed and these as-built records can be used to assess future geomorphological changes after major flood events.
2. Riparian habitat changes: Revegetation will require annual inspections during the first three years to confirm survival of planted materials, perform replanting if deemed necessary, and to assess natural changes in the vegetation mix. Monitoring vegetation would then be reduced to evaluations after significant flood events.
3. Fish population changes: This will involve evaluation of pre and post project changes in habitat conditions for both fish predators and salmon. Monitoring criteria would include items such as flow velocity, temperature, comparisons of estimated transit time through the old vs new stream channel, combined with sampling and observations of fish populations and spawning riffle conditions.

IMPLEMENTABILITY

This is the first of several restoration projects being proposed for the Tuolumne River based on the restoration plans being developed by the TRTAC. The staff is also working closely with the affected landowners in the development of site specific adjustments to the preliminary plans. A consultant will be hired to assist with the CEQA, NEPA, and permitting work. Our NEPA work will be coordinated with that being developed by the USFWS in their AFRP cost share program on this project. Since these are environmental restoration projects, it is anticipated that a FONSI and Mitigated Negative Declaration can be obtained.

A partial list of the anticipated permits and agencies to be dealt with prior to construction is as follows: 404 Fill & Dredge Permit from the USCOE; 1600 Series Streambed Alteration Agreement from CDFG, a mining lease and Boundary Delineation finding from the State Lands Commission; an exemption from the SMARA permit by the CMGB; Stanislaus County use permit; RWQCB 401 waiver for water quality; and an Encroachment Permit from the Reclamation Board.

IV. COSTS AND SCHEDULES

BUDGET COSTS

The CALFED is being asked to fund the construction and revegetation portions of this project. The total amount requested from CALFED is $2,353,100. This is $1,965,300 for construction, $117,100 for Revegetation, and $270,700 for project and construction management. The CEQA, NEPA, permitting, and construction design needed prior to floodplain reconstruction will be paid with cast share funds by TID, ModID, CCSF, and USFWS-AFRP.

TID has been coordinating with several different agencies to obtain funding for the SRP 9 and SRP 10 projects. TID, ModID, and CCSF will provide $46,000 through the TRTAC for CEQA, NEPA, and permitting. The USFWS through AFRP is being asked to provide $295,000 spread over two of their fiscal years for pre and post project monitoring and construction design. A spreadsheet titled "AFRP- CALFED Matrix for 1997 & 1998 Funding" is attached showing these other anticipated funding sources, the periods of expenditures, and associated project work for all the contributing agencies.

The costs of this restoration project compare favorably with estimates prepared by DWR and CDFG for 4 Pumps financing of five planned predator isolation and habitat restoration projects along 3.5 miles of the Merced River near Snelling.

SCHEDULE

The schedule below shows all the work components even though CALFED is being asked to fund only public works elements 4 through 7. Early assurance of funding will allow construction and revegetation bidding to proceed if CEQA, NEPA, permitting and civil design are completed ahead of schedule.

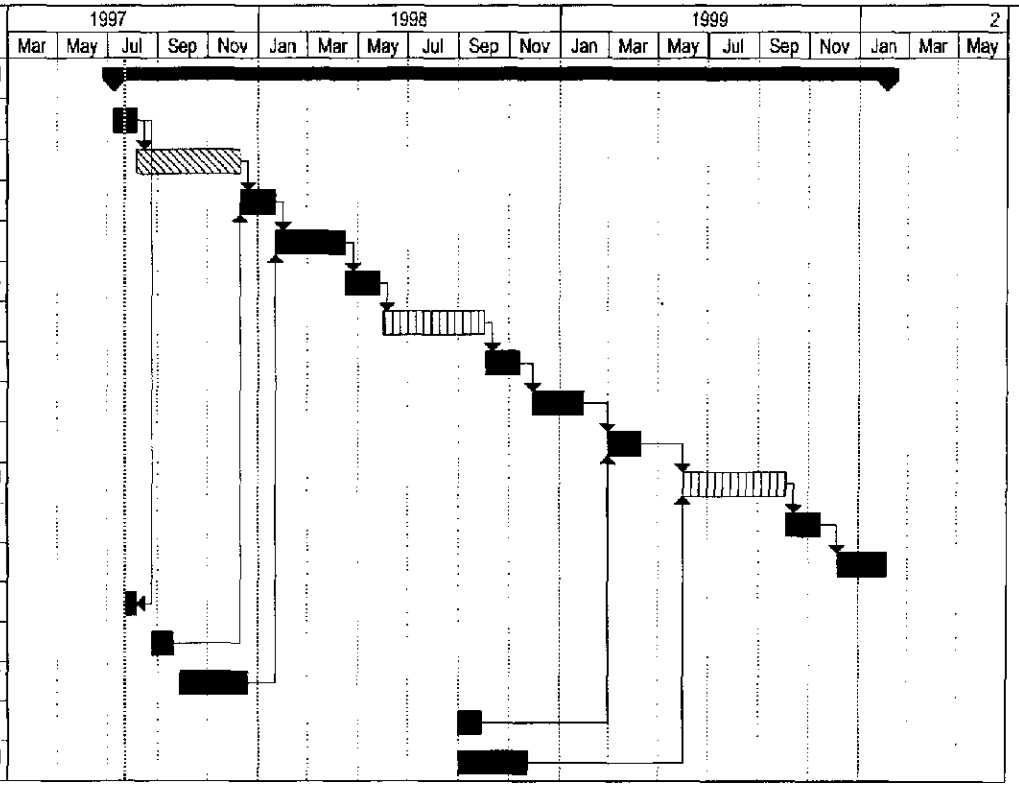
1.	Preliminary project design:	Completed
2.	CEQA, NEPA, & permitting:	Aug 97 through Dec 97
3.	Civil design for construction:	Jan 98 through Mar 98
4.	Construction bidding:	Apr 98
5.	Construction:	Jun 98 through Oct 98
6.	Revegetation bidding:	Oct 98
7.	Revegetation:	Dec 98 through Feb 99

The attached Gantt chart shows the interconnection of activities for both the current SRP 9 Project and the future SRP 10 Project that will be in a future proposal to CALFED RFP submittal.

THIRD PARTY IMPACTS

The parties most directly impacted by the proposed project are the local landowners at the project site, those along the haul road route, and the County Roads Department. As described in Part V below, TID staff and consultants have been and will continue to meet with the affected

ID	Task Name	Duration
1	SRP 9 & 10 (1998)	672d
2	CONTRACT CEQA \ NEPA	20d
3	SRP 9-10 CEQA & PERMITS	90d
4	CONTRACT CIVIL ENG	30d
5	CIVIL 9-10 SITE DESIGN	60d
6	LET SRP 9 CONTRACT	30d
7	CONSTRUCTION SRP 9	90d
8	REVEG CONTRACT SRP 9	30d
9	REVEG SRP 9	45d
10	LET SRP 10 CONTRACT	30d
11	CONSTRUCTION SRP 10	90d
12	REVEG CONTRACT SRP 10	30d
13	REVEG SRP 10	45d
14	TRTAC FUNDING	10d
15	AFRP FUNDING FOR 97 & 98	20d
16	CALFED FUNDING FOR 98	60d
17	AFRP FUNDING FOR 99	20d
18	CALFED FUNDING FOR 99	60d



Project: RESTORATION PROGRAM
SRP 9 & 10
Date: 7/22/97

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

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AFRP - CALFED Matrix For 1997 & 1998 Funding

