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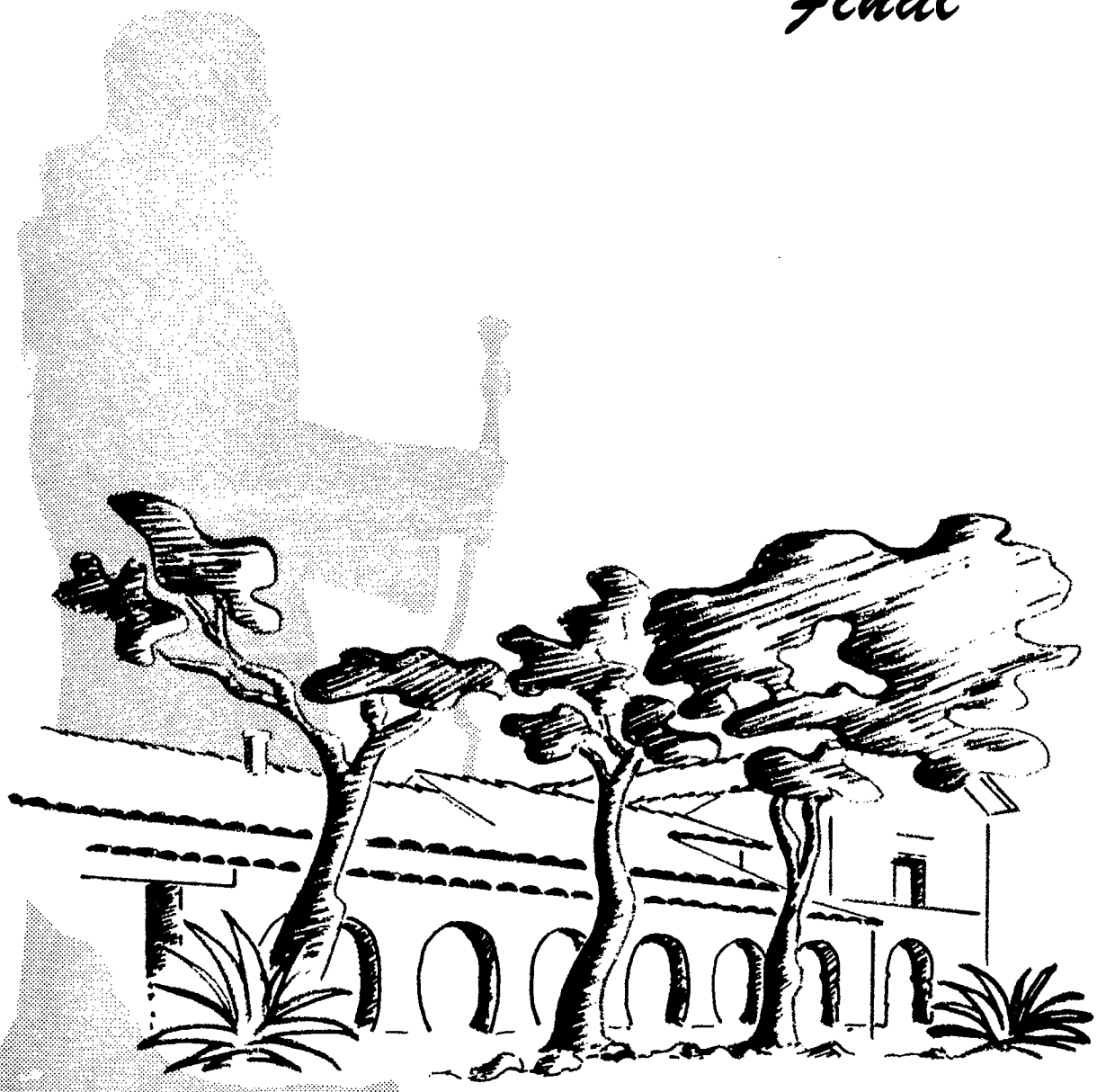

San Felipe Division

Environmental Statement

Volume 1

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UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

C—038574

C-038574

DEