ESTABLISHMENT OF A STEELHEAD FISHERY

IN

ALAMEDA CREEK

Report of the Technical Committee

May 1989

TECHNICAL COMMITTEE REPORT

ON

ESTABLISHMENT OF A STEELHEAD FISHERY IN ALAMEDA CREEK

VII. APPENDIX

Drawings

- Alameda Creek Watershed (ACWD Drawing G3-77C-22-1)
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  (ACWD Drawing G3-77C-310)

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- III-A SF Water and Power Systems, General Map, 1970
- III-B ACWD Service Area 1987
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References

- Hetch Hetchy (Raker) Act (Sixty-Third Congress,

  Sess II CH4 December 19, 1913, HR7207)
- Water Rights Permit Nos. 011319 and 011320
- CDF&G "General Fish Screening Criteria, Appendix F"
- Alameda Creek Urban Streams Study (DWR October 1980)
- Alternate Plans for Offstream Storage South of the Delta (DWR May 1984)
- Alameda Creek - Update on Potential for Reestablishing Steelhead Run (K. Burger, EBRPD, October 27, 1983)
- Potential Anadromous Fish Population Size Based on Flow Releases from Different Source Locations in the Alameda Creek Watershed (K. Burger, EBRPD, October 5, 1987)
- Report on Potential Steelhead Population (Charles Hanson, November 13, 1987)

TECHNICAL COMMITTEE REPORT
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EXECUTIVE SUMMARY

Steelhead trout are anadromous, meaning that adult fish migrate from the ocean upstream in the winter and reproduce in areas conducive to spawning. Eggs deposited in stream gravels hatch in the spring, with the young fish remaining in the fresh water stream for one or two years until they migrate downstream to the ocean. Steelhead trout require sufficient fresh water flow both to permit the survival of juvenile fish and to permit the migration of spawning fish and the out-migration of the young fish to the ocean as smolts.

Alameda Creek once supported a self-sustaining run of steelhead trout. At the southern end of the steelhead range which extends from Central California to Alaska, Alameda Creek is typical of California coast range streams, with major flows occurring during the rainy season from November through March, and reductions in flow during the summer months.

The steelhead fishery in Alameda Creek declined during the early part of this century as a result of changes in the watershed which reduced flows to the bay (groundwater pumping in the Livermore Valley, Spring Valley Water Co. operations in Sunol and construction of Calaveras Reservoir).

By the late 1950's the Department of Fish and Game considered that a viable steelhead fishery no longer existed in Alameda Creek. Subsequent water supply and flood control projects were then constructed without provision for accommodating anadromous fish (San Antonio Reservoir, Del Valle Reservoir, Corps of Engineers creek channelization project, and ACWD groundwater recharge projects along Alameda Creek).

A Technical Advisory Committee was formed in 1987 to determine if steelhead could be reestablished in Alameda Creek and if so what modifications would have to be made to current conditions and what costs would be associated with these modifications.

The major obstacles to reestablishment of a steelhead fishery are 1) the 10-foot WPRR/BART drop structure in Alameda Creek Flood Control Channel which prevents the upstream migration of steelhead and 2) the lack of sufficient stream flow to the bay during the spring out-migration period.

This report presents four alternatives with respect to establishment of a steelhead fishery.

ALTERNATIVE 1 - NO PROJECT, NO NEW COSTS

This alternative maintains current conditions and does not establish a steelhead fishery. The existing 20,000 to 30,000 planted trout fishery, which is supported by the existing water supply operations in the creek, would be continued.

ALTERNATIVE 2 - MINIMUM STEELHEAD FISHERY; COST RANGE: $225,000 to $1,055,000 (FIRST YEAR)

This alternative involves construction of a fishway at the WPRR drop structure to eliminate the major migration barrier. In addition, because a steelhead fishery is established, ACWD would be required to retrofit its existing diversion facilities (fish screens on all diversion pipes, plunge pools below inflatable dams). No changes or additions to existing water releases would be proposed at this time. The put-and-take trout fishery would be eliminated from Alameda Creek east of Mission Blvd. because the trout compete with steelhead for food. The trout could be relocated to the quarry lake areas or further downstream in the flood control channel west of Mission Blvd.

ALTERNATIVE 3 - MODERATE STEELHEAD FISHERY; COST RANGE: $270,000 to $1,815,000 (FIRST YEAR)

This alternative expands on Alternative 2 by adding a 10 cfs water flow to the bay during springtime smolt out-migration. The report identifies several sources for such a release and the varying potential costs.

ALTERNATIVE 4 - MAXIMUM STEELHEAD FISHERY; COST RANGE: $370,000 to $4,155,000 (FIRST YEAR)

This alternative expands on Alternative 3 by adding flow releases on selected streams to increase available rearing habitat by 23.3 miles. The report identifies potential streams, water sources and their potential costs.

Estimates of the number of fish which could be produced by the project alternatives range from 100 to 2,400 steelhead. A more precise estimate cannot be made without a more detailed assessment of habitat by the instream flow incremental method (IFIM).

Following is a summary of the four alternatives and their respective components, costs, and impacts. More detailed information and back-up material is contained in the body of the report.

TABLE IV SUMMARY OF STEELHEAD ESTABLISHMENT PROJECT ALTERNATIVES

ALTERNATIVES	1 - No Project	2 - Minimum Project	3 - Moderate Project	4 - Maximum Project
	o Current Conditions	o Construct Fishway	o Construct Fishway o 10 CFS Flow over Fabridam #2 from March 1 through May 15	o Construct Fishway o 10 CFS Flow over Fabridam #2 from March 1 through May 15 o Live stream below Reservoirs
CONDITIONS				
1. Barrier to adult migration	Yes	No	No	No
2. Existing rearing habitat	N/A	16.5 miles estimated	16.5 miles estimated	16.5 miles estimated
3. Additional rearing habitat	None	None	None	23.3 miles estimated
4. Smolt "Out-Migration" assured	No	No	Yes	Yes
5. Fish screens/Plunge Pools required	No	Yes	Yes	Yes
6. Adult migration	N/A	Poor	Self-sustaining	Larger Self-sustaining
7. Put-and-take trout fishery in Alameda Creek east of Mission Blvd.	Yes	No	No	No
8. Steelhead harvest	No	*	*	*

* fishing limited (i.e., none until established, or catch and release; limited harvest once established)

COST ESTIMATES				
First Year Capital	-0-	$225,000 to $1,055,000	$225,000 to $1,055,000	$225,000 to $1,055,000
Annual M & R	-0-	$ 16,000 to $ 91,000	$ 19,000 to $ 93,000	$ 19,000 to $ 93,000
Annual Water	-0-	-0-	$ 45,000 to $ 760,000	$145,000 to $3,100,000

FIRST YEAR CAPITAL COSTS ($)

	LOW	HIGH
Fishways at Barrier	75,000	125,000
Fishscreens at Water Diversions	90,000	870,000
Plunge Pools at Inflatable Dams	60,000	60,000
Subtotal	225,000	1,055,000

ANNUAL MAINTENANCE & REPLACEMENT COSTS ($)

	LOW	HIGH
Fishways at Barrier	8,500	14,200
Fishscreens at Water Diversions	8,200	76,900
Subtotal for Alt. 2	16,700	91,100
Low Flow Channel (4.5 Miles)	2,000	2,000
Subtotal for Alt. 3 & 4	18,700	93,100

ANNUAL WATER COSTS ($)

	LOW (at $30/AF)	HIGH (at $200/AF)
Flow over Downstream Inflatable Dam		
Mar 1 to May 15: 10 cfs x 76 days = 1,500 AF	45,000	
Mar 1 to May 15: 25 cfs x 76 days = 3,800 AF		760,000
Subtotal for Alt. 3	45,000	760,000
Flow for Habitat in Arroyo Del Valle		
May 15 to Oct 30: 5 cfs x 169 days = 1,673 AF	50,190	
May 15 to Oct 30: 20 cfs x 169 days = 6,700 AF		1,340,000
Flow for Habitat in Upper Alameda Creek		
May 15 to Oct 30: 5 cfs x 169 days = 1,673 AF	50,190	
May 15 to Oct 30: 15 cfs x 169 days = 5,000 AF		1,000,000
Subtotal for Alt. 4	145,380	3,100,000

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OPERATIONAL COMPONENTS OF THE PROPOSED ALAMEDA CREEK STEELHEAD FISHERY

This operational summary is an extension of the Technical Committee Report on the Development of a Steelhead Fishery in Alameda Creek. The Technical Report provides extensive material on the water supply requirements of the proposed fishery, recreational benefits, required capital improvements, as well as a discussion of cost and financial requirements for the proposed fishery.

It might be possible for the involved agencies to implement their portions of the project using periodic coordination and problem-solving meetings similar to the process used to prepare the Technical Committee Report. However, the administrators of the involved public agencies feel that a lead role should be assumed by one of the primary agencies (Alameda County Water District, San Francisco Water District, Alameda County Flood Control District, East Bay Regional Park District, California Department of Fish and Game, U.S. Fish and Wildlife Service) to place overall project responsibility with one agency and to insure that all elements of the project are managed in a timely and efficient manner.

The principal areas of responsibility for the lead agency would include the following:

1. Complete the required studies and technical analysis identified in the Committee Report and prepare the required Environmental Impact Report.

2. Negotiate with the involved water agencies to obtain the necessary water releases for maintaining the fishery.

3. Coordinate the installation of capital improvements required to implement the fishery and assist in obtaining grants, agreements and permits required to implement the project.

4. Coordinate and oversee the operational elements of the proposed steelhead fishery:

   a. Work with the Department of Fish and Game to establish stream restrictions and enforcement of appropriate Fish and Game regulations.

   b. Provide annual maintenance of the fishery structures and coordinate period stream habitat improvements and maintenance of the flow channel within the Alameda Creek flood control reach.

   c. Provide operational and public safety services within sections of the stream open to public fishing.

   d. Coordinate citizen, school, and public information programs about the restored steelhead fishery within Alameda Creek.

Therefore, we seek not only your comments on the project and its components but also whether or not your agency is willing to assume the lead role.

I. INTRODUCTION

The possibility of restoring an anadromous fishery to Alameda Creek has been a topic of sporadic discussion and study for the past 40 years. After inconclusive discussion in the 1950's and 1970's, a task force was formed in 1983 to again examine the question. An inventory of the upper reaches of the Alameda Creek watershed was conducted. The conclusion indicated there could be adequate watershed for anadromous fish. The provision of a sufficient supply of water remains a critical factor in the discussion of this issue. The 1983 task force disbanded without reaching final conclusions.

In August of 1987 elected and appointed officials met to reestablish the study of anadromous fishing in Alameda Creek--the "Alameda Creek Beneficial Use Study." The Technical Advisory Committee has worked on the report since that time.

It was recognized from the beginning of the study that many pieces of information would have to come together in order for there to emerge an understandable description of the elements necessary for an anadromous fishery. The agencies with access to that information and expertise have worked together to frame the issues as clearly as possible. Some of the information is subject to differing interpretations, particularly information related to water availability.

The "Commentary" section provides an opportunity for a more argumentative approach to the issues. It is hoped these perspectives will shed additional light on the topic.

Staff from the following agencies participated in the Alameda Creek study:

1. Alameda County Flood Control District
2. ACFC&WCD Zone 7
3. Alameda County Water District
4. City of Fremont
5. East Bay Regional Park District
6. San Francisco Water Department
7. State Department of Fish and Game
8. State Department of Water Resources

The Technical Committee hopes this report will provide decision makers with the information necessary to resolve this important public policy question.

II. REQUIREMENTS FOR ALAMEDA CREEK STEELHEAD RESTORATION

A. Water Flow Requirements

The water flow requirements to support a self-sustaining run of adult steelhead in the Alameda Creek watershed depends on a sufficient amount of water being available at critical periods in the life cycle of the species (Salmo gairdneri gairdneri). Anadromous is a Greek term which means "up-running," referring to the annual upstream migration of adult fish in route to spawning areas in the same stream where they were hatched and out-migrated to the ocean to grow and mature. Returning adults have spent 1-4 years in the ocean where they grow rapidly and sometimes reach weights in excess of 15 pounds. Fertile eggs deposited in stream gravels by the adult spawners in the fall and winter, hatch in the spring. The fry generally remain in the stream environment for one to two years until they out-migrate to the ocean as "smolts" (typically 6-10 inches). Because of this anadromous lifecycle, it is possible to delineate both juvenile and adult lifestage freshwater requirements.

The major requirements of the juvenile fish in freshwater consist of: 1) water temperatures that do not exceed 72°F for prolonged periods, 2) continuous surface water flows or sufficient intermittent stream flow conditions (isolated pools) throughout the year in portions of the stream to provide rearing habitat, and 3) adequate spring to early summer (February-May 15) continuous flows to allow "out-migration" of smolts to the ocean (access to San Francisco Bay in this case).

The major adult freshwater spawning requirements consist of: 1) ability to migrate upstream to spawning areas, i.e., sufficient winter stream flows without barriers to allow upstream access, and 2) sufficient stream flow conditions at spawning sites to allow successful spawning.

In addition, such basic habitat requirements such as food and shelter are necessary for successful completion of the life cycle. These other requirements for steelhead are addressed in the Fish Habitat Restoration section that follows.

Alameda Creek watershed at one time provided all the basic flow and habitat requirements to support an adult steelhead (and probably silver salmon) migration. Figure 1 shows a number of adult steelhead harvested by workers during construction of Calaveras Reservoir completed in 1935.

By the late 1950's, however, the State Department of Fish and Game considered steelhead fishery was no longer viable in the Alameda Creek watershed. Factors contributing to their decline include water diversions and impoundments, regulation of seasonal flows, channelization (both lower on the drainage and in the Livermore-Amador Valley area), poor water quality especially due to discharges of treated sanitary wastewater (no longer a problem), and installation of permanent and seasonal migration barriers.

With respect to the three dams, no provisions were made for fish passage, nor in most cases, for water flow releases specifically to maintain fish populations and rearing areas. (Del Valle Dam being the exception as it appears live stream flows were supposed to be maintained downstream to near the confluence with Arroyo de la Laguna as a condition of the Water Rights Permit issued by the State Water Resources Control Board (permits No. 11319 and 11320). Nonetheless, a few steelhead of unknown origin have been observed annually by DF&G and EBRPD personnel, blocked in their upstream spawning migration by a concrete drop structure (weir) constructed to stabilize the Western Pacific Railroad tracks (heretofore referred to as the WPRR Weir). The structure is located about three miles upstream from the mouth of the creek.

Currently insufficient instream data is available to predict the productivity of existing juvenile steelhead rearing habitat under different flow regimes. The preferred approach to such an evaluation of stream flow and habitat availability is the Instream Flow Incremental Method (IFIM). This essentially involves assessing available habitat (pools, riffles, glides) by making depth and cross-sectional analyses of stream reaches under a variety of flow rates during winter, spring, summer and fall conditions for at least one year. These measurements together with water flow and depth related curves developed by fishery biologists for the various lifestage requirements of the species, allow the prediction of potential productivity of the stream for juveniles and, consequently, a range of estimates for adult return spawners. Due to manpower constraints, this level of assessment has not been performed to date on the Alameda Creek watershed.

Without a broader data base using the IFIM methodology referred to above, it is not possible to predict reliable ranges of expected adult steelhead populations for existing habitat nor, for creation of additional rearing habitat. A "ballpark" prediction was made by Ken Burger, East Bay Regional Park District water management specialist, using data from the Carmel River and assuming the two streams are similar enough to make comparisons. A possibility of 2,400 adult steelhead was predicted (see Appendix C). A similar effort utilizing somewhat different sets of assumptions and methodology was performed by Dr. Chuck Hanson, fishery biologist, TENERA Consultants. Dr. Hanson predicted a range between 100-1,000 adults (Appendix C). Both of these estimates were based upon assumptions without benefit of data that the IFIM method would provide specific for Alameda Creek. Without such a detailed specific stream analysis, any adult population estimates are subject to criticism and must be regarded as best efforts without sufficient data. The need for a study to provide IFIM data for Alameda Creek is apparent.

Four alternatives are presented here. They range from no project to the minimum that must be done to allow utilization of existing spawning and rearing habitat, to the maximum potential for the restoration of the fishery. Water availability and any legal condition or requirement for flow releases to support fish and wildlife are addressed in the Water Availability section.

<u>Alternative 1</u>: Maintain current conditions and operation; no steelhead establishment project

This alternative would involve no new projects and would not promote establishment of a steelhead fishery. The current practice of planting 15,000 to 30,000 catchable trout each season in Alameda Creek would be continued.

The following existing conditions are not conducive to establishment of a steelhead fishery.

1. Upstream adult steelhead migration (November-March) is blocked three miles upstream from the bay by the 10 foot drop structure (weir) in the flood control channel at the Western Pacific Railroad. Migration is also hindered by inflatable rubber dams operated by ACWD in the channel and by small dams in Niles Canyon.

2. Smolts (young steelhead ready to go to sea) migrating downstream in the spring and early summer cannot reach the bay due to no provision for a continuous stream flow during critical out-migration periods.

3. Water flows to the bay have been significantly reduced due to groundwater pumping in the Livermore Valley and to dams on Alameda Creek tributaries operated by San Francisco Water Department (and to a lesser extent the California Department of Water Resources). (See Water Supply Agencies section)

4. In addition to normal seasonal runoff from the watershed, ACWD imports state water from the Delta in spring, summer, and fall. This water flows down Alameda Creek and is diverted into groundwater recharge areas before it gets to the bay. This operation supports planted trout in Niles Canyon but not a steelhead fishery since no water in most periods is allowed to flow to the bay.

5. ACWD diverts its water from the creek channel into abandoned quarry pits for percolation into the groundwater. These diversion pipes do not have fish screens. Since steelhead smolts may get diverted during migration, fish screens would be required. This is not a requirement for the existing trout fishery.

6. Table 1 summarizes this alternative.

Alternative 2: Establish a minimum steelhead fishery by constructing a steep-pass fishway at the WRPP Weir; (no minimum spring and early summer flow releases over fabridams).

Operating under this alternative, the following effects upon development of a fishery are anticipated.

1. The adult steelhead winter migration (November-March) over the WPRR Weir to remaining upstream spawning and rearing areas would occur provided Fabridam 1 is dropped periodically or the fishway is designed and constructed to allow passage over the fabridam while inflated.

   Comment: Alameda County Water District personnel have stated that normal operation of the two existing fabridams is to drop them when stream flows exceed 300-400 cfs at the beginning of major storm events. This allows poor quality (highly turbid) water to pass downstream. Steelhead would be able to pass through the fishway only at these times unless the fishway was designed to include passage over the inflated fabridam.

2. Juvenile steelhead would be reared in remaining rearing habitat identified during stream surveys conducted since 1983 consisting of about 16.5 stream miles (Appendix A). These areas include Alameda Creek (proper) through

Niles Canyon (5.5 miles) and in the vicinity of Sunol Regional Park (5.0 miles), and a 6.0 mile stretch of Arroyo Mocho east of Lake Del Valle. Tributary streams in these areas would also provide some rearing but, in general, become dry during late summer.

3. Smolts migrating downstream in the spring and early summer would be unable to reach San Francisco Bay due to lack of continuous streamflow.

   Comment: Under existing streamflow conditions, nearly all the natural runoff plus imported water from the South Bay Aqueduct (Department of Water Resources) is captured behind fabridams or stored in the Alameda Creek Quarries for groundwater percolation and replenishment of local municipal water needs. Normally there is no flow over the most downstream fabridam and, consequently, the Flood Control Channel is dry. Without a continuous flow to the San Francisco Bay during the out-migration, smolts become trapped and are unable to complete their life cycle.

4. Fish screens to prevent diversion of juvenile steelhead (smolts) into the Alameda Creek Quarries along with groundwater recharge diversions would be required by Fish and Game.

5. Continued poor returns of adult steelhead would reflect poor survival of smolts.

6. Stocking catchable trout in Niles Canyon would be discontinued.

   Comment: Fish and Game policy prohibits stocking catchable trout in steelhead streams since they would compete for the same habitat. Instead catchable trout would be stocked in one or more of the Alameda Creek Quarry lakes or channel areas west of Mission Boulevard to support a put-and-take fishery.

7. Table 1 summarizes this alternative.

<u>Alternative 3</u>: Establish a moderate steelhead fishery by constructing a steep-pass fishway at WPRR Weir and providing 10 cfs flow over Fabridams down a low flow channel to the bay through May 15.

Operating under this scenario the following effects upon development of a fishery are anticipated.

1. The adult steelhead winter migration over the WPRR Weir to remaining upstream spawning and rearing areas would occur provided Fabridam 1, immediately upstream of the WPRR Weir, is dropped at certain flows or the fishway is designed and constructed to include passage over the fabridam while inflated.

2. Juvenile steelhead would be reared in remaining rearing habitat (see Alternative 2, #2).

3. Out migrating smolts would be able to reach the ocean.

   Comment: In 1986 a flow of 10 cfs over the fabridams were observed to created a continuous flow to the Bay conducive to out-migration of juvenile smolts. Therefore the 10 cfs criterion is being applied for purposes of determining water flow requirements for out-migration. Such flows would be needed through about May 15. According to Alameda County Water field personnel, flows over the fabridams generally drop below 10 cfs by about the end of February. Water to maintain a 10 cfs flow for 2 1/2 months (March, April, May 15) would have to come from flow releases specifically allocated for this purpose from one or more of the upstream impoundments - Del Valle Reservoir, San Antonio Reservoir, and/or Calaveras Reservoir. South Bay Aqueduct water could also be used but would be less desirable due to elevated water temperatures (exceeding 72°F). Flow release towers that will permit cool water discharges from deep in the water column of each of the reservoirs are reportedly in place. Maintaining the 10 cfs flow over fabridams for approximately 76 days (March, April, May 15) would require about 1,500 acre-feet of water. Lake Del Valle, as a possible water supply source, was addressed in a reconnaissance level report (see Appendix C).

4. A self-sustaining population of adult steelhead could once again utilize remaining available habitat.

   Comment: No more than a few hundred adult steelhead could be accommodated under existing habitat conditions (i.e., without additional water flow augmentation).

5. Fish screens to prevent diversion of juvenile steelhead (smolts) into the Alameda Creek Quarries along with water diverted for groundwater recharge would be required by Fish and Game.

6. Stocking catchable trout in Niles Canyon by Fish and Game would be discontinued.

7. Table 1 summarizes this alternative.

Alternative 4: Establish a maximum steelhead fishery by constructing a steep-pass fishway at WPRR Weir; providing 10 cfs flow over fabridams down a low flow channel to the bay through May 15; and providing flow releases sufficient to maintain live streamflows downstream from reservoirs.

Operating under this scenario would approach the optimum conditions for development of a fishery by providing the following:

1. The adult steelhead winter migration over the WPRR Weir to remaining upstream spawning and rearing areas would occur provided Fabridam 1 immediately upstream of the invert is dropped at certain specified flows (300-400 cfs depending on water quality) or the fishway is designed and constructed to include passage over the inflated fabridam.

2. Juvenile steelhead would be reared in remaining habitat identified during stream surveys conducted since 1983 consisting of about 16.5 stream miles. Flow releases would augment existing (natural) summer low flows and enhance productivity (smolt production) by providing more instream habitat.

3. An additional 23.3 miles of rearing habitat downstream from the reservoir release points (Del Valle, San Antonio and Calaveras) would be created by providing continuous flows in areas that currently become dry or have elevated water temperatures (exceeding 75°F) during summer months.

   Comment: Flow releases to maintain live stream flows would have to include water losses due to evaporation, evapotranspiration and groundwater recharge. Losses due to these factors downstream from the three impoundments do not appear to be well understood. No flow data has been presented from water purveyors that would define losses. The one exception is the 1980 Urban Streams Study by the Department of Water Resources which determined that during the study period (1979-80) water losses due to these factors between Del Valle Dam and Arroyo de la Laguna, a distance of about 11 miles, resulted in losses of 13-15 cfs. Based upon those observations, it appears that in order to maintain a live stream flow from Del Valle Reservoir, flow releases would have to exceed 13-15 cfs during summer and fall periods. No data is available for similar flow losses downstream from San Antonio Reservoir or Calaveras Reservoir. However, surface flows due to natural runoff have been observed downstream of Calaveras Reservoir to the vicinity of Naka Nursery during the summers of 1986-88. Only about 3-3.5 miles of dry stream bed existed before confluence with Arroyo de la Laguna where streamflows are perennial. This would imply that flow losses may be significantly less than the 13-15 cfs losses observed for Del Valle releases. In order to arrive at flow releases necessary to provide live stream flows downstream from impoundments, flow experiments appear to be necessary. A similar steelhead restoration effort for the Carmel River, where two water supply reservoirs have seriously affected normal streamflow conditions, resulted in an agreement to provide 5 cfs minimum flow to accommodate habitat requirements of steelhead. During critical water years such as 1986-87 a flow of 3 cfs was negotiated under the concept that water availability for all the various beneficial uses varies from year to year. A similar strategy could be adopted to the Alameda Creek watershed.

4. Out-migrating smolts would be able to reach the ocean via a low flow channel (maintained annually as required).

5. A larger self-sustaining population of adult steelhead could be supported by remaining and expanded rearing habitat than would result from Alternative 3 above.

6. Fish screens to prevent diversion of juvenile steelhead (smolts) into the Alameda Creek Quarries along with water diverted for groundwater recharge would be required by Fish and Game.

7. Stocking catchable trout in Niles Canyon by Fish and Game would be discontinued.

8. Table 1 summarizes this alternative.

B. <u>Fish Habitat Restoration</u>

An important element in the overall effort to restore a self-sustaining run of adult steelhead in Alameda Creek will be fish habitat restoration. Enhancement of the remaining habitat will increase smolt production and consequently increase the number of returning adults. The prior section on water flow requirements has already addressed several habitat restoration issues, i.e., water flows for fish passage and rearing and spawning habitat.

Steelhead, like other fishes, require more than the mere presence of water to survive. The following is a list of factors that must be present in order to sustain a migratory steelhead run in the Alameda Creek watershed.

1. Food: Food sources are primarily aquatic insect larvae and adults such as stoneflies, mayflies, caddisflies, etc., that are familiar inhabitants on and beneath stream rocks, cobbles and woody debris.

   Insects falling from streamside vegetation can also be an important source of food.

2. Shelter: It is important to provide refuges for juvenile fish to escape from predators such as raccoons or other predatory species of fish. Refuges also provide microhabitat where water temperatures are cooler than the ambient surrounding water allowing the fish to survive periods of elevated water temperatures that would otherwise be lethal. Shelter is typically provided by undercut banks, tree root masses, and undersides of large rocks and boulders or bedrock crevices.

3. Riparian plant species, i.e., plants growing in and immediately adjacent to the stream channel, provide food through insect drop (drift) as well as shade that can prevent high water temperatures.

4. Opportunity to reproduce: The opportunity to reproduce includes adequate streamflow to provide sufficient water depths during the spawning process and to keep the eggs moist and well oxygenated while they are incubating in the gravel where they are deposited. Gravels must be of sufficient size (mix of 1/4 - 3 inch diameter) and relatively silt free to be useable (otherwise eggs will suffocate).

The field of stream and fish habitat restoration has blossomed in recent years as interest in stream restoration has gained momentum across the country. Technologies for different aspects of instream restoration are still developing. A partial list of techniques and their benefits are:

1. Planting riparian plant species - use of alders, willows and other easily established plant species are effective at providing stream shading to prevent elevated water temperatures and provides drift as a food source. They are also effective for use in stabilizing banks to prevent erosion. Considerable planting is needed through the watershed.

2. Installation of gabions - these rock filled wire baskets can be installed within the stream to form weirs for collection and stabilization of spawning size gravels, to create shelter and pools and can be located along unstable banks as protection from erosive water flow velocities.

3. Installation of log weirs - logs along or within the stream environment can be used to perform the same functions as gabions but are much cheaper to install. Figures II-A and II-B show a typical log weir installation.

4. Removal of severe debris jams - physical removal of severe debris jams will allow fish migration that might otherwise be blocked.

5. Modification of instream permanent migration barriers - the WPRR Weir is a classic example of a complete barrier to upstream migration. Construction of a steep-pass fishway is recommended.

6. Installation of fish screens - for major stream flow diversions such as Alameda Quarry pond groundwater recharge diversions, installation of fine mesh screens at pipe inlets to prevent entrapment of juvenile steelhead may be necessary.

A long-term fish habitat restoration plan that addresses specific areas within the watershed is needed. Inputs from stream surveys already conducted as well as from a more detailed stream evaluation provided by an IFIM study could be the basis for the plan. The following elements would be important aspects of the restoration plan.

1. Modification of the in-stream fish passage barriers at the WPRR Weir to allow upstream access to remaining spawning and rearing habitat.

2. Encourage initial plantings of yearling juvenile steelhead, preferably of East Bay native stock, to help restore a viable adult spawning population within the watershed at the earliest possible time.

3. Freshwater habitat improvement efforts including but not limited to, restoration of riparian vegetation throughout the drainage, manipulation of pool to riffle ratios utilizing instream techniques, initiation of summer critical flow augmentation if available, and general evaluation of the watershed to find ways to enhance freshwater requirements of adults and juvenile steelhead.

4. Involve local sportsmen's groups, organizations, and public participation, in general, including "hands-on" projects directed toward habitat restoration.

5. Solicit funds from government agencies and private businesses to finance all aspects of the steelhead restoration effort.

6. Encourage adoption of special regulations by the Fish and Game Commission to protect juvenile and adult steelhead until the run is significantly restored to allow regulated harvest of the resource.

7. Development of a comprehensive management plant that will include important fishery management issues such as: a) agency coordination, b) habitat protection, c) habitat improvement, d) fish population enhancement, and e) public education.

C. Funding Sources

Precise costs for the steelhead restoration project are unknown at this time and will vary depending on a number of factors including the number and extent of areas along the stream that receive habitat improvement treatments, the level of monetary and other support attracted from private industry as well as methods and techniques utilized. However, the costs for the first phase restoration effort, i.e., construction of a fishway over the WPRR Weir, can be estimated at this time based upon prior project costs and evaluation by Ted Vande Sande, Fish and Game hydrologic engineer. An estimate of $5,000-$10,000 per vertical foot rise is the guideline utilized based upon projects of similar nature. Since the drop structure (WPRR Weir) poses about a 10 ft. vertical barrier, costs should be $50,000-$100,000 for this important step.

Other costs for fish screens and habitat restoration (see Table 2) also would need funding.

Potential sources of grant funding identified through programs administered by the State Department of Fish and Game include:

1988-1989 Fiscal Year Amounts

1. Bosco-Keene - $630,000 available for various stream restoration or rehabilitation projects.

2. Proposition 19 - $2,000,000 available for flowing waterways for the management of fish, habitat for wildfowl, marshlands, habitat for threatened, endangered and fully protected species.

3. AB 1705 - $5,000,000 available for restoration of fishery resources and habitat damaged by past water diversions, acquisition of land, restoration of habitat, restoration or creation of spawning areas, artificial reef construction, construction of fish screens or fish ladders, stream rehabilitation and installation of pollution control facilities.

In addition, if the California Wildlife Coastal and Park Land Conservation Act (CALPAW) initiative being placed on the ballot this June is passed by the voters it will include:

1. $17,000,000 for fisheries (California Fish & Game)

2. $5,000,000 for urban stream restoration (Department of Water Resources)

D. Unresolved Questions: Section III, Requirements for a Fishery

Some members of the committee have concern that the above requirements for a steelhead fishery and the projected success of a steelhead fishery are based on insufficient data. Following are some questions raised which would require an IFIM study to resolve.

1. On what basis can reliable ranges of expected adult steelhead populations be predicted?

2. Are existing stream bed conditions conducive to spawning?

3. Will flushing flows be necessary to create optimum spawning gravel conditions?

4. What amount of flow is required for upstream rearing habitat? Wouldn't an IFIM study would help to determine the carrying capacity of stream-related substrate, food and flow.

5. Wouldn't an evaluation of the effect of flow fluctuations on potential spawning success be needed?

6. How many years would an effective IFIM study take? How much would it cost? Who will pay for it? Where will the water come from?

Additional Questions Relating to a Fishery in General:

1. What is the effect of delta water being imported into the creek (temperature, scent)?

2. Do the current estimates of production take into account the extremely variable hydrologic conditions in the watershed?

3. From an operations standpoint can SFWD release enough cool water to permit steelhead to survive without excessive mortality? Does the watershed have enough natural features (e.g., undercut banks) which would prevent mortality due to high temperatures?

4. How much water will the new riparian vegetation consume?

5. The report states that one of the major spawning requirements is sufficient water flows without barriers. Would additional winter releases of water be necessary, given the fact that SFWD reservoirs rarely spill? How much water would be required for this purpose, in addition to the March 1-October 15 releases proposed in Alternatives 3 and 4?

6. Who will pay for the installation and maintenance costs of fishways and screens? The report identifies up to $560,000 installation and $100,000 annual maintenance costs. Is the cost estimate for construction of the three plunge pools ($60,000) below the ACWD fabridams accurate?

7. How much will construction of the low flow channel in the Alameda Creek Flood Control Channel cost? The report states that 4.5 miles of channel would be required at a $2,000 annual maintenance cost. Is this a realistic estimate? What amount of silt is carried by Alameda Creek each year? Will various entities involved with approving such a project (e.g., U.S. Army Corps of Engineers) approve it?

8. What impact will flood flows have on proposed habitat restoration projects (e.g., log weirs)?

9. Is it accurate to transfer IFIM studies on the Carmel River to Alameda Creek, given differences in hydrology and habitat?

10. Detailed recreational value studies should be conducted to give justification to the costs here versus using the money elsewhere. Who will pay for any recreational studies, and how much will they cost?

11. Is the recreational value of the existing catch and release trout fishery necessarily less than a steelhead fishery? How can the relative values be compared without a recreational cost-benefit analysis? Is it worth eliminating much of the trout fishery to create a limited steelhead fishery with minimal, if ever, harvest potential?

12. How much water would be needed to create a 10 cfs flow over the most downstream fabridam? What losses could be expected from percolation, evaporation and evapotranspiration?

13. Would spills from dams, although infrequent, harm the fishery?

14. How accurate is the extrapolation of percolation losses on Arroyo De Laguna over to Calaveras and Alameda Creeks? How does the geology of Arroyo de la Laguna compare to Alameda Creek? Are the 13-15 cfs percolation losses observed on Arroyo de la Laguna equal to the losses which could be expected on Alameda Creek?

15. Is it accurate to presume that because summer flows exist downstream from Calaveras Dam to the vicinity of Naka Nursery, that percolation losses on Alameda Creek would be less than the 13-15 cfs losses observed on Arroyo de la Laguna?

16. Who will pay for the cost of releasing 20 cfs under alternative 3? Is this figure sufficient to create a 10 cfs flow over the last ACWD fabridam several miles downstream?

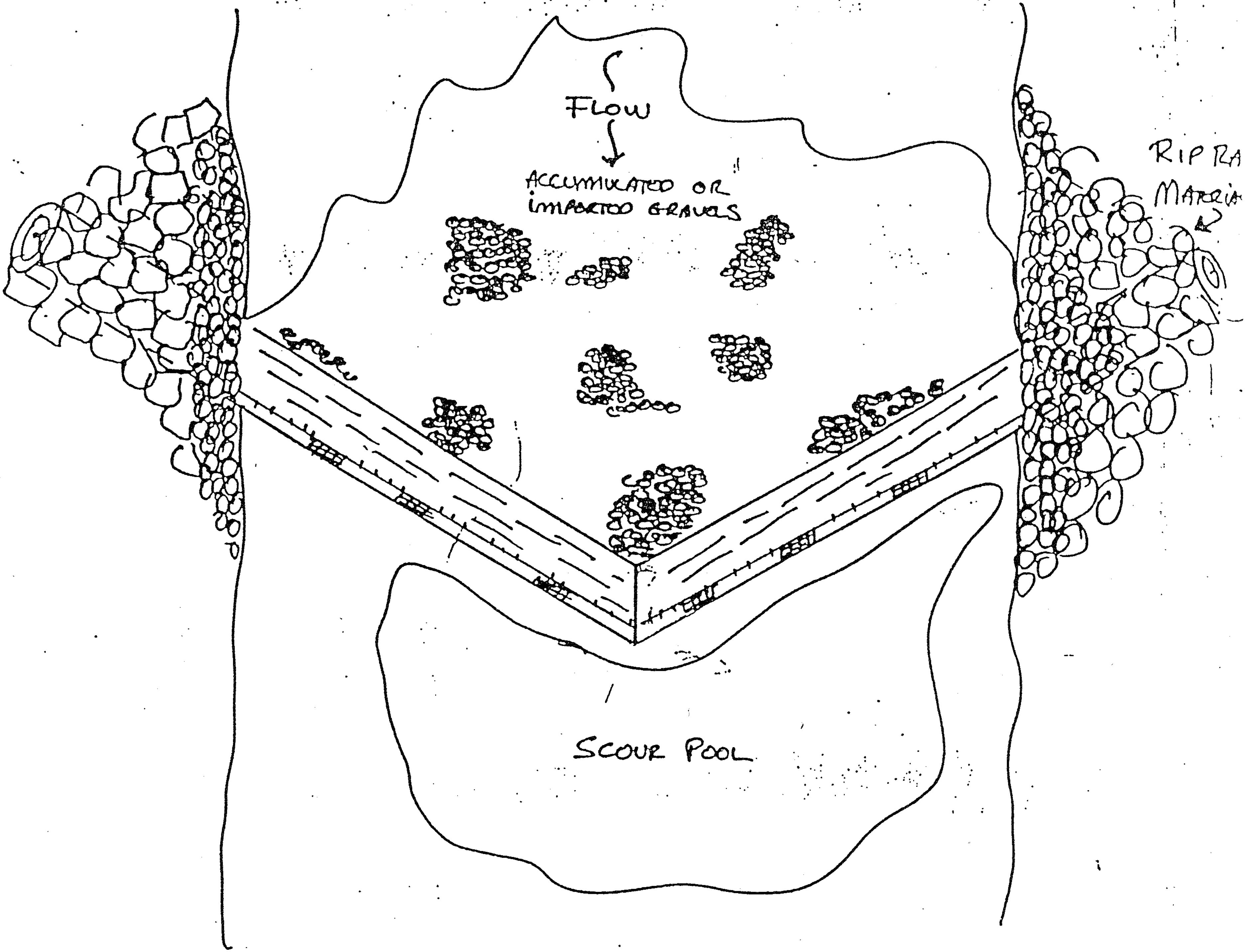

FIGURE II–A Top view of completed log weir structure.

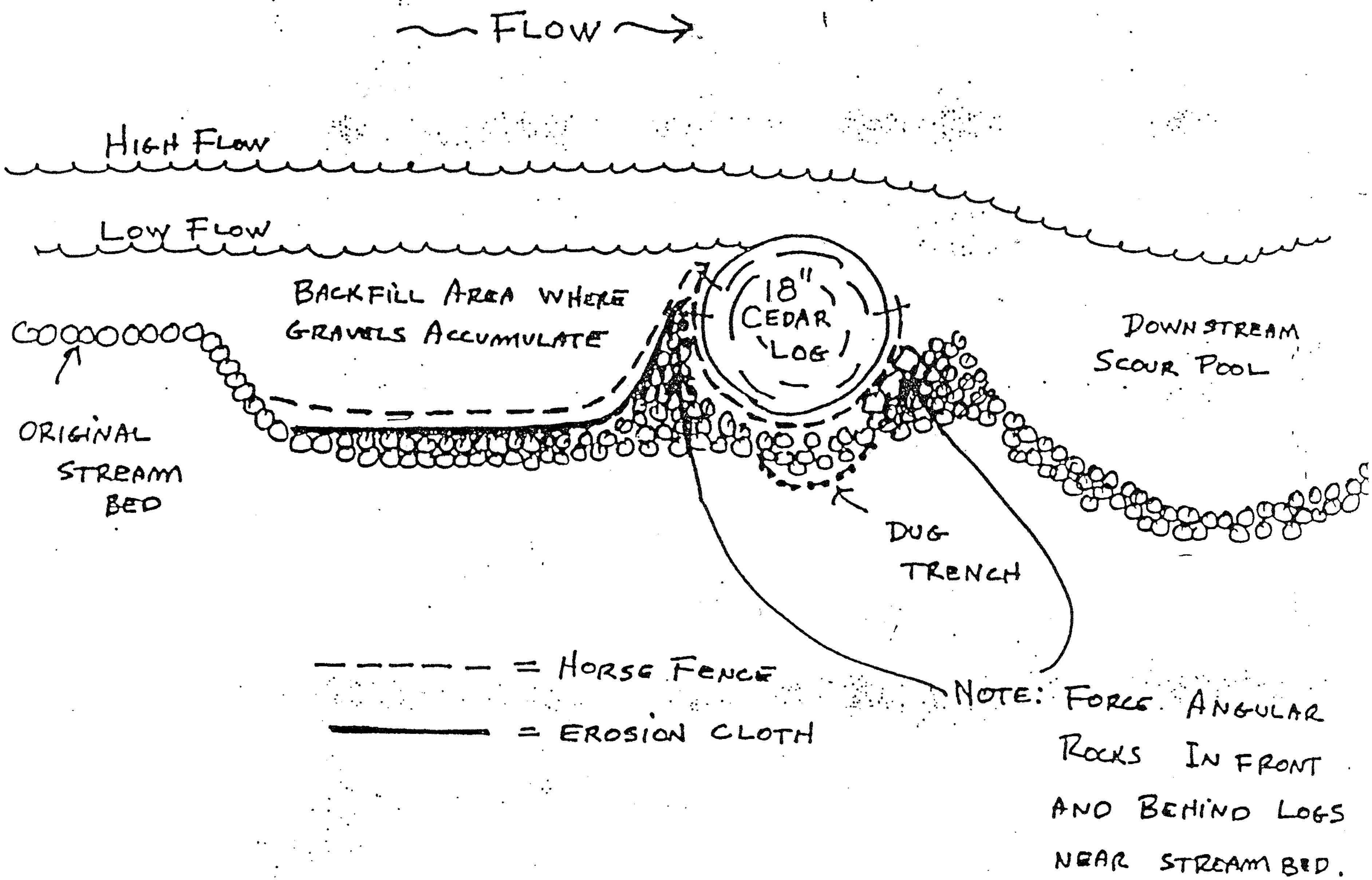

FIGURE II-B Cross sectional view of log weir structure.

III. WATER SUPPLY AND FLOOD CONTROL OPERATIONS

A. Description of Agencies and Review of Water Supply Sources

1. San Francisco Water Department

a. Imported Water

The San Francisco Water Department has served its in-city and suburban customers water from local watersheds in Alameda County since 1930. Beginning in 1932, water from the Hetch Hetchy system began flowing to Bay Area customers to supplement limited local supplies. Local water supplies continue to serve as a baseload supply to this day.

Hetch Hetchy water supplies imported into the San Francisco Bay area are subject to limitations and requirements of the Raker Act. Section 9(h) of Raker Act reads:

> "That the said Grantee shall not divert beyond the limits of the San Joaquin Valley any more of the waters from the Tuolumne watershed than, together with the waters which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes."

Use of Hetch Hetchy water for purposes other than domestic and municipal uses would be a violation of the Raker Act. It was not the intent of Congress to permit the diversion of Tuolumne River water to the Bay Area for anything but domestic and municipal uses.

The Raker Act requires, and established practice dictates, that all local waters be fully utilized prior to the use of Tuolumne River water. Compliance with these requirements is evidenced by the fact that local reservoirs rarely spill. Local reservoirs like San Antonio and Calaveras are operated so that sufficient storage capacity is available going into the winter season to capture the rainy season runoff. Only in especially wet years would a reservoir possibly fill and spill. Table III-A indicates that Calaveras Reservoir has spilled only 12 times since 1938. The table also shows that the amount of water spilled and the number of years between spills is highly variable. Any surplus water which exceeds the SFWD's ability to store and capture in Calaveras Reservoir is entirely intermittent and cannot be construed to be a reliable source for stream flow and fish habitat maintenance.

Water demands will continue to increase throughout the four counties served by the SFWD, with the largest growth occurring in Alameda and Santa Clara counties. In the next 15 years the demand for water in the general area served by the City of Hayward and the Alameda County Water District may increase by 50 percent, even with long term water conservation programs. Full use of local sources of supply is required. Diversion of local water supplies for fishery purposes could have an adverse impact on the area's economy. As demonstrated by the City and County of San Francisco in the Bay-Delta Hearings, maximizing the use of local sources minimizes the diversion required from the Tuolumne River Basin.

b. Local Water

As originally designed, Calaveras Reservoir (construction completed in 1925) stored water for controlled release into Alameda Creek. This controlled release recharged extremely permeable gravel beds (currently located immediately south of Interstate 680 in the Sunol Valley) which were tapped by the Sunol filter galleries. Water from the Sunol filter galleries in turn supplied the Sunol Aqueduct via the Sunol Water Temple. The Sunol Aqueduct carried the water by gravity through Niles Canyon to the Niles Reservoir, from where it flowed into the Niles Irvington pipeline to the Irvington pump station. From here the water was pumped across San Francisco Bay in the Bay Division pipeline and carried to Crystal Springs Reservoir and ultimately San Francisco.

TABLE III-A

HISTORICAL RECORDS OF SPILLS FROM CALAVERAS RESERVOIR

Year	Period	Amount, Millions of Gallons	Amount Acre-Feet
1938	February 11 - March 27	No record	No record
1941	February 17 - April 18	No record	No record
1952	January 12 - May 21	28,900	88,720
1956	January 19 - May 1	14,780	45,370
1958	March 17 - May 25	20,090	61,670
1965	April 11 - May 5	4,350	13,360
1967	April 3 - May 26	9,150	28,090
1969	February 25 - May 7	8,650	26,360
1970	March 1 - April 7	2,480	7,610
1973	February 28 - March 26	2,260	6,940
1983	January 27 - May 24	31,170	93,690
1986	February 19 - April 9	13,330	40,920

Calaveras Reservoir, located on the Calaveras and Arroyo Hondo Creeks, has a drainage area of about 100 square miles. Its supplies are supplemented by water from the Alameda Creek drainage which is diverted to the reservoir via the upper Alameda Creek Diversion Dam and Tunnel. Calaveras Reservoir currently delivers water by gravity through the Sunol Water Treatment Plant. San Antonio Reservoir also supplies water to the Sunol Treatment Plant, but water must be pumped via the San Antonio Pump Station. Treated water from the Sunol plant is discharged directly into the Hetch Hetchy aqueduct lines that cross the Sunol Valley, also known as the "Alameda Creek siphons." Controlled releases from Calaveras Dam no longer occur since the water is now treated at the Sunol filter plant. Any water which percolates into the Sunol filter galleries via the gravel beds is pumped to San Antonio Reservoir using the Sunol pump station. The Sunol Aqueduct currently supplies the SFWD's retail customers located in Niles Canyon.

The SFWD's water rights for Calaveras Reservoir and the Alameda Diversion Dam predate the State of California permit system. (Pre-1914 rights) San Antonio Reservoir was built after 1914. At the time San Antonio Reservoir was approved in 1961, the California Department of Fish and Game ("CDFG") expressed concern for the use of water for fish and wildlife purposes in San Antonio Creek. After a review, the CDFG concluded that the reservoir would not have a detrimental impact on downstream fish and wildlife.

Turner Dam, which forms San Antonio Reservoir, was completed in 1965. San Antonio Reservoir, located on La Costa (San Antonio) Creek, has a very small watershed that supplies intermittent storm runoff. It is used to store Calaveras Reservoir water and Hetch Hetchy water for treatment at the Sunol Treatment Plant, which then becomes part of the Bay Area treated water supply. San Antonio Reservoir is subject to the same Raker Act restrictions as the City's other local facilities; the restriction on maximum use of local water perhaps applies to a greater degree to San Antonio Reservoir as a portion of its waters are from Hetch Hetchy.

Releases from Calaveras Reservoir would be subject to undetermined losses due to percolation from Alameda Creek and the Sunol Valley. There would be some evapotranspiration losses in the normally dry creek. Channel percolation of the groundwater could cause rising water levels in the quarry pits and a subsequent conflict with the quarry operations.

2. <u>California Department of Water Resources</u>

The California Department of Water Resources operates the State Water Project which supplies water to 30 agencies throughout the state. Three of the agencies are ACWD, Zone 7 and Santa Clara Valley Water District (South Bay Contractors).

The State supplies State Project water to the South Bay Contractors through the South Bay aqueduct which includes Lake Del Valle. The State also operates Lake Del Valle to capture, store and release local runoff water for Zone 7 and ACWD which have local water rights on the Arroyo del Valle.

The State Water Project is water supply deficient and is expected to remain so indefinitely. Therefore the State will not allocate a part of its water supply for steelhead restoration in Alameda Creek.

ACWD and Zone 7 have entitlements to State Project water; however, as growth takes place this water supply will be fully utilized. This water is primarily used for municipal and industrial purposes with a small amount used for irrigation agriculture.

Lake Del Valle local water is shared by Zone 7 and ACWD. Part of the water is used for groundwater recharge and part of it is treated for distribution within the two agencies' service areas. The Del Valle water is an intermittent supply depending on the weather, operation of Lake Del Valle and on the needs of the two water districts.

Lake Del Valle water is transported in the South Bay Aqueduct to the treatment plants and to turnouts for release into tributaries of Alameda Creek for groundwater recharge. Releases at the Arroyo del Valle turnout flow down Arroyo Del Valle through Pleasanton and into Arroyo de la Laguna, then into Alameda Creek. Water taken along this route conflicts with Zone 7 operating goals and with Pleasanton quarry operations for the next 30 or so years. ACWD is concerned about water losses by importing water through this route.

3. Alameda County Water District

The Alameda County Water District serves the area within the cities of Fremont, Newark, and Union City. The service area has a population of about 255,000 persons and covers approximately 100 square miles. The ACWD service area is shown on Figure III-B.

The District supplies potable water to the residents of the three cities. It manages the Niles Cone groundwater basin from which private pumpers draw water for industrial use, municipal recreational use and agricultural irrigation.

Currently, the ACWD distribution system supplies are about 30 percent from San Francisco, 20 percent treated State Project water and 50 percent pumped groundwater. The groundwater is recharged with local water and imported State Project water. The ratio of these two sources varies with climatic conditions.

The District expects all of its water supplies to be fully utilized in the next decade. ACWD is implementing its Capital Improvement Program which includes facilities to increase its local supplies so as to provide for the increases in demands it anticipates will take place in the next 10 to 15 years. Even with these supplies, water restrictions will be required during droughts.

4. Zone 7 of Alameda County Flood Control and Water Conservation District

Zone 7 of Alameda County Flood Control and Water Conservation District is the water resources manager for the area upstream of the confluence of Alameda Creek and Arroyo de la laguna. The Zone 7 service area is shown on Figure III-C. Zone imports water from the State Water Project through the South Bay

Aqueduct. The major portion of imported water is treated at two treatment plants and delivered to retailers in Dublin, Livermore and Pleasanton for distribution to the consumer. A small portion (10 percent) is used for agricultural purposes.

In addition to the imported water, Zone 7 has local water rights (in partnership with Alameda County Water District) on the Arroyo del Valle. This water is generally captured in Lake Del Valle. Some of that water is released and recharged into the Zone's groundwater basin. The remainder is generally processed at its water treatment plants and distributed within its 120,000 population service area.

Zone 7's groundwater resources are fairly extensive. However, the average annual yield is only about 13,000 acre-feet, and it is being fully used. If excess pumping were to commence, then that excess would have to be replaced during years of excess supply.

As a whole the various supplies will be more fully utilized in another 20 or so years. It is expected that additional developed water will then be needed to sustain a successful, growing community.

5. Alameda County Flood Control and Water Conservation District

The Alameda County Flood Control and Water Conservation District (ACFC) provides flood control facilities and maintenance throughout Alameda County. It cooperates with the Corps of Engineers and State agencies in providing this service. ACFC regularly performs maintenance in the Alameda Creek Flood Control Channel to regrade the channel bottom and remove debris.

Zone 7 is the only area within ACFC&WCD with a water supply and Zone 7 is governed by its own Board of Directors. ACFC&WCD does not have any water supplies that it controls in other areas of Alameda County.

B. Required Improvements, Facilities Modifications and Operational Changes

As discussed in the "Requirements for a Fishery" section of this report, four steelhead restoration alternatives have been presented. This section will identify the required improvements, modifications to existing facilities, and changes in water handling operations that would be required to support a water supply for each of the steelhead establishment alternatives.

1. ALTERNATIVE 1 - Maintain current conditions and operation

   a. No physical improvements are required.

   b. No modifications to existing facilities are required.

   c. No changes in existing water handling operations are required.

2. ALTERNATIVE 2 - Construct Fishway at WPRR Weir, (drop structure)

   a. Installation of a fishway would be required at the Alameda Creek Flood Control Channel drop structure located at Army Corps of

Engineers Station 519+52+, between the Union (Western) Pacific Railroad and the BART crossings of the Alameda Creek Flood Control Channel. Regular maintenance and eventual replacement of the fishway would also be required.

As shown in Table 2, the capital cost for a fishway is estimated to range between $75,000 to $125,000. The annual maintenance and replacement cost is estimated to range between $9,000 to $14,000.

b. Installation of fish screens would be required pursuant to California Department of Fish and Game Standards ("General Fish Screening Criteria, Appendix F") for at least six of ACWD's existing and proposed water diversion facilities in the Alameda Creek Flood Control Channel.

As shown in Table 2, the capital cost for fish screens, depending on screen type (i.e., self cleaning), ranges from a low of $90,000 to a high of $870,000. The annual maintenance and replacement cost is estimated to range between $8,000 and $77,000.

c. Construction of plunge pools would be required immediately downstream of each of ACWD's inflatable dams to protect smolts from injury during overfall.

The estimated capital cost for constructing three pools is $60,000.

d. ACWD would be required to deflate each of its three (two existing and one proposed) inflatable dams four times during the period November 1 through February 28 to accommodate upstream migration of adult fish. In some years this may happen naturally due to flood flows.

This operation, in addition to releasing approximately 1,500 acre-feet of water per year to SF Bay, would cost up to $4,000 per year.

e. ACWD would be required to make the following operational changes to accommodate emigrating smolts:

(1) Provide overflow at inflatable dams when excess water is available.

(2) Delay annual construction of two temporary earthen dikes (Dike 8 and Dike 9 located within the Alameda Creek Flood Control Channel) until after May 15.

(3) Regulate water diversion flow rates during the period March 1 through May 15 to meet the CDF&G minimum velocity requirements at the fish screens.

3. ALTERNATIVE 3 - Construct fishway and provide 10 cfs minimum flow over inflatable dams during the smolt emigration period March 1 through May 15.

a. Construct fishway (See Alternative 2).

As shown in Table 2, the capital cost for a fishway is estimated to range between $75,000 to $125,000. The annual maintenance and replacement cost is estimated to range between $9,000 to $14,000.

b. Install fishscreens (See Alternative 2).

As shown in Table 2, the capital cost for fish screens, depending on screen type (i.e., self cleaning), ranges from a low of $90,000 to a high of $870,000. The annual maintenance and replacement cost is estimated to range between $8,000 and $77,000.

c. Construct plunge pools (See Alternative 2).

The estimated capital cost for constructing three pools is $60,000.

d. Deflate rubber dams (See Alternative 2).

This operation, in addition to releasing approximately 1,500 acre-feet of water per year to SF Bay, would cost up to $4,000 per year.

e. Make operational changes (See Alternative 2).

f. Construction and maintenance of a low flow channel would be required within the Alameda Creek Flood Control Channel, between the downstream inflatable dam (Fabridam No. 2) and the San Francisco Bay tidal zone. This low flow channel is needed to accommodate emigrating smolts during the period March 1 through May 15.

The estimated minimum annual cost for maintaining approximately 4.5 miles of low flow channel is $2,000 per year.

g. It is estimated that ensuring 10 cfs flow over ACWD's downstream inflatable dam (Fabridam No. 2) during the period March 1 through May 15 would require at minimum one of the following:

(1) an estimated 12 cfs flow release (about 1,800 acre-feet) from the South Bay Aqueduct Vallecitos Turnout.

(2) An estimated 20 cfs flow release (about 3,000 acre-feet) from either the San Antonio Reservoir or the Calaveras Reservoir.

(3) An estimated 25 cfs flow release (about 3,800 acre-feet) from either the South Bay Aqueduct Arroyo Valle turnout or Lake del Valle directly.

The above figures must be <u>significantly increased</u> if releases are not concurrent with ACWD's import of State water.

4. ALTERNATIVE 4 - Construct fishway, provide 10 cfs minimum flow over inflatable dams during the smolt emigration period March 1 through May 15 and provide live stream flows downstream from reservoirs.

   a. Construct fishway (See Alternative 2).

      As shown in Table 2, the capital cost for a fishway is estimated to range between $75,000 to $125,000. The annual maintenance and replacement cost is estimated to range between $9,000 to $14,000.

   b. Install fishscreens (See Alternative 2).

      As shown in Table 2, the capital cost for fish screens, depending on screen type (i.e., self cleaning), ranges from a low of $90,000 to a high of $870,000. The annual maintenance and replacement cost is estimated to range between $8,000 and $77,000.

   c. Construct plunge pools (See Alternative 2).

      The estimated capital cost for constructing three pools is $60,000.

   d. Deflate rubber dams (See Alternative 2).

      This operation, in addition to releasing approximately 1,500 acre-feet of water per year to SF Bay, would cost up to $4,000 per year.

   e. Make operational changes (See Alternative 2).

   f. Construct low flow channel (See Alternative 3).

      The estimated minimum annual cost for maintaining approximately 4.5 miles of low flow channel is $2,000 per year.

   g. Release water from March 1 to May 1 (See Alternative 3).

   h. Ensure a live stream (5 cfs minimum flow) in Arroyo del Valle between Del Valle Dam and confluence of Arroyo de la Laguna by securing a flow release of about 20 cfs from either the South Bay Aqueduct Arroyo Valle turnout or Lake del Valle directly, during the period May 15 through October 30 (169 days). The annual water requirement for this live stream will be about 6,700 acre-feet.

   i. Ensure a live stream (5 cfs minimum flow) in Alameda Creek between Calaveras Dam and confluence of Arroyo de la Laguna by securing a flow release of about 15 cfs from Calaveras Reservoir during the period of May 15 through October 30 (169 days). The annual water requirement for this live stream will be about 5,000 acre-feet.

   j. Construct and maintain additional rearing habitat. No costs have been estimated. Materials are expected to be donated. Labor is expected to come from volunteer groups.

TABLE 2

SUMMARY OF COSTS OF IMPROVEMENTS

FISHWAY

LOCATION: ALAMEDA CREEK FLOOD CONTROL CHANNEL (C.O.E. Station 519+52±)
TYPE: Steep pass
USEFUL LIFE: 20 Years
ESTIMATED CAPITAL COST $75,000 to $125,000
ESTIMATED REPLACEMENT COST (A): $ 7,100/yr to $ 11,800/yr
ESTIMATED MAINTENANCE COST (A) $ 1,400/yr to $ 2,400/yr

FISHSCREENS

				REMOVABLE SCREEN (C)		FIXED/MECHANICALLY CLEANED SCREEN	
WATER DIVERSION FACILITY REQUIRING FISHSCREEN	1988 STATUS	OWNER	OPERATOR	ESTIMATED CAPITAL COST ($000)	ESTIMATED ANNUAL REPLACEMENT & MAINTENANCE COST (B) ($000)	ESTIMATED CAPITAL COST ($000)	ESTIMATED ANNUAL REPLACEMENT & MAINTENANCE COST (B) ($000)
Alameda Creek Pipeline Intake	Existing	ACWD	ACWD	10-20	1-2	50-100	4.4- 8.8
Bunting Pit Pump Intake	Existing	ACWD	ACWD	5-10	0.5-1	25- 50	2.2- 4.4
Kaiser Pit (AHF) Intake	Existing	ACWD	ACWD	5-10	0.5-1	25- 50	2.2- 4.4
Shinn Pit Intake	Existing	ACWD	ACWD	15-25	1.3-2.2	60-120	5.3-10.6
Pit T Intake	Existing	ACWD	ACWD	5-10	0.5-1	25- 50	2.2- 4.4
Pit S Intake	Proposed	ACWD	ACWD	50-100	4.4-8.8	250-500	22.1-44.3

(A) = Equivalent Uniform Annual Cost for n = 20 years, i - 7%
(B) = Equivalent Uniform Annual Cost for n = 30 years, i - 7%
(C) = Rate of water diversion flow v minimum velocity requirements which may be imposed by DF&G criteria could limit use of this type of screen

III.C. Questions and Unresolved Issues

1. The water suppliers determine that all available sources of water in the Alameda Creek watershed (local and imported) are, or will in the future, be committed to three beneficial uses (i.e., domestic, municipal, and agricultural (minor amount)). No water is perceived to be available for other uses including fish and wildlife or recreation, (except for some mutually beneficial uses which do not in any way adversely affect or reduce the agency's water supply). Does the sentence "San Francisco Water Department's water supplies are fully committed and there is serious concern over violation of the Raker Act." mean that all available water is currently being used or that anticipated future demands will result in complete use? How much water normally available (stored) is not being used for municipal and domestic purposes? What percentage of the normal watershed runoff is released below the dam?

   The concern over violation of the Raker Act appears not to be well founded. The last paragraph of the Act clearly establishes that State law has precedence, and full compliance with State laws is required as a condition and implementation of the Act.

   Fish and Game Code Section 5937 requires sufficient flows downstream from dams and water impoundments to maintain fish and wildlife. Such flow releases are not being made.

2. The Water Suppliers state "There is no water available from the State Water Project for fishery enhancement in Alameda Creek." However, State Water Project water has been made available elsewhere as a recreational component and for fish and wildlife purposes in recognition of these other beneficial uses of water established by State law. The TAC should formally apply to the State for allocation of water to allow flow releases in the Alameda Creek watershed to support the steelhead restoration.

3. The Water Suppliers state "Releases at the Arroyo del Valle turnout flow down Arroyo del Valle through Pleasanton and into Arroyo de la Laguna, then into Alameda Creek. Water taken along this route conflicts with Zone 7 operating goals and with Pleasanton quarry operations for the next 30 years or so." Apparently flow releases into Arroyo del Valle from the Del Valle Dam are not being made on a regular, continual basis. This appears to be a violation of the water right permit issued by the State.

   As a condition of Water Rights Permit 11319 affecting water storage at Del Valle Reservoir, the State Department of Fish and Game filed a protest to protect game and non-game species of fish located downstream from the dam. The negotiated settlement of this protest and a condition of Permit 11319, specifies: "Permittee shall, concordant with project operational procedures and objectives, maintain a live, flowing stream in the reach of Arroyo del Valle from Del Valle Dam to the USGS Gaging Station 11-1766 on Arroyo del Valle near the confluence with Arroyo de la Laguna when water stored pursuant to this permit is available."

   It appears that water flow releases from Del Valle Dam are always available in that the lake always contains stored water.

Regular flow releases were made initially until 1983 when an agreement was reportedly made with the quarry operators to discontinue flow releases, preventing groundwater recharge from interfering with quarrying operations. This agreement with quarry operators should not invalidate the separate prior permit requirement to make continual releases.

4. The Water Suppliers state "ACWD and Zone 7 have entitlements to State Project water, however, as growth takes place this water supply will be fully utilized." However, at a recent meeting involving EBRPD and Zone 7, EBRPD was advised that Zone 7 has a very optimistic future regarding water supply for its service area. If its entitlements from the State Water Project are fulfilled, the water supply for that area will exceed all projected demands based upon the General Plan for local government. It was mentioned that surplus water may be great enough to sell some of it to other contractors. It would be helpful if data regarding current and future demands based upon existing General Plan documents was provided by ACWD, Zone 7, other South Bay Aqueduct contractors, and San Francisco Water Department. Existing State Water Project contract entitlements should be included with a prospectus on percentage of entitlements that will be provided in the future (if not already met).

5. The Water Suppliers state "Calaveras Reservoir water rights and commencement of dam construction are pre 1914, and not bound by the State of California permit system." Has the San Francisco Water Department resolved the issue with the State Board as to whether a permit to store water at the site of the Calaveras Reservoir should be obtained? (Note: During the 1959 State Board hearings regarding water rights at San Antonio Reservoir, the State Board determined that since no permit was obtained "the Board would apparently be required to regard the Calaveras Reservoir operation as unauthorized (Water Code Section 1225) and the water therein stored and used as still subject to appropriation.")

   Although the water rights for the Calaveras Reservoir are pre 1914, has the water storage within the reservoir increased and has the water usage increased significantly since 1914?

6. The Water Suppliers state "At the time San Antonio Reservoir was constructed in 1964, dialogue with the Fish and Game took place concerning the fishery of San Antonio Creek. After review, the Fish and Game withdrew their protest stating that the Reservoir would not have a detrimental effect on downstream fishery." The Department of Fish and Game considered the self-sustaining run of steelhead to be extirpated in the Alameda Creek watershed by the mid 1950's due to habitat degradation and flow manipulation practices. Now, however, the Department of Fish and Game is under a legislative directive to examine restoration of historical steelhead runs and now supports restoration of the steelhead fishery in the Alameda Creek watershed along with flow releases to accommodate this effort.

The Appellate Court "Racanelli Decision" (U.S. vs. State Water Resources Control Board, May 1986) establishes authority of the State to review all existing water rights permits to assure the public trust doctrine and that all beneficial uses were properly considered before issuance of the permit. Permit conditions may be changed to reflect conformance with the public trust. It does not appear that the public's interest and reasonable protection of all beneficial uses has prevailed in the Alameda Creek watershed.

TABLE IV SUMMARY OF STEELHEAD ESTABLISHMENT PROJECT ALTERNATIVES

ALTERNATIVES	1 - No Project	2 - Minimum Project	3 - Moderate Project	4 - Maximum Project
	o Current Conditions	o Construct Fishway	o Construct Fishway o 10 CFS Flow over Fabridam #2 from March 1 through May 15	o Construct Fishway o 10 CFS Flow over Fabridam #2 from March 1 through May 15 o Live stream below Reservoirs
CONDITIONS				
1. Barrier to adult migration	Yes	No	No	No
2. Existing rearing habitat	N/A	16.5 miles estimated	16.5 miles estimated	16.5 miles estimated
3. Additional rearing habitat	None	None	None	23.3 miles estimated
4. Smolt "Out-Migration" assured	No	No	Yes	Yes
5. Fish screens/Plunge Pools required	No	Yes	Yes	Yes
6. Adult migration	N/A	Poor	Self-sustaining	Larger Self-sustaining
7. Put-and-take trout fishery in Alameda Creek east of Mission Blvd.	Yes	No	No	No
8. Steelhead harvest	No	*	*	*
COST ESTIMATES				
First Year Capital	-0-	$225,000 to $1,055,000	$225,000 to $1,055,000	$225,000 to $1,055,000
Annual M & R	-0-	$ 16,000 to $ 91,000	$ 19,000 to $ 93,000	$ 19,000 to $ 93,000
Annual Water	-0-	-0-	$ 45,000 to $ 760,000	$145,000 to $3,100,000

* fishing limited (i.e., none until established, or catch and release; limited harvest once established)

V. COMMENTARY

This commentary section is provided as a vehicle for Technical Committee members to articulate perspectives which, though important to the policy considerations, would not be appropriate in the strictly technical assessment portion of the report.

A. Environmental Perspective

The Alameda Creek watershed is the largest watershed on the east side of San Francisco Bay draining a land mass of nearly 700 square miles. Like other coastal streams of its size in central and southern California, as far south as Santa Barbara and north to Eureka, it naturally becomes nearly dry (except in the headwaters) during summer months and drought periods; yet once supported a viable run of steelhead trout.

Actual historical numbers are not known for this watershed or any other streams in California. Early data on this resource, in most cases, is simply not available. The best estimate comes from visual observations and recollections of "old timers" who used to frequent the watershed in pursuit of the fish. Early accounts by locals indicate that a substantial number of steelhead ascended the Alameda Creek watershed annually. Angling for steelhead was not uncommon into the 1950's. During construction of Calaveras Reservoir, completed in 1935, steelhead were plentiful enough that workmen harvested them on their spawning grounds as evidenced by photographs depicting stringers of steelhead. Recent photographs (in possession of Fish and Game) are also available of steelhead that were able to ascend Alameda Creek as far as the WPRR Weir (also called BART invert) located only 3 miles from the mouth. The complete barrier at the WPRR Weir prevents further upstream access necessary to complete spawning, thereby perpetuating the species.

Like so many streams, Alameda Creek has been degraded so severely by man's activities that it no longer supports a viable run of steelhead. Currently best estimates by Fish and Game indicate that the steelhead resource in California has dwindled to about 20 percent of estimated numbers that existed there in the 1950's. This statewide crisis was so apparent to sportsmen and environmental groups as well as State resource agencies, that the State Legislature responded in 1983 by issuing a directive to Fish and Game to develop a plan to restore the steelhead (and salmon) resources throughout the state in streams that historically supported steelhead runs. In the 1970's, Alameda Creek was identified by the State Department of Water Resources as the <u>top candidate</u> of all urban streams surveyed within the entire state that could be restored to support a viable fishery. That agency also recognized that in order to do this, cooperation among all the agencies with water interests would be necessary. Consequently, interest by local sportsmen's groups and resource agencies continued and has culminated in this Technical Advisory Committee Report.

The report has described what would be necessary in terms of fish migration barrier modification, cooperative water management to provide water for <u>all</u> the beneficial uses including reestablishment of a steelhead fishery, and potential for habitat enhancement, all of which are necessary due to the current degraded nature of the streams within the watershed.

It has been shown (in fact, design sketches have already been made) that installation of a fishway over the WPRR Weir is technically feasible and is the only complete barrier currently preventing access to spawning grounds. It has been shown through stream surveys that viable habitat for rearing young steelhead still exists. It has been shown that this habitat could be enhanced by instream techniques with major labor supplied by volunteer groups. It has been shown that the amount of water necessary to restore the fishery is not unreasonable (1,800-3,800 acre-feet of water for alternative 3 or about 7 percent of the average natural water yield in the Calaveras Reservoir watershed alone). It has been shown that certain legal agreements (Water Rights Permits and Fish and Game Code Section 5650), and requirements to release water to protect downstream fishery resources located below the dams in the watershed have been ignored. It has been shown that the concept of the public trust doctrine being used more and more frequently in reviewing existing water rights has not prevailed on the Alameda Creek watershed, otherwise water would have been appropriated to preserve the steelhead run.

Total costs for the proposed restoration effort cannot be assessed precisely due to the many variables affecting costs but have been reported as ranges for each of the elements involved. When considering Alternative 3 - Construct fishway and provide 10 cfs minimum flow over fabridams through May 15, the major costs identified are: 1) constructing the WPRR Weir invert fishway, 2) providing a splash pool at each of the ACWD inflatable dams, 3) installation of 6 fish screens at diversion pipes, 4) annual maintenance and replacement costs, and 5) release of 1,800-3,000 acre-feet of water from an upstream source.

Ranges for these respective costs were reported as:

1) $75,000 - $125,000 (one-time cost) to construct the WPRR Weir fishway.

2) $60,000 (one-time cost) to construct three splash pools.

3) $90,000 - $870,000 (one-time cost) to construct 6 fish screens.

4) $17,000 - $91,000 total annual maintenance and replacement costs.

5) No cost was assigned to the 1,800 - 3,000 acre-feet of water required. However, the San Francisco Water Department is currently in the process of assigning a cost of raw untreated water for nursery usage in the Sunol area located on their property. The project cost will be about $30 per acre-feet (agency staff personal communication). Assuming the fishery water could be purchased at the same price as a SFWD leasee in Sunol (using $30 per acre-foot for release of water from Calaveras Reservoir judged the best source of water to support a fishery), there would be water costs of $54,000 to $114,000 per year. (We reiterate that no cost should be assigned to water release as the public trust doctrine dictates that the public interest should have been considered and water appropriated to prevent destruction of the steelhead run during development of the watershed supplies.)

Based upon the above costs a steelhead fishery could be established for an initial cost of as little as $296,000. Each year thereafter annual maintenance and replacement costs of $17,000 plus water costs of $54,000 for a total of $71,000 adjusted for inflation. The most expensive estimate that would include a highly-inflated cost of $870,000 for 6 fish screens, would bring the initial year's cost to $1,055,000 for the project. Eighty-three percent of this total is attributed to fish screens! Each year thereafter maintenance and replacement costs of $91,000 per year, plus water costs of $54,000 for a total of $145,000 per year adjusted for inflation.

Although the total production of steelhead measured in terms of projected adult return spawners is unknown, two separate analyses concluded between 300-2,400 fish would be realistic. Assuming initial returns may be at the low end and that the ability of the watershed to produce steelhead will be enhanced by in-stream restoration efforts conducted by sportsmen and other volunteer groups in later years, an average run of at least 1,000 adult steelhead is reasonable. Using 1,000 fish as an average expected return for determining a cost per fish analysis results in the following:

Minimum Cost: Assume 7% Inflation

Adult Return Year	Capital $	Annual M & R $	Annual Water $	Adult Return Spawners	Cost/Fish
1*	296,000	54,650	173,645	300-1,000	$1,747-$524
2	None	58,475	66,175	1,000	$ 125
3	None	62,570	70,806	1,000	$ 133
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Maximum Cost: Assume 7% Inflation

Adult Return Year	Capital $	Annual M & R $	Annual Water $	Adult Return Spawners	Cost/Fish
1	1,055,000**	292,550	173,645	300-1,000	$5,070-$1,520
2	None	313,030	185,800	1,000	$ 500
3	None	334,950	198,000	1,000	$ 535
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x					

*No returns expected until the third year after stocking juvenile steelhead.

**Includes $870,000 for installation of 6 fish screens or 83 percent of total.

This analysis reveals that the project cost per fish initially due to the one-time capital costs ranges from $524 per fish to $5,070 per fish, but after the first year of initial adult returns drops dramatically, reflecting the annual costs for maintenance and replacement, plus cost of water. Costs per fish then become more reasonable, ranging from $125-$500 the second year with incremental increases thereafter due to inflation.

The challenge will be to become innovative through use of grant funds, cost sharing, volunteer labor and interagency cooperation to minimize costs. As habitat restoration techniques are implemented to increase pools, spawning areas and create better micro-habitats resulting in larger average annual adult returns, the costs per fish will decrease.

Costs of up to $500 per fish are not outrageous and costs of less than $200 per fish are quite reasonable. Studies conducted in California and Idaho, as well as other states have attached an economic value of hundreds of dollars per fish for salmon and steelhead when considering returns to the economy from sales of fishing and related equipment, plus incidental costs anglers pay to local economies in their pursuit to catch these fish.

Therefore the Alameda Creek steelhead restoration project has been shown to be technically achievable, sufficiently developable (in terms of numbers of fish) and economically justifiable. Alameda Creek is one of few creeks in the Bay Area which can still be restored to support steelhead for the interest and enjoyment of the public. This fishery would supplement the existing put-n-take trout fishery as the 15-30 thousand trout currently stocked annually would either be stocked lower in the watershed at the inflatable dams or within the adjacent Alameda Creek Quarry ponds.

At a time when California's water resources are being allocated for multiple uses statewide, it is imperative that we include sufficient water to preserve, restore and enhance our local natural history. The Alameda Creek steelhead restoration effort provides such an opportunity. The quality of life in such a highly populated urban region as the Bay Area, is positively affected by local government's willingness to support resource diversity and preserve fragments of the local fish and wildlife for generations to come.

B. Recreation Perspective

A self-sustaining population of steelhead once inhabited the Alameda Creek watershed. How many adult fish actually ascended the watershed annually in route to spawning areas is uncertain. However, early accounts of Indian life in Southern Alameda County include harvest of large fish ascending the creeks (probably steelhead and salmon) and "old-timers" who grew up in the area recall occasions when they harvested steelhead from various creeks in the watershed. This resource has been lost along with its recreational opportunity. Development within the watershed has resulted in barriers to upstream migration and habitat losses that have essentially eliminated the species from the watershed. A steelhead restoration effort would reestablish the annual run of adult steelhead enroute to spawning areas and would renew a lost public recreation opportunity.

There would be a great satisfaction from fishermen, environmentalists, fishery biologists, and probably to a segment of the general public of knowing that a steelhead fishery has been restored. There is magic to the term "steelhead" that is exciting to all who have contact either through the sport of fishing or the following of the migration. The concept that a stream, heavily modified by man, has been rehabilitated and again has seasonal water to support a steelhead fishery has become one of the prime goals of the State Department of Fish and Game as well as the many organizations devoted to fishery development.

As was part of history, an anadromous fishery in Alameda Creek would be cyclical. Some years there was more water available; hence, a better migration, better spawning, and combined with a following year runoff into early spring created a larger population for both grill and the returning steelhead for another migration. Until the middle of the 20th century, there were years in which runoff kept Alameda Creek a live stream for many months from all through winter into spring. There were also years at which time there was very little rainfall and in those years the live stream was very short-lived. This same cyclical habitat for a restored stream would be appropriate providing some waters would be released in almost every year with more water being released for a better fishery in the wet years than the dry years. This expectation is true of almost any watershed having an anadromous fishery, and there is no reason that in the very dry years more water could be held and in the wet years more waters released to develop the same cyclical potential for a restored Alameda Creek. Fishermen have always had this cycle and would look forward to the good years and reduce their take on poor years.

One of the great successes in public elections over the past few years has been the overwhelming support of bond issues for public recreation and outdoor environments. All bond issues with the exception of one that had some negative aspects added to it in terms of water conservation for agriculture that turned the voters against the issue. Some eleven bond issues, with the Bay Area being one of the strongest supporters of the development of natural resources for recreation, would indicate the public is vitally interested and would oftentimes pass bond issues in terms of a majority and in the recent election a two-thirds vote to assure the restoration and preservation of our outdoor recreation resources.

Oftentimes, the technical aspects of development, harnessing resources, and special interest groups have caused concern by the overall public on the treatment of our natural resources. To have the technical aspects such as, reservoirs; lumbering too heavily to reduce the water holding capacity of a watershed; the pumping of water for domestic, industrial, and agricultural purposes causing poor water quality or subsidence of land; and the general use of watershed in such a manner that it affects the water quality have met with appreciable opposition and changing of methods of treatment of watersheds. A goal of the restoration of Alameda Creek to make it available for anadromous fishery would be to protect the watershed from additional stream blockage, grading and exposure to erosion, and the reduction of water holding capacity of the watershed to a much cleaner, natural stream bed and practices within the watershed that would enhance its capability of producing water the year-round. The technical issues of uses within the watershed of the water resources and its ability to retain water for year-round use will need to be changed and modified, making the entire environment more desirable for all the uses depending upon Alameda Creek.

Fisheries and the fish have been considered public domain. It has not been the practice nor will it probably ever be the practice in California waters to have the fishery owned by a private source. Stream beds and the water flow within a stream bed for the maintenance of fishery have been considered to be owned by the public. There are locations where the land on both sides of the stream are privately owned and access is not available to the fishermen, but the fish moving up and down the stream and the laws relating to the maintenance of that fishery and the taking of fish for sport or commerce are controlled by the State of California. Alameda Creek has always been a public domain stream even though the water rights and the use of the streams by others for transportation of water has been a right that they have. The fishery has always been open and available to the public, and will probably always remain as such.

Reestablishment of a steelhead run in the Alameda Creek watershed would create a public recreational opportunity for East Bay residents that currently does not exist. Alameda Creek is one of the few streams in the whole Bay Area that can still be revitalized to support steelhead. Development of a steelhead fishery in this urban setting could be a model project for other communities to follow.

C. Water Supply Perspective

The proposed project to establish a steelhead fishery on Alameda Creek was an idea which was worth investigating. However, the findings of the technical report do not support the proposal for several reasons.

1. **A steelhead establishment project, even if a dedicated water supply were found, has not been shown to be 1) technically achievable, 2) sufficiently developable (in terms of numbers of fish), or 3) economically justifiable.**

The Hanson Report, which was an independent review of K. Burger's analysis of potential fish population size, cautioned that a detailed analysis of the spawning and rearing potential of the watershed had not been performed and that estimating numbers of fish based on data and assumptions extrapolated from other systems may be inaccurate. The Carmel River study may not be transferable to Alameda Creek. K. Burger estimated up to 2,400 steelhead fish could be supported by Alameda Creek under the highest alternative. Hanson's guarded estimate ranged from 100 to 1,000 fish.

There is concern that the 2,400 fish estimate is extremely optimistic. Alameda Creek in its entirely natural state was a borderline steelhead stream located at the southern end of the steelhead territory ranging from Alaska to Central California. Optimum steelhead rivers and streams are in Oregon, Washington and Alaska. Much of the Alameda Creek water supply is blended with imported water from the Delta or from reservoirs and is too warm for steelhead. An extensive tree/shrub planting program is not judged to be a viable solution to the negative temperature effects.

The total initial cost of the steelhead establishment project is estimated to range from $200,000 to $1,000,000. This cost includes fishways, fish screens, and channelization work. This does not include volunteer habitat installation work, maintenance costs, fishway and fish screen replacement costs or the cost of additional water. The value of the water proposed for the project is estimated at $1.2 million per year, if it were available. The unit cost per year for an established steelhead fish ranges from $500 to $12,000 per fish for water costs alone.

Although a cost/benefit analysis has not been performed, by inspection it would be very difficult to economically justify the steelhead establishment project.

2. A steelhead establishment project would negatively affect an existing recreational fishery enjoyed by a broad cross section of the community, and attempt to create a mini-fishery for a special interest group of people.

Currently 20,000 to 30,000 trout are planted each year in the portion of Alameda Creek flowing with water imported by ACWD from the State Water Project. About half the fish are estimated to be caught by people fishing along the creek or channel, and about half are lost to predators (thus supporting other wildlife). The steelhead establishment project would require ending this fishing program because the trout compete with steelhead for the same food. Replacement of the trout program with fishing from the gravel pits/lakes is not judged to be comparable to the stream fishing experience. The preferable alternative would be to expand the trout fishing to include both the gravel pits/lakes and Alameda Creek.

The steelhead establishment project would eliminate or severely limit fishing in Alameda Creek. Proposals such as barbless hook fishing and throwback, limited days/hours for fishing, or lottery tags for fishing would be enforcement nightmares. What was once a pleasant fishing area could become a "fisherman off limits" or patrolled environment reserved for specialists only.

There is no question that the public is supportive of and has approved bond issues for recreation projects and restoration of polluted rivers. This project should not be evaluated based on availability of funding, but on cost-effectiveness and public benefit. This project is not a water cleanup project. This project results in reduced recreation opportunities. Bond issue funds should be better spent on other projects that result in water quality enhancements or significant improvements in recreation to the general public.

3. A steelhead establishment project would negatively affect local water suppliers and consumers by 1) reducing available water for southbay cities, 2) requiring extensive and expensive reconstruction of water facilities, and 3) requiring implementation of less efficient and more costly operational procedures.

The water suppliers potentially affected by the proposed project are the San Francisco Water Department and the State Department of Water Resources (as reservoir operators) and the Alameda County Water District and ACFC&WCD Zone 7 as local water suppliers.

All of the water agencies have shown that their full available supply is needed to serve their consumers in the southbay area. In critically dry years that supply is deficient. ACWD and Zone 7 are faced with potential shortfalls to their State Water entitlements if 1) The State Water Project is not fully developed or 2) the Delta Hearings result in increased water releases for Delta fisheries.

If State Water is used for establishment of an Alameda Creek steelhead fishery then there must be a reduction in water supply available for either local consumers or the delta fishery. If water from SFWD local reservoirs is to be available for a steelhead fishery, then ACWD believes that the water could be better used locally to 1) make up for any shortfall in State Project water, or 2) provide recharge to keep the groundwater basin above sea level. The water supply situation in California is such that even if recreation money were available to purchase water for this fishery, there is virtually no water to be purchased.

For decades the planning and construction work in Alameda Creek and its watershed has been based on the premise that no viable steelhead fishery exists. The occasional steelhead seen trying to migrate up Alameda Creek is not a native but is lost, confused, or a planted trout "gone wild." Examples of major water supply projects constructed in the Alameda Creek watershed are the San Antonio Reservoir, the Corps of Engineers Alameda Creek Flood Control Channel construction, and the ACWD rubber dams and diversion pipes to the quarry recharge areas.

The ACWD water supply and recharge facilities, which work in harmony with the planted trout fishery, could incur retrofit costs in excess of $900,000 to accommodate establishment of a steelhead fishery. In addition there are costly operation problems.

By having two 1-month delays each year in start of construction of two earthen dikes in Alameda Creek flood control channel, ACWD will loose capability to percolate of about 450 acre-feet of water per year into the groundwater basin.

Fish screens at water diversion intakes will impede flow and reduce the capacity of the intakes. Even if the screens are adequately designed, the diversion flows will need to be constantly monitored and adjusted by ACWD to maintain the CDF&G velocity requirements. Nonmechanical screens will require frequent cleaning manually to prevent clogging from floating trash/debris, filamentous algae and water plants. Mechanical screens with automatic cleaning devices will require security enclosures and routine maintenance.

Maintaining a continuous 10 cfs minimum flow of water over the inflatable dams during smolt emigration will require ACWD to constantly monitor and adjust water flow at other diversion facilities.

ADDITIONAL COMMENTARY: SAN FRANCISCO WATER DEPARTMENT

a) Use of Alameda Creek Waters for Human Consumption

Water development in the Alameda Creek watershed by San Francisco and its predecessor the Spring Valley Water Company ("Spring Valley") has a long history. Spring Valley looked to Alameda Creek in the 1870's to supply the burgeoning population of San Francisco after its supply from reservoirs and coastal streams on the San Francisco Peninsula were exhausted.

Spring Valley first developed the extremely porous supply from the Sunol gravel beds. Calaveras Dam was constructed in the teens and twenties of the 20th century in order to capture the flows of Calaveras Creek, a tributary to Alameda Creek. The original operation of Calaveras Dam released the water for recharge of the gravel beds at Sunol.

The SFWD completed the Alameda Creek diversion dam in 1931. This facility diverts flood flows from Alameda Creek into a tunnel for storage in Calaveras Reservoir.

San Antonio Dam was completed in 1965. The SFWD's storage and diversion dams in Alameda Creek watershed conserve flood flows for human use throughout the year. In addition, San Antonio Dam stores water from the City's Hetch Hetchy Project and water pumped from the Sunol gravel beds via the Sunol pump station.

Historical flow patterns in Alameda Creek were typical of California coast range streams. Flows on the creek were seasonal in nature, with large storm flows occurring during the rainy season from November to April. These flows diminished during the summer; a 1910 report by Samuel Storrow states that the summer flow of Alameda Creek went dry at the mouth of Niles Canyon.

The upper limits of the watershed above SFWD facilities remain largely unaltered by the effects of human development. This ensures high quality drinking water. In contrast to the lack of human impact upstream, major development has taken place downstream. These developments have altered habitat and affect the viability of the stream for purposes of restoring a steelhead fishery. Major alterations include gravel extraction in the Sunol Valley; faberdams used by Alameda County Water District to capture flows for groundwater recharge; the BART invert which provides a major obstacle to fish migration; and the channelization of large portions of the stream bed from the mouth of Niles Canyon to San Francisco Bay.

In the over 100 years of water supply development in the Alameda Creek watershed, no provision for a steelhead fishery has been required. Development decisions have taken place, not only by the major water suppliers but by other entities, which render establishment of a steelhead fishery and consumptive releases of water for fish an extremely expensive proposition. Moreover, the entire economy of the Bay Area has been developed because this water was available, and economic growth continues in reliance upon a continued water supply.

All of the water produced by Calaveras Reservoir has been used to meet the water needs of the SFWD service area since those facilities were purchased by the City in 1930. Similarly, maximum use is made of San Antonio Reservoir, subject to a license condition prohibiting diversions of more than 19,700 acre feet of stored water during any twelve month period. These facilities have an average yield of approximately 38 million gallons per day ("mgd"). Additional water is delivered from the Hetch Hetchy system to satisfy total service area demands, now totalling nearly 300 mgd to meet the needs of over 2 million users. The SFWD's sources in Alameda County thus satisfy between 10 and 15 percent of the system's current water needs.

Water needs throughout the system's four-county service area will continue to grow well into the next century. The Alameda County Water District and City of Hayward, both served by the SFWD, will exhibit among the highest rates of growth anywhere in the system. Their combined usage in 1986 was 55 mgd and their combined purchases from SFWD in 1985 were almost 30 mgd, or 54.5% of their total supply and 10 percent of all water delivered to the SFWD service area. By the end of this century, their combined need for water will increase by as much as 15 mgd.

While the SFWD's Alameda Creek reservoirs serve other areas, it is significant to visualize the importance of the Alameda Creek reservoir water supply by comparing it to the need for water in that area. Alameda County Water District and Hayward purchases from the SFWD alone nearly equal the average production of the two reservoirs. An additional one-half of that amount will be needed to support the increase in residential, commercial, industrial and community water needs in just the next 15 years.

In time of recurring drought and forecasted shortages of water for human use, the steelhead establishment project would require the SFWD to release 3,000 (alternative 3) to 8,000 (alternative 4) acre feet of water per year. This equals from 7% to 20% of the average long term production of the watershed form 1962 to 1988. These supply figures and demand projections, when coupled with the fact that Calaveras Reservoir has spilled only 13 times in the last 50 years (Table III-A, page 16), indicate that no surplus water is available on a consistent basis to support the proposed fishery project.

b) Additional SFWD Commentary on Proposed Steelhead Fishery

Proponents of the steelhead fishery state that Alameda Creek once supported a "substantial" run of steelhead, yet there is no evidence as to how large the historic fishery was. What is known is that the Alameda Creek fishery was at the southern end of the steelhead range, was subject to reductions in population due to low flows in drought years, and probably did not produce a large commercial harvest. Despite drastic changes in habitat and flow patterns caused by human activity, fishery proponents assume that the mere removal of spawning obstacles and increased flows will establish a steelhead fishery without any facts or comprehensive studies to support this conclusion.

The assumption that a 20 cfs reservoir release would produce 10 cfs to the bay may be erroneous. This assumption does not take into account the extremely porous nature of the Sunol gravel beds in the calculation of percolation losses. The SFWD believes the 10 cfs loss figure to be optimistic. Even assuming the estimate of 10 cfs is correct, of the total amount of water released (8,000 acre feet annually) half of this amount (4,000 af) would not appear in the stream but would be needed to raise the water table in the gravel beds so that surface flow would exist. This water, lost to subsurface flow, amounts to ten percent of the average annual production of the watershed, and is unreasonable in times of increasing shortages of water.

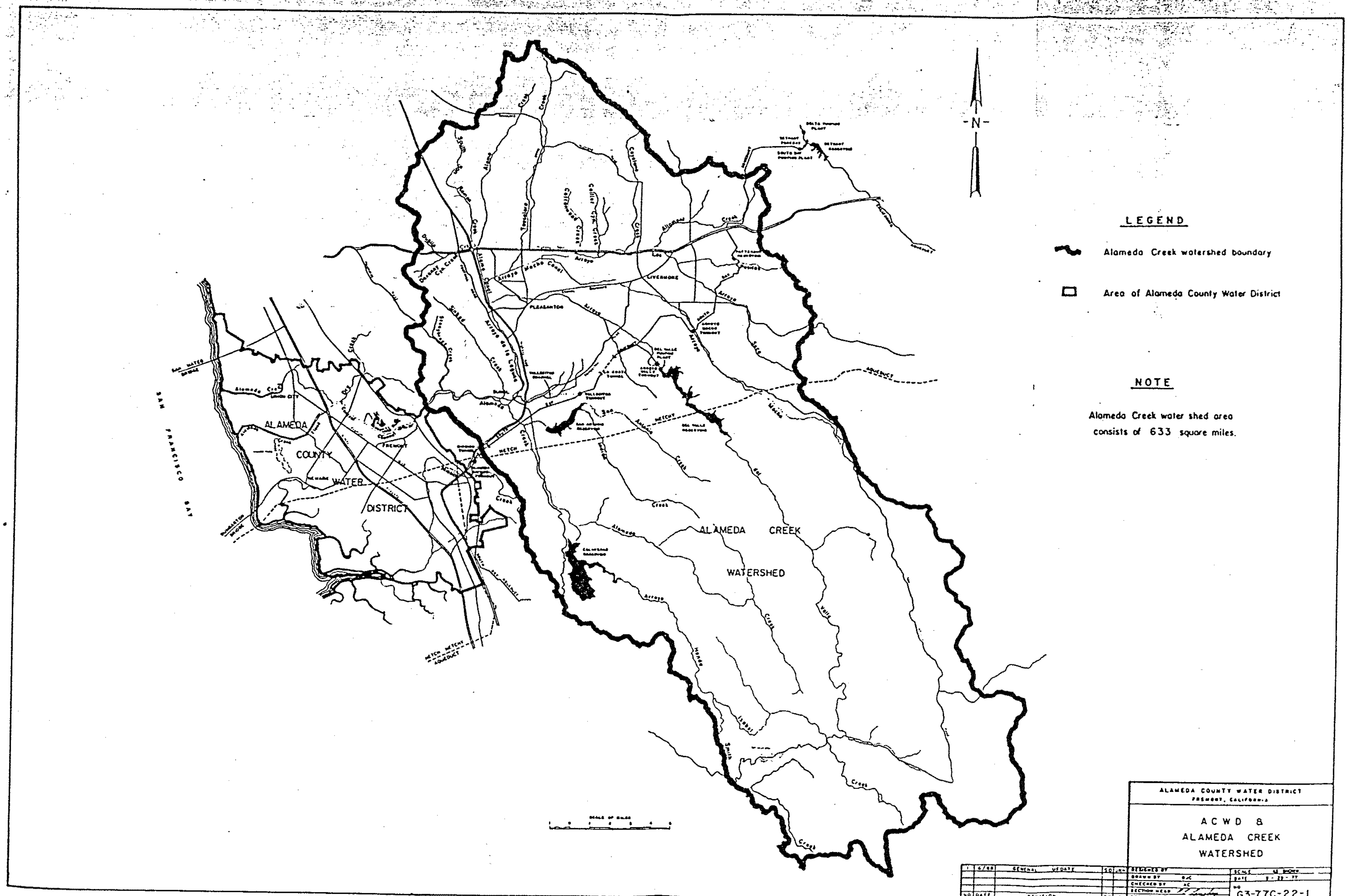
The San Francisco Water Department recognizes that wildlife and fishery uses are beneficial uses of water under the law. (California Water Code Ss 1243). However, all water use in California is subject to a limitation of reasonable use to prevent waste. (Cal. Water Code Ss 100; Cal. Constitution Article X, Sec. 2) Domestic use of water is given the highest priority. (Water Code 106)