USFWS fiscal year 1998 = Oct 97 to Sep 98
CALFED fiscal year 1998 = July 97 to Jun 98
TRTAC fiscal year 1998 = Jan 98 to Dec 98

14-Jul-97

Plan item	Phase # from design map	Funding period 1997	1998	months	Funding Source
SRP 9 & 10 Reach					
Permitting for both		$46,000		Jul 97 - Dec 97	TID-MID-CCSF
pre & post project monitoring		$75,000	$75,900	Jul 97 - Sep 97	AFRP
Const. Design for SRP 9			$78,400	Jan 98 - Mar 98	AFRP
Const. SRP 9			$2,082,400	Jul 97 - Sep 98	CALFED
Project & Const. Mgt.	13 %		$270,700	Jan 98 - Sep 98	CALFED
Project & Const. Mgt.	13 %		$20,100	Jan 98 - Sep 98	AFRP
	sub totals	$121,000	$2,527,500		
	TOTALS	$75,000	$174,400	$249,400	AFRP
		$0	$2,353,100	$2,353,100	CALFED
		$46,000	$0	$46,000	TID-MID-CCSF

stakeholders to listen to and address their individual concerns. Recognizing those individual concerns, the landowners at the site contacted to date have been cooperative and supportive of the project.

If materials for the major setback levees must be transported by truck to the project site from outside the immediate area, then there are potential third party impacts to persons and properties adjoining the roads over which the materials need to be hauled. These will be short duration construction related impacts that will be identified in the environmental documentation. Possible impacts from excavation of the materials would be addressed in the applicable County and SMARA permits for each aggregate mining site.

The local environmental groups associated with the Tuolumne River have worked through the TRTAC on the development of the restoration plan for the entire river and have reviewed the site specific project plans.

Those fishermen that fish for largemouth bass in the old mined out areas may be impacted, but a different fishery will become available to them. There may be short term impacts on boating in the river during those periods when construction is permitted in the river.

V. APPLICANT QUALIFICATIONS

Since 1971, TID, ModID, and CCSF have, in cooperation with DFG and USFWS, monitored river conditions and developed programs that enhance the natural production of fall-run chinook salmon in the Tuolumne River. The project manager for these activities has been TID.

Project Management

The enclosed table shows the planned organization of TID staff, consultants, and other resources to be used in implementing this project.

The Project Manager is Wilton Fryer, P.E. Mr. Fryer graduated from the University of California at Davis with a B.S. in Soil & Water Science, an M.S. in Irrigation Science, and later an M.E. in Civil Engineering with an emphasis in water resources. He is currently registered as both a Civil Engineer and an Agricultural Engineer. Accomplishments are: Development and implementation of the Oakdale Irrigation District Irrigation Master Plan; Directed a $22 million canal rehabilitation project for OID where 54 miles of dirt canals were replaced with pipe; Development of the OID domestic water service system; Designer and project manager for a replacement water treatment plant for the La Grange Domestic Water System.

Mr. Fryer will be assisted by Tim Ford, staff aquatic biologist for TID and ModID since 1981. Mr. Ford graduated from the University of California at Davis with a B.S. in Wildlife & Fisheries Biology in 1977. He worked as a Biological Technician for the Modoc, Tahoe, and Stanislaus National Forests prior to working for the districts. Mr Ford is tasked with planning, coordinating and conducting the aquatic resources program for the districts, and his responsibilities at TID include field studies, program development, consultant supervision, and coordination with Don Pedro project operations.

Contracting support and financial service support as needed will be provided by TID staff.

Qualified consultants will be retained to perform the CEQA and NEPA environmental work and to obtain necessary permits and easements. TID has issued a request for proposals has been issued for this work.

TID Engineering will provide construction management and inspection services to the project. It is anticipated that a licensed professional civil engineer will be assigned to perform these duties.

For ease of coordination and verification of on-site conditions, it is anticipated that a local qualified consulting engineering firm will be retained to prepare the civil construction design work.

Project design work has been performed by McBain & Trush who will continue to provide oversight of the civil construction design work and revegetation design and

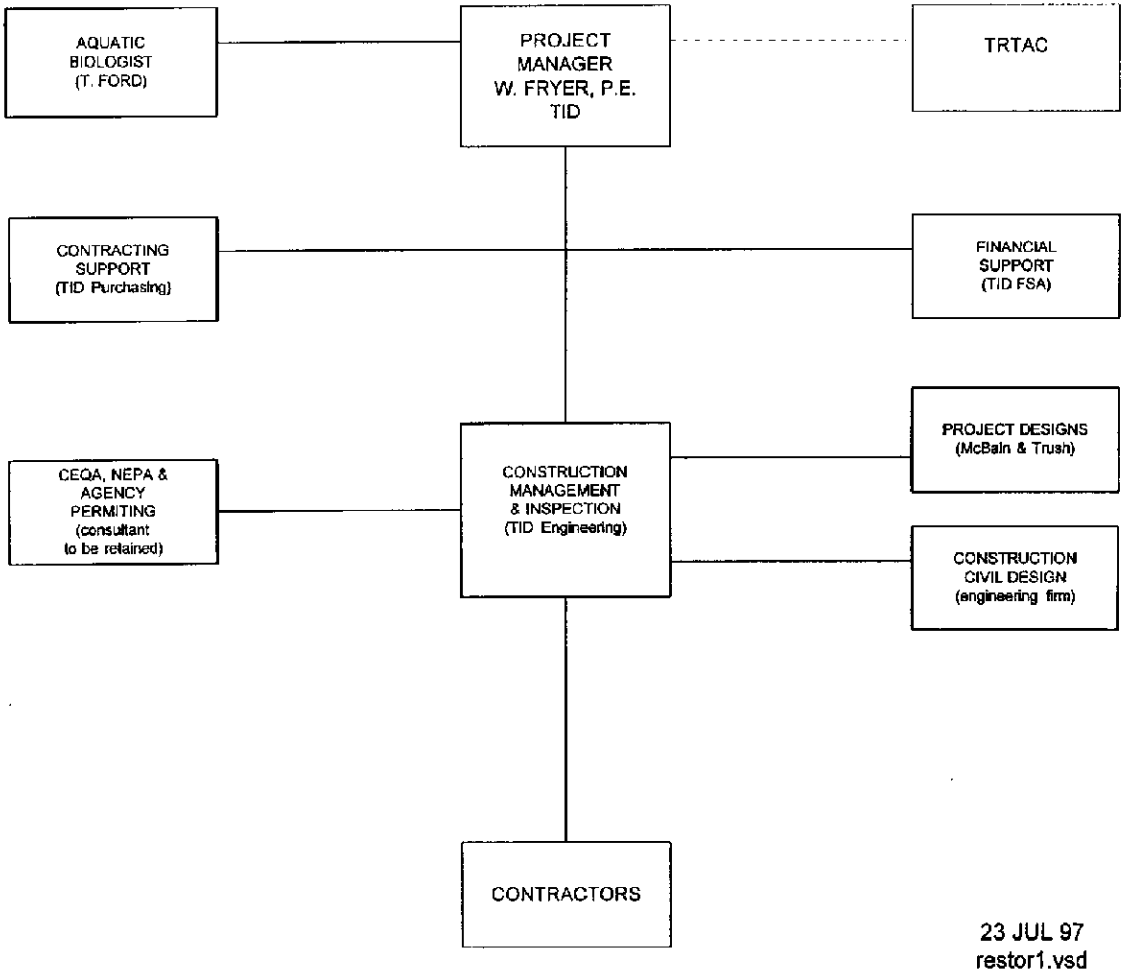
implementation. McBain & Trush is a professional consulting partnership specializing in applying fluvial geomorphic and ecological research to river management and restoration, particularly in regulated river ecosystems. The principals on this project are Scott McBain, Dr. William Trush, and John Bair.

Scott McBain is a hydraulic engineer and fluvial geomorphologist with a M.S. in Civil Engineering from the University of California at Berkeley. He specializes in effects of high stream flows on channel morphology, bedload transport, watershed sediment yields, and stream restoration

Dr. William Trush is an adjunct professor in the Humboldt State University Fisheries Department, specializing in anadromous fish ecology, anadromous fish interactions with fluvial geomorphology, channel maintenance flows and hydrology, riparian ecology, and stream restoration and management. He is also Director of the HSU Institute for River Ecosystems.

John Bair is a riparian botanist with a M.S. in Environmental Systems form Humboldt State University. He specializes in riparian interactions with geomorphic processes and riparian restoration.

TUOLUMNE RIVER RESTORATION
PROJECTS



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VI. COMPLIANCE WITH STANDARD TERMS & CONDITIONS

Applicant is a public entity. The applicable RFP project group type is Group 1, P... Works Construction.

The applicant agrees to the terms and conditions of the Request for Proposals as ... by CALFED's Responses to RPF Questions dated 14 July 1997, and applicant intends to ... with those terms and conditions.

It is anticipated that a majority of the public works construction effort will be per... by private contractors. Pursuant to Question and Response 25 of the above CALFED Res... the applicant will be deferring the requirement for submission of bid & payment bonds ... time as each subcontract is sought and awarded and before any work under the subcon... performed.

Enclosed are the following completed formes:

Nondiscrimination Compliance Statement, RPF Item No. 8
Noncollusion Affidavit - Public Works, RPF Item No. 11

Submitted by:

TURLOCK IRRIGATION DISTRICT

By _____
Paul D. Elias, General Manager

Date: 28 July 1997

VI. COMPLIANCE WITH STANDARD TERMS & CONDITIONS

Applicant is a public entity. The applicable RFP project group type is Group 1, Public Works Construction.

The applicant agrees to the terms and conditions of the Request for Proposals as amended by CALFED's Responses to RPF Questions dated 14 July 1997, and applicant intends to comply with those terms and conditions.

It is anticipated that a majority of the public works construction effort will be performed by private contractors. Pursuant to Question and Response 25 of the above CALFED Responses, the applicant will be deferring the requirement for submission of bid & payment bonds until such time as each subcontract is sought and awarded and before any work under the subcontract is performed.

Enclosed are the following completed formes:

Nondiscrimination Compliance Statement, RPF Item No. 8
Noncollusion Affidavit - Public Works, RPF Item No. 11

Submitted by:

TURLOCK IRRIGATION DISTRICT

By _____
Paul D. Elias, General Manager

Date: 28 July 1997

Item 8

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

Turlock Irrigation District

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME

Paul D. Elias

DATE EXECUTED

July 28, 1997

EXECUTED IN THE COUNTY OF

Stanislaus

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE

General Manager

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Turlock Irrigation District

Item 11

Agreement No. _____

Exhibit _____

NONCOLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID FOR PUBLIC WORKS

STATE OF CALIFORNIA)
)ss
COUNTY OF Stanislaus)

Paul D. Elias (name), being first duly sworn, deposes and says that he or she is General Manager (position title) of Turlock Irrigation District (the bidder)

the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

DATED: 28 July 97 By _____
(person signing for bidder)

GAIL HUMPHREY
Comm. # 1109009
NOTARY PUBLIC - CALIFORNIA
Stanislaus County
My Comm. Expires Aug. 18, 2000

(Notarial Seal)

Subscribed and sworn to before me on
July 28, 1997
Gail Humphrey
(Notary Public)

F1-134
Reference

TUOLUMNE RIVER CHANNEL RESTORATION PROJECT

SPECIAL RUN POOLS 9 AND 10
TUOLUMNE RIVER MILE 25.9 AND 25.4

Prepared for:

Tuolumne River Technical Advisory Committee
(Don Pedro Project, FERC License No. 2299)

July 15, 1997

Prepared by:

McBain and Trush
P.O. Box 663
824 L Street, Studio 5
Arcata, CA 95521
(707) 826-7794

EA Engineering, Science, & Technology
3468 Mt. Diablo Blvd., Suite B-100
LaFayette, CA 94549
(510) 283-7077

in the Tuolumne River occurs upstream of this location so that most juveniles must pass through this reach.

2.2 Channel geometry and planform dimensions

The regulation of flow and the reduction of sediment supply in the Tuolumne River by dams have changed the geometry of the channel from its pre-dam configuration, creating a new bankfull channel and riparian stand structure. The Tuolumne River channel has been further manipulated by agricultural practices (channelization and rip-rap), gold dredging (fragmentation, channelization, relocation), flood control (channelization and rip-rap), and aggregate extraction (channelization, creation of abnormally large pools, degradation) nearly over its entire length, limiting the number of "model" reaches where post-dam channel geometry has been allowed to adjust naturally. One of these few model reaches is found between river mile 35.0 to 35.6, and several cross sections, a thalweg profile, and a planform map of thalweg location were recorded at that site by Trinity Fisheries Consulting in 1990 (Figures 2 and 3). Their measurements have provided an initial estimate of post-dam channel morphology that is used in this proposal to prepare the following initial design channel dimensions (Figures 4 and 5):

appx channel width at low water	50 - 100 feet
appx channel depth at low water	0 - 2 feet
appx width at spawning flow (300-500 cfs)	100 - 115 feet
appx ave channel depth at spawning flow	1 - 2 feet
appx ave water velocity at spawning flow	1.3 - 2.5 feet/sec
appx bankfull width	175-200 feet
appx ave bankfull depth	7 feet
appx ave bankfull water velocity	4.4 feet/sec
appx floodplain width	> 300 feet
max floodway width, including terrace	< 650 feet
maximum design floodway discharge	15,000 cfs
appx meander wavelength	1,200 - 1,600 feet
appx sinuosity	1.1-1.2
appx radius of curvature	380 feet

The bankfull channel in this model reach was not well-defined. Additional field data will be collected at this model reach (as well as others), and integrated with hydraulic modeling techniques to refine a design channel morphology.

with the discharge most influential in forming the channel, and as such, is commonly used by river engineers as a design discharge. Bankfull discharge just begins to spill onto the floodplain, and over time, the bankfull discharge tends to transport more sediment than larger but less frequent floods.

The bankfull channel strongly influences bedload transport in the main channel. In many alluvial rivers, bedload begins to move at discharges slightly less than bankfull; as the discharge increases to bankfull discharge, bedload is transported at a significant rate. Once bankfull discharge is exceeded, the flow spills onto the floodplain and minimizes the rate of increase in boundary shear stress (and thus, bedload transport).