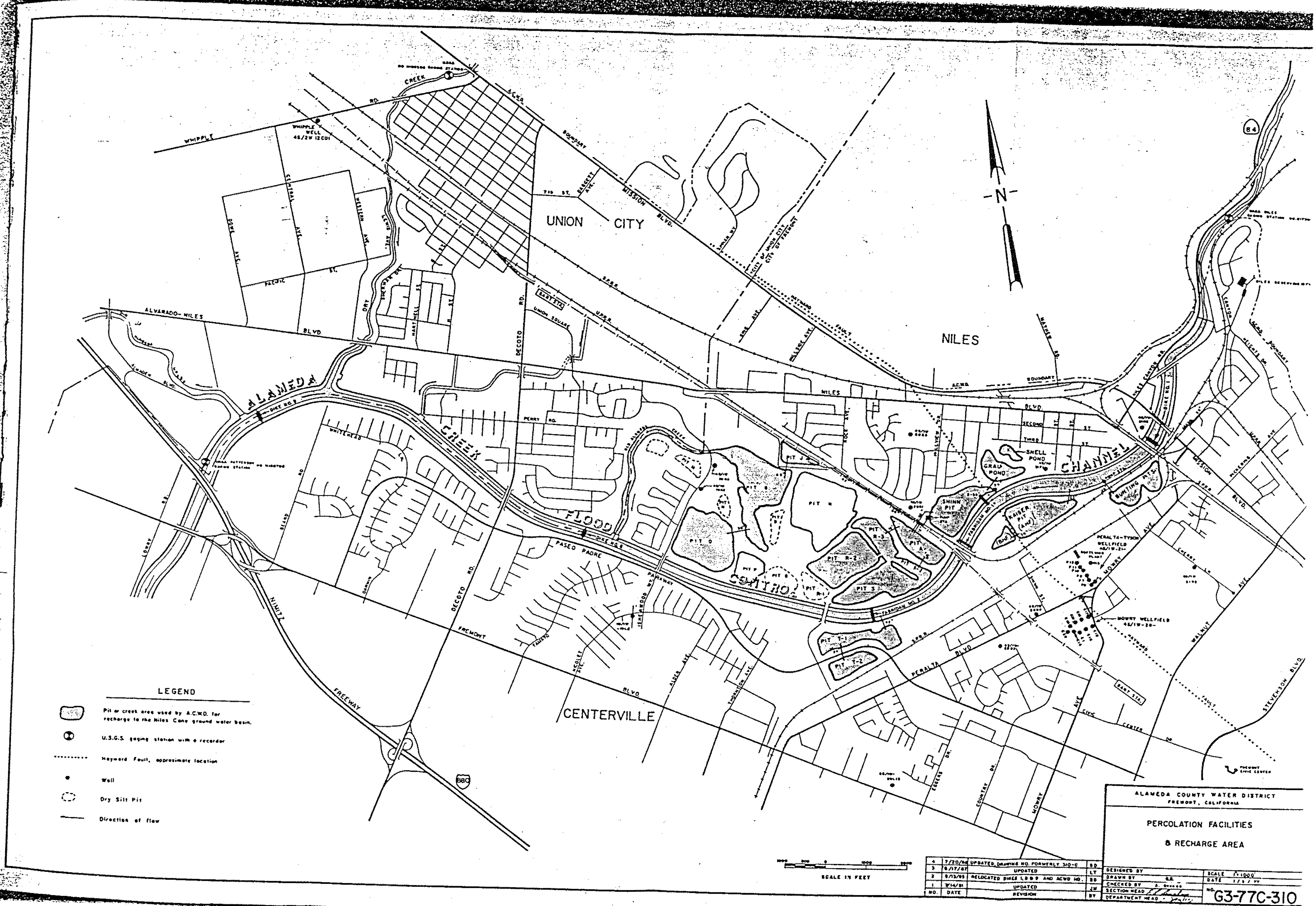
The Department of Fish and Game is not under a legislative mandate to restore steelhead runs in all creeks. By the fishery proponents' own estimates, the creation of a live stream through releases from SFWD dams in the Alameda Creek watershed would require loss of at least 1/2 of the water released in order to produce visible amount of water on the surface of the stream. The large volume of water required, when compared to the small number of fish to be produced, suggests that the use of water for the proposed fishery is an unreasonable and wasteful use of water.

Proponents of the fishery argue that Fish and Game Code Ss 5937 requires the SFWD to release water from its dams. Section 5937 originally applied to dams with fishways. In 1937, it was amended to include dams without fishways. This is after the construction of the SFWD's Calaveras and Alameda diversion dams. These facilities therefore predate the enactment of Ss 5937, which cannot be applied retroactively. While San Antonio Dam was built after 1937, the California Department of Fish and Game withdrew its protest to construction of San Antonio Dam, because the project was seen as having no impact on fish and wildlife. This suggests that Ss 5937 should not be applied to San Antonio Dam.

Proponents of the fishery also cite the "Racanelli decision" (182 Cal. App. 3d 82) and the public trust doctrine in support of creation of the fishery. The Racanelli Decision only applies to the state's reconsiderations of the D-1485 standards imposed in 1978 to protect the waters of San Francisco Bay and the Sacramento-San Joaquin Delta. The Racanelli Decision does not apply to Alameda Creek.

While public trust uses should be considered in any new application to appropriate water, the public trust doctrine has not been applied to vested rights to stored water acquired prior to 1914 and to nonnavigable streams. The public trust doctrine does not apply to man-made reservoirs like Calaveras (Golden Feather Community Assoc. v. Thermalito Irrig. Dist. (1988) 199 Cal.App.3d 402) or to non-navigable streams like Alameda Creek. The seminal case on the public trust doctrine, National Audobon Society v. Superior Court (1983) 33 Cal.3d 419 (the "Mono Lake" case), expressly permits the degradation of some public trust values (i.e. Fisheries) to benefit other uses of water on navigable streams, including domestic and municipal use of water. (Id. at 446.) The history of economic and population growth in California is replete with examples of the appropriation of water for uses unrelated to in-stream public trust values like the proposed steelhead fishery. The value of Alameda Creek water for human use should not be underestimated. The benefits to be gained from the proposed fishery are clearly outweighed by the use of this water for domestic and other human uses.


N
LEGEND
Alameda Creek watershed boundary
Area of Alameda County Water District
NOTE
Alameda Creek water shed area consists of 633 square miles.
ALAMEDA COUNTY WATER DISTRICT
ALAMEDA CREEK WATERSHED
LIVERMORE
PLEASANTON
FREMONT
SAN FRANCISCO BAY
ALAMEDA COUNTY WATER DISTRICT
FREMONT, CALIFORNIA
ACWD &
ALAMEDA CREEK
WATERSHED
G3-77C-22-1



UNION CITY
NILES
CENTERVILLE
ALAMEDA CREEK FLOOD CONTROL CHANNEL
N
WHIPPLE RD.
ALVARADO-NILES BLVD.
MISSION BLVD.
NILES BLVD.
DECOTO RD.
FREMONT BLVD.
PASEO PADRE PARKWAY
PERALTA BLVD
MOWRY AVE
NIMITZ FREEWAY
PIT O
PIT N
PIT R-2
PIT 3
PIT T-1
SHINN PIT
SHELL POND
GRAU POND
KAISER PIT
BUNTING PIT
PERALTA-TYSON WELLFIELD
MOWRY WELLFIELD
LEGEND
Pit or creek area used by A.C.W.D. for recharge to the Niles Cone ground water basin.
U.S.G.S. gaging station with a recorder
Hayward Fault, approximate location
Well
Dry Silt Pit
Direction of flow
SCALE IN FEET
ALAMEDA COUNTY WATER DISTRICT
FREMONT, CALIFORNIA
PERCOLATION FACILITIES
& RECHARGE AREA
4 7/20/94 UPDATED, DRAWING NO. FORMERLY 310-C SD
3 6/17/87 UPDATED LT
2 9/13/85 RELOCATED DIKES 1, 8 & 9 AND ACWD NO. SD
1 7/14/81 UPDATED JM
NO. DATE REVISION BY
DESIGNED BY
DRAWN BY
CHECKED BY
SECTION HEAD
DEPARTMENT HEAD
SCALE 1"=1000'
NO. G3-77C-310

ALAMEDA COUNTY WATER DISTRICT SERVICE AREA

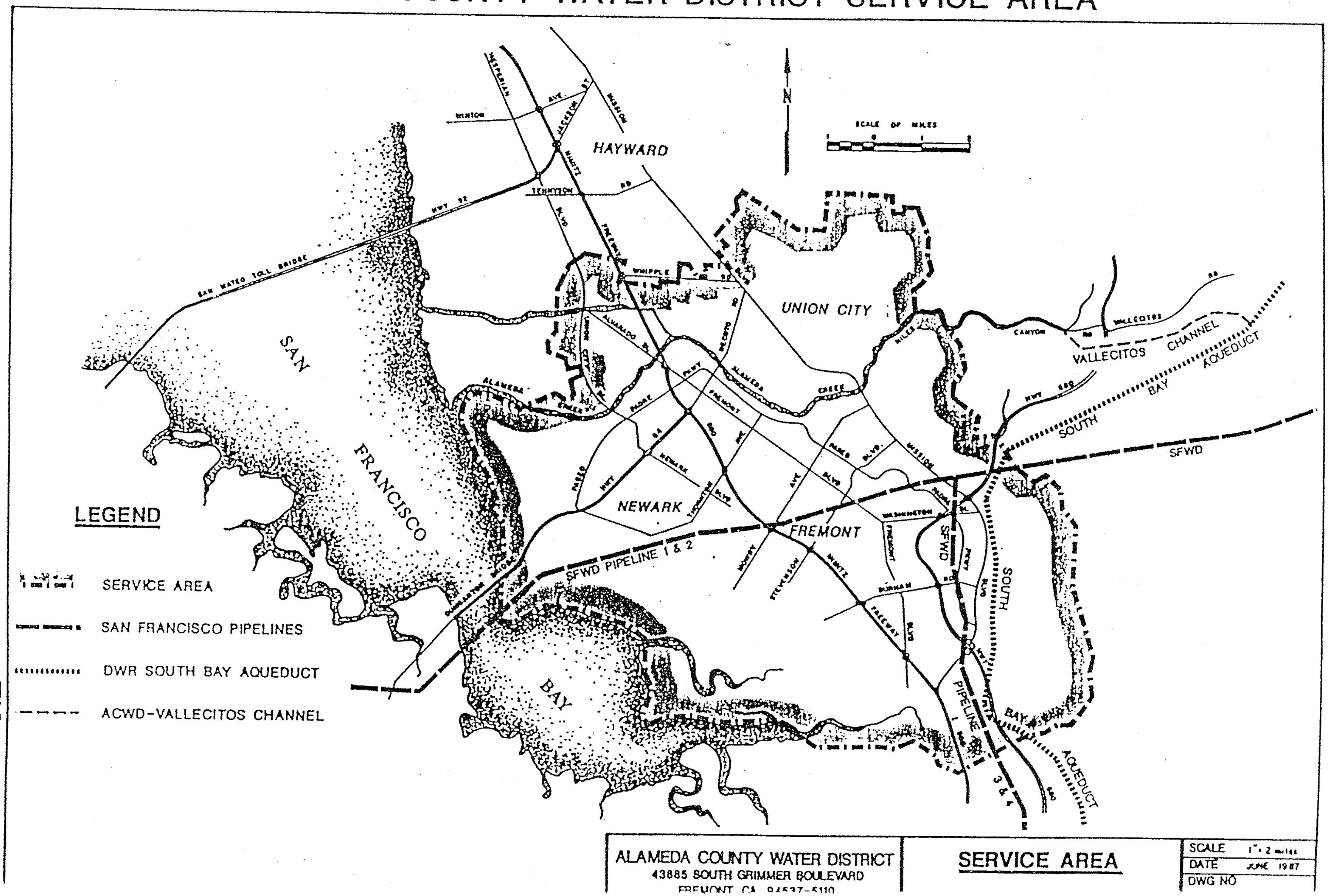


FIGURE III-B

ZONE 7 SERVICE AREA

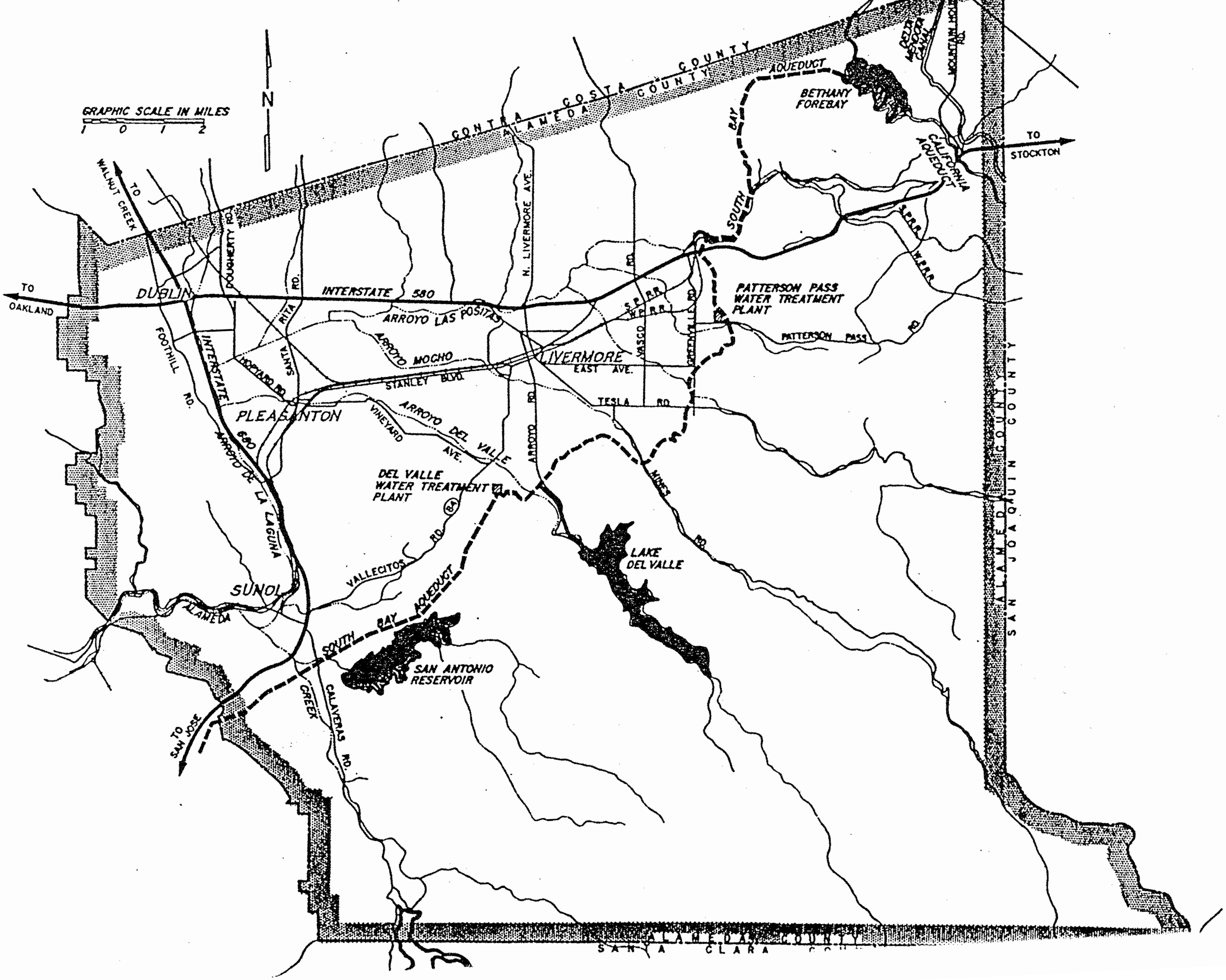


FIGURE III-C