Quantifying bankfull discharge on the Tuolumne River is problematic, because channel-forming flows are based less on precipitation-induced floods, and more as a result of power generation and controlled flood releases. The maximum power generation releases (4,500 to 5,500 cfs) occur frequently, which may imply a post-dam channel forming flow, but have little to no bedload transport capacity based on tracer gravel experiments at 5,400 cfs. Therefore, the channel geometry at the site will need to be designed to transport bedload at the design bankfull discharge. In many streams, bankfull discharge has been found to have a recurrence interval (RI) in the annual maximum series between 1.5 and 2.0 years (Leopold 1994). The post-dam 1.5- and 2-year RI flood for the Tuolumne River at Modesto gaging station is 3,900 cfs and 4,300 cfs respectively. The bankfull channel indicators at the single model site need more analysis, so evaluating the 1.5- to 2.0-year flood as a bankfull discharge by comparing it with bankfull channels measured in the field will require more detailed field work. In the meantime, a contemporary bankfull discharge of approximately 4,000 cfs is assumed, since it falls within the 1.5 and 2.0 year flood and allows preliminary design development, which will be refined as more field data is collected.

The design bankfull channel as proposed in section 2.2 must convey the bankfull discharge. The following analysis evaluates the channel conveyance by using a simple Manning's analysis. Prior work by Trinity Fisheries Consulting (1990) found that the bed slope from river mile (RM) 34 to RM 37.5 is 0.0015; field measurements by EA personnel during the 1995 high flows (approximately 6,000 cfs) found water surface slopes of 0.00075 near the project site. Because both the Manning's analysis and bed mobility models (see section 3.2 below) are very sensitive to

Consulting, 1990), and 48 mm for a slope of 0.00075 (slope as measured by EA personnel in 1995). We currently do not have bed particle size data near the project site, so we cannot compare this incipient motion particle size to the on-site particle size distribution. The 97 mm and 48 mm particles are well represented in the particle size distributions at the Trinity Fisheries Consultants study sites (near RM 35), but the particle sizes down-river at the location of the project site may be smaller (due to lower slope). The particle size distribution of the bedload supply, thus the material that sizes the future bed surface, will need to be well documented at the project site before finalizing the design. The incipient motion of a 97 mm particle using a slope of 0.0015 represents the "worst case scenario" for excessive particle mobility, and if the true bankfull slope is 0.00075, then a 97 mm rock would have greatly restricted mobility.

3.3 Bank Stability and Riparian Revegetation

In section 3.2, the bed mobility model predicts that a 97 mm particle on the bed surface will mobilize at bankfull discharge or greater for a slope of 0.0015. However, the simplifying assumptions needed to apply Equations 1 and 2 cannot be made for shear stress on banks. Bank erosion on long, straight flume-like reaches is minimal because of energy diffusion from the bank margins, shallow water depths near the banks, and large bank material particle sizes. In contrast, fluid forces on the banks on the outside of a meander bend will be greater than in a long, straight flume-like reach, and increase with increasing radius of curvature. A small degree of bank erosion and channel migration is part of the natural processes that most alluvial rivers exhibit, but rapid channel evulsion or excessive migration of a newly constructed channel is undesirable.

Riparian vegetation in undisturbed alluvial channels often impedes channel migration. Root and stem strength increases the cohesiveness of banks, particularly those composed of non-cohesive sediments. Over time, bank and vegetation are slowly eroded on the outside of meander bends and new vegetation colonizes the extending point bar. Therefore, the revegetation design is a crucial component of the overall channel restoration design. More intensive revegetation with live willow rootwads at the outside of meanders will provide immediate bank protection and increase the regrowth success in these critical areas. As shown on Figures 4, 5, and 7, and Table 1, the proposed design would establish riparian species at the proper inundated surfaces within the hydraulic geometry and planform of the channel.

Has salmonid habitat been improved? How has a certain flood affected channel morphology? How successful is the riparian revegetation, and how has it contributed to channel stability? Quantitative monitoring techniques are a crucial part of any restoration project to answer these important questions.

5.1 FISH HABITAT AND USE MONITORING

The proposed restoration design will restore important salmon spawning and rearing habitat within the SRP 9 and 10 reach, and reduce salmonid predator habitat created by the aggregate extraction. Fish habitat and use monitoring will focus on documenting the effect of the project on: 1) pre- and post-project salmonid predator habitat availability (preferred water surface area, depth, and velocity), 2) pre- and post-project salmonid predator populations, and 3) pre- and post-project salmonid predation rates. While direct quantification of actual salmonid predation is preferable, quantitative description, accuracy, precision, and cost becomes increasingly difficult from 1) to 3). Therefore, pre- and post-project predator habitat will be sketched onto topographical maps (created from the pre-project and as-built topographic surveys, and pre- and post-project predator populations will be estimated during the following periods:

- 1 year prior to construction (if funding is available)
- immediately prior to construction
- 1 month after construction (allowing predators to migrate back into site)
- once a year for each of the next three years after construction to document long-term trend

In addition, a control site will be established and monitored similarly to the project site to estimate population trends that may be independent of the project. For example, if predator populations are reduced as a result of the project, and a nearby undisturbed control site shows a similar downward trend, then the real effect of the project on predator populations can be evaluated by comparing the two sites. Because documenting actual salmonid predation rates is difficult and potentially inaccurate, a monitoring strategy to better document this variable is being developed by the Tuolumne River Settlement Agreement Technical Advisory Committee, and may be used at the SRP 9 and 10 sites.

5.2 CHANNEL MORPHOLOGY

The key to monitoring changes in channel morphology is to sample prior to and after flow events capable of causing a change in morphology. Sampling based on a pre-determined schedule can

2 consecutive drought years	Document drought related mortality
5 years	Document overall survival, conclude monitoring program

Yearly monitoring reports will be produced, and at the end of the five year monitoring program, a final monitoring report will be produced that summarizes monitoring data, and more importantly, interprets the data and makes recommendations that will improve future designs.

6.0 SUMMARY

This analysis is based on data from 1989-1991 field work done by Trinity Fisheries Consulting, depth soundings by EA personnel on 20-23 December 1993, water slope data collected by EA personnel on June 15, 1995, tracer gravel observations made by McBain and Trush in 1996, and other varied field efforts. Preparation of the final design will include more in-depth data collection and analysis of model reach morphology, bed mobility, and riparian communities than are presented here. This in-depth data collection is presently being conducted outside of this proposal at the direction of the Tuolumne River Settlement Agreement Technical Advisory Committee, and includes:

- testing the validity of bankfull discharge/channel forming discharge concepts on a regulated river;
- calibrating hydraulic models to the latest high flow releases (water surface slopes, Manning's roughness in gravel and vegetated portions of the channel, etc.);
- estimating meander wavelength, amplitude, radius of curvature, and bar slopes;
- assessing native species composition and distribution of riparian vegetation within the Tuolumne River corridor.

7.0 REFERENCES

Andrews, E.D., (1983). Entrainment of gravel from naturally sorted riverbed material, *GSA Bulletin*, Vol. 94, p. 1225-1231.

EA Engineering, Science, and Technology, (1992). Lower Tuolumne River predation study report, in *Appendix 22 of Volume 7 Report of Turlock Irrigation District and Modesto Irrigation District Pursuant to Article 39 of the License for the Don Pedro Project.*

Leopold, L.B. (1994). *A View of the River*, Harvard University Press, Cambridge, 298 p.

McBain, S.M. and Trush, W.J. (1995). Channelbed mobility and scour on a regulated gravel-bed river, In *ASCE Waterpower '95 Proceedings*, San Francisco, CA, July 1995.

Trinity Fisheries Consulting, (1990). Miscellaneous fieldbook data.

SRP 9 and 10 ESTIMATED BUDGET-6/24/97

SRP 10 design and permitting included as part of SRP 9

SRP 9

Determine site specific design channel dimensions for SRP 9 and 10

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$14,450	$1,950	$16,400

Topographic survey of SRP 9 and SRP 10

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$17,400	$1,535	$18,935

Write final design, revisions for SRP 9 and SRP 10

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$41,050	$2,055	$43,105

Project permitting for SRP 9 and 10

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$41,250	$4,813	$46,063

Field stakeout (SRP 9 ONLY)

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$4,525	$613	$5,137.50

Construction, assuming 100 loads/day (SRP 9 ONLY)

	CU YDS	COST/YD	TOTAL
FILL MATERIAL	146,000	$0	$0
SPAWNING MATERIAL	12,000	$8	$96,000

[redacted]

	CU YDS	COST/YD		Trucking total
TRUCKING (reasonable)	146,000	$8		$1,168,000
	DAYS	RATE	TOTAL	
2 D9'S on-site	150	$1000/day	$300,000	
Excavator at LaGrange	75	$1000/day	$150,000	
Site Preparation (pave SRP 9&10 and LaGrange access, improve access road drainage)				$200,000
			Construction Subtotal:	**$1,914,000**

Construction supervision (SRP 9 ONLY)

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$18,575	$1,913	$20,487.50

Riparian revegetation (SRP 9 ONLY)

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$97,969	$19,132	$117,101

Channel, predator, and riparian monitoring (SRP 9 ONLY)

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$66,500	$8,925	$75,425

SRP 9 SUBTOTAL: $2,256,653

Project Administration (10% of non-construction budget): $34,265

Contingency (10% of entire budget): $225,665

SRP 9 GRAND TOTAL: $2,516,584

Draft 7/15/97

SRP 10

Determine site specific design channel dimensions for SRP 10 (INCLUDED IN SRP 9 BUDGET)

Topographic survey of SRP 9 and SRP 10 (INCLUDED IN SRP 9 BUDGET)

Write final design, revisions for SRP 9 and SRP 10 (INCLUDED IN SRP 9 BUDGET)

Project permitting for SRP 9 and 10 (INCLUDED IN SRP 9 BUDGET)

Field stakeout (SRP 10 ONLY)

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$4,525	$613	$5,138

Construction, assuming 100 loads/day (SRP 10 ONLY)

	CU YDS	COST/YD	TOTAL
FILL MATERIAL	293,000	$0	$0
SPAWNING MATERIAL	12,000	$8	$96,000

	CU YDS	COST/YD		Trucking total
TRUCKING (reasonable)	293,000	$8		$2,344,000
	DAYS	RATE	TOTAL	
2 D9'S on-site	195	$1000/day	$390,667	
Excavator at LaGrange	75	$1000/day	$150,000	

Construction Subtotal: **$2,980,667**

Construction supervision (SRP 10 ONLY)

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$18,575	$1,913	$20,488

Riparian revegetation (SRP 10 ONLY)

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$195,938	$38,264	$234,201

Channel, predator, and riparian monitoring (SRP 10 ONLY)

LABOR	PER DIEM, MATERIALS, EQUIPMENT RENTAL	SUBTOTAL
$66,500	$8,925	$75,425

SRP 10 SUBTOTAL: **$3,315,918**

Project Administration (10% of non-construction budget): **$33,525**

Contingency (10% of entire budget): **$331,592**

SRP 10 GRAND TOTAL: **$3,681,035**

Draft 7/15/97

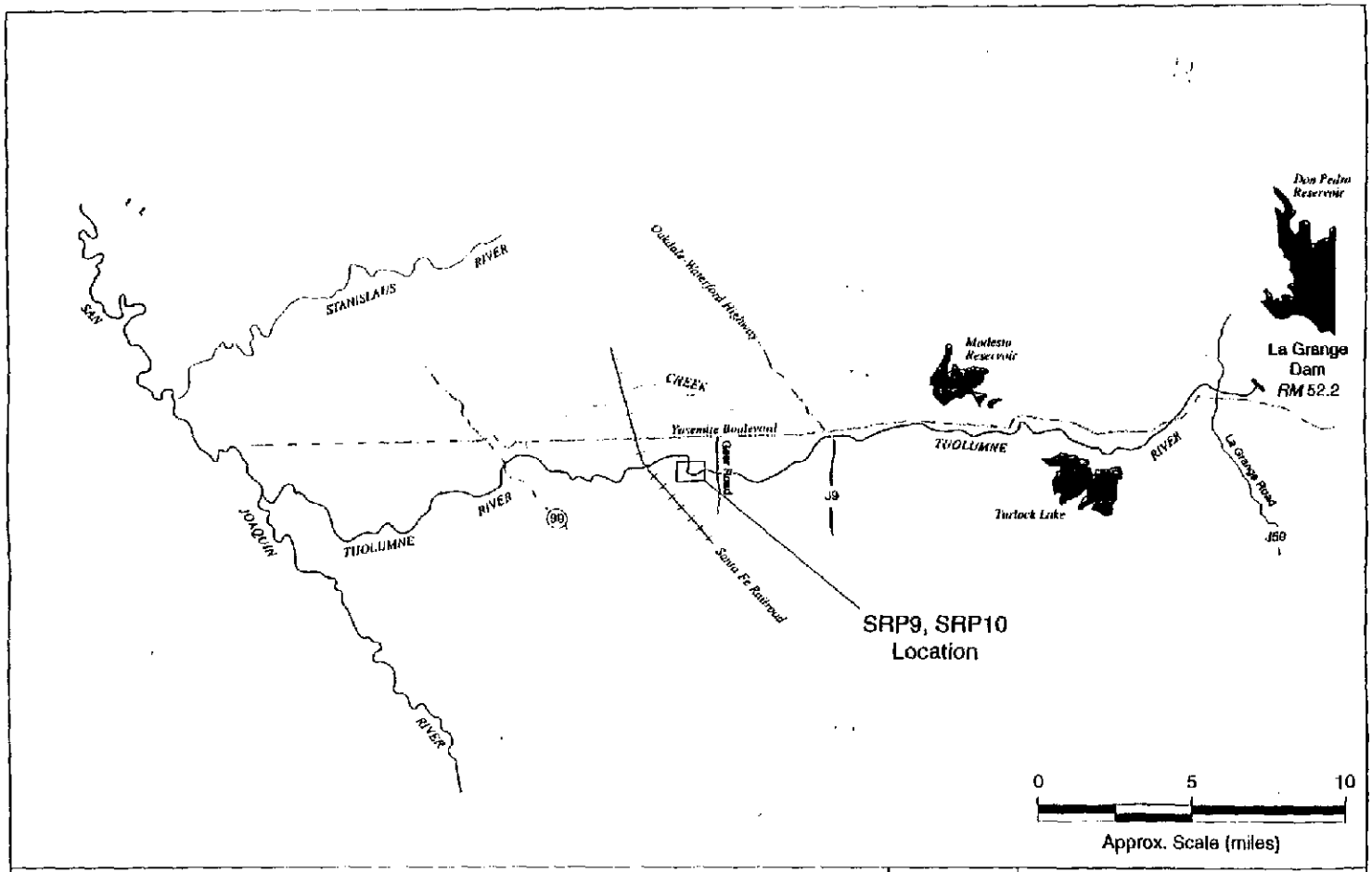
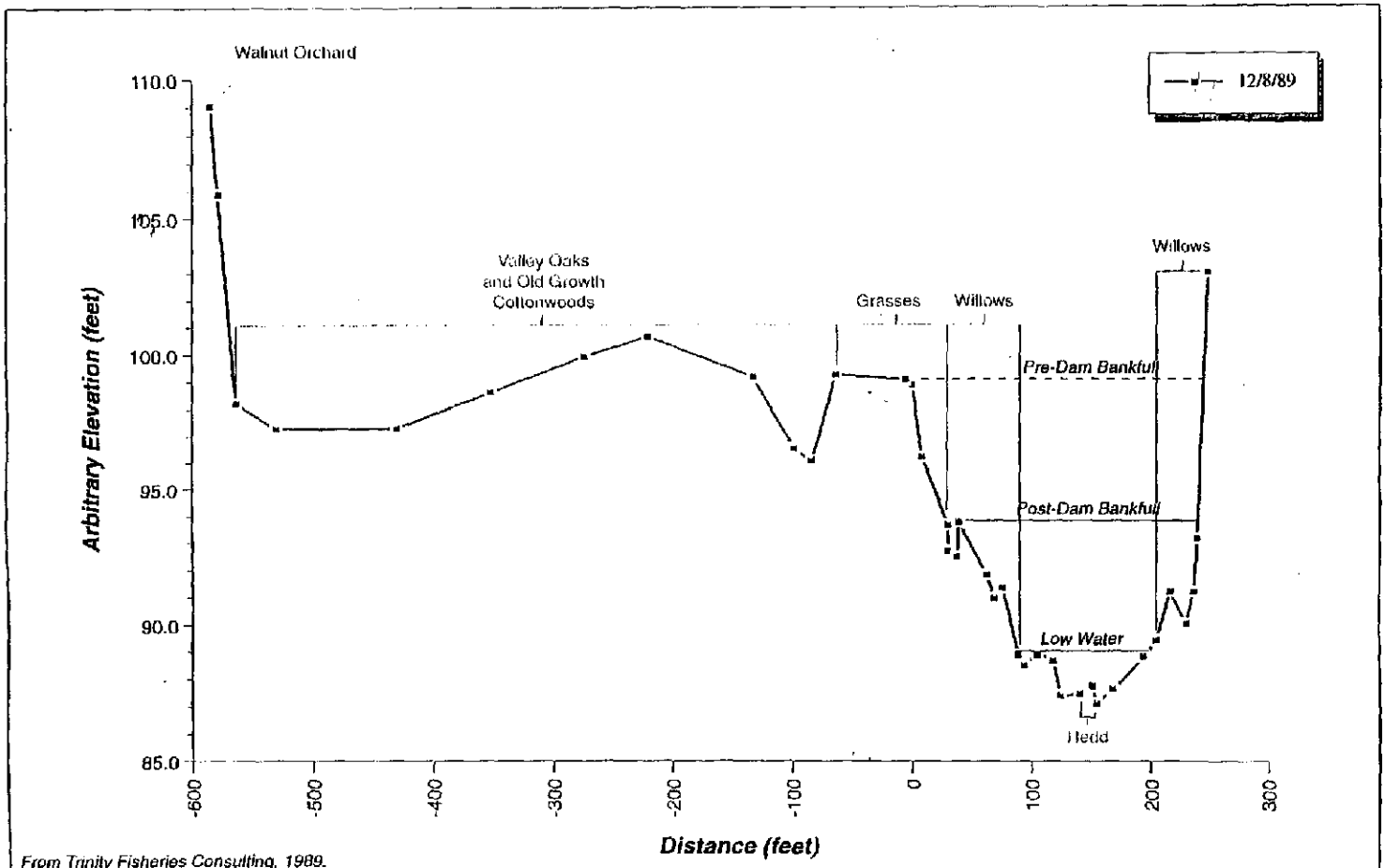


Figure 1. Locations of SRP9 and SRP10 floodway restoration sites, Tuolumne River Mile 25.4 to 25.9.

EA Engineering, Science, and Technology

PROJECT NO: 13009.01.2000 DATE: 8/0/95

I-002904



From Trinity Fisheries Consulting, 1989.

Figure 2. One of several model cross-sections in an undisturbed reach (Tuolumne River mile 35.5) used to develop design cross-sections.

EA Engineering, Science, and Technology

PROJECT NO. 13009.01.2000

DATE 8/9/95

FILE

REVIEWED

DRAWN BY

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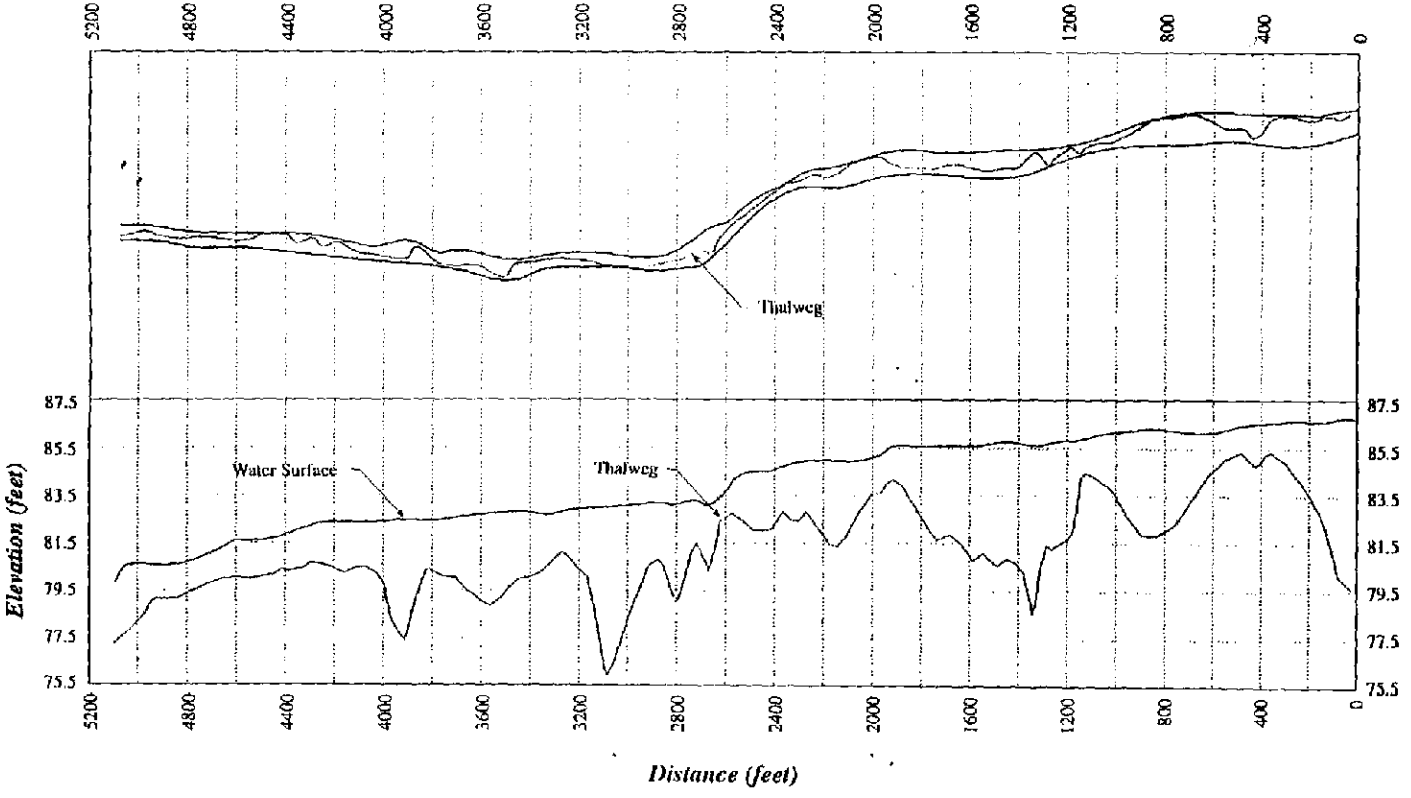


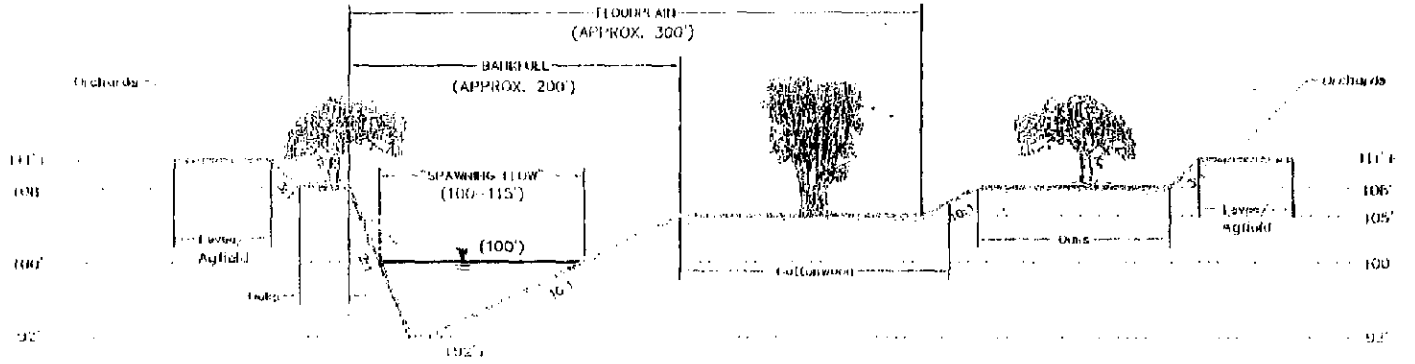
From Trinity Fisheries Consulting, 1991.

Figure 3. Model reach planform and thalweg profile from Tuolumne River mile 34.7 to 35.6. Elevations reference 1929 USGS datum.

EA Engineering, Science, and Technology

PROJECT NO.:	DATE:
13009.01.2000	8/9/95
FILE NAME: GR2.FH3	REVIEWED BY: F. Ligon / DRAWN BY: M. Wottrich

I-002906



NOTES:
SIDE SLOPE: Horizontal:Vertical
ELEVATION: Arbitrary Datum
5X Vertical Exaggeration

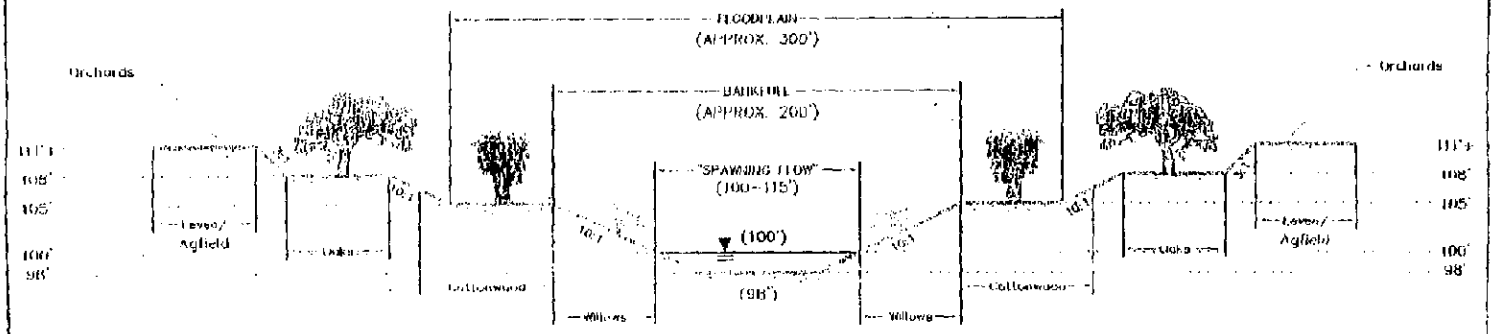
Figure 5: Conceptual Design Cross-Section through Open Channel Area

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

PROJECT NO: 15809.01.2000

DATE:

I-002907



NOTES:
SIDE SLOPE: Horizontal:Vertical
ELEVATION: Arbitrary Datum
5X Vertical Exaggeration

Figure 4. Conceptual Design Cross Section through riffle (alternate bar crossover)

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

PROJECT NO:	DATE
13009.01 2000	7/25/95
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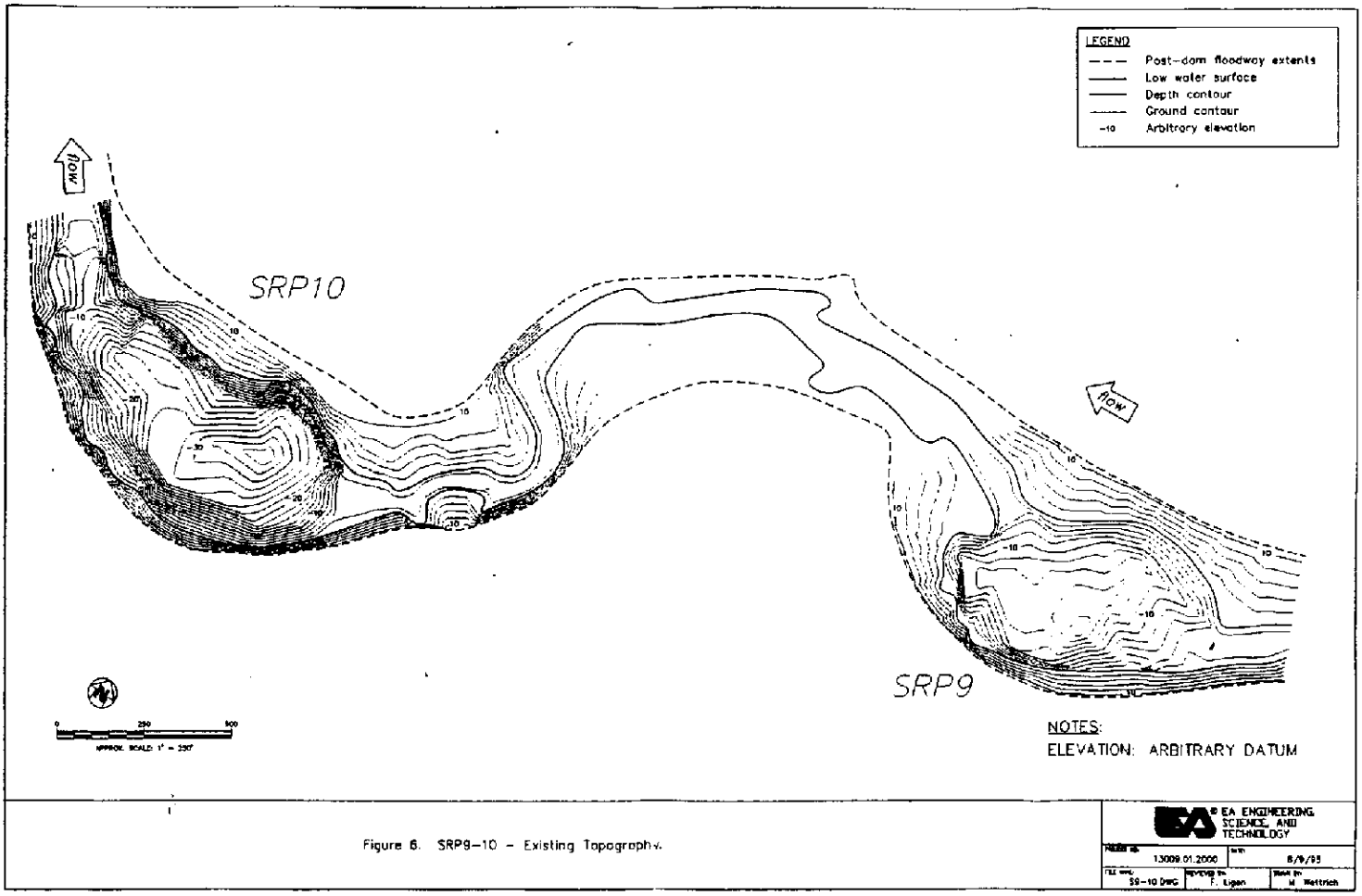

Figure 6. SRP9-10 - Existing Topography.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

13009.01.2000 | 8/9/95

SS-10.DWG | F. Ligon | M. Wettrich

I-002909

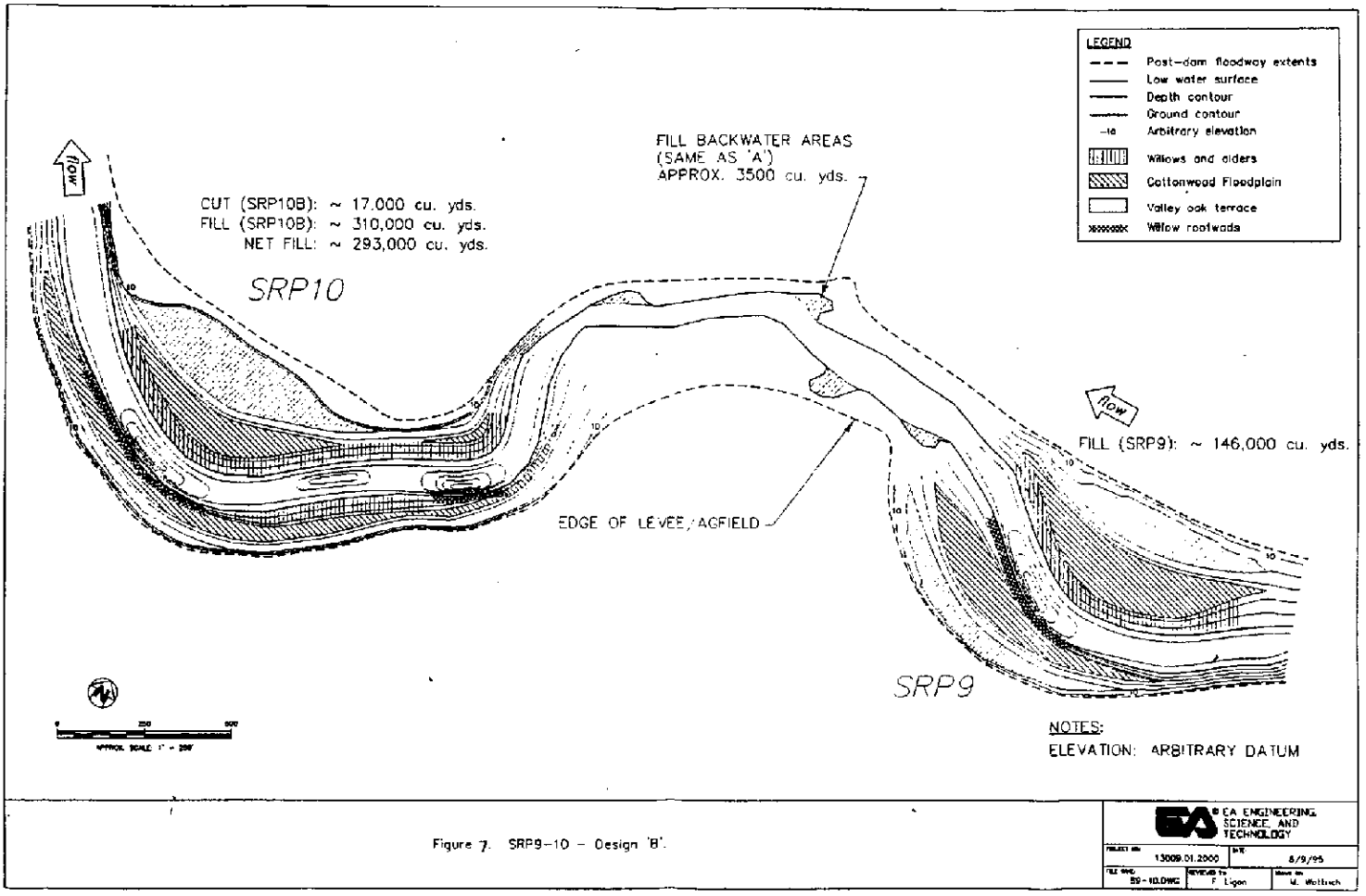

Figure 7. SRP9-10 - Design 'B'.

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13009.01.2000	8/9/95
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I-002910

I-002910

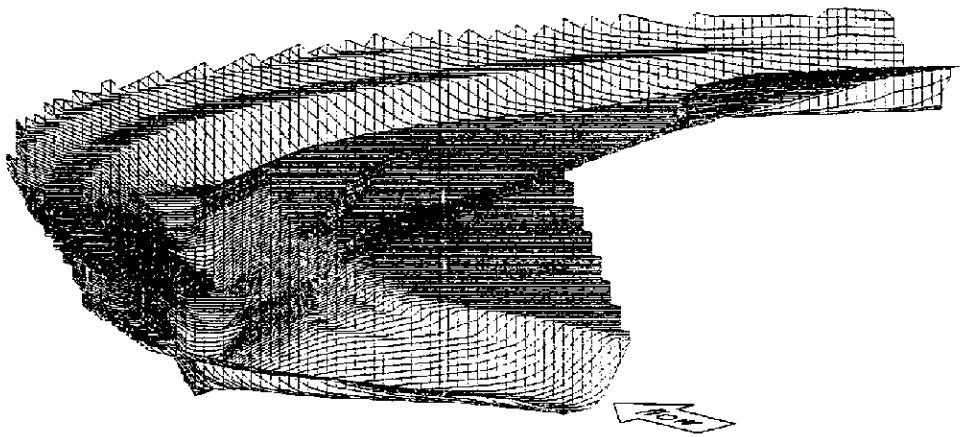

Figure B. SRP10 Design 'B' 3D Model.

CA ENGINEERING, SCIENCE, AND TECHNOLOGY	
PROJECT NO. 13009.01.2000	DATE 7/5/95
FILE NAME SRP10-B.DWG	REVISED BY F. Ligon

I-002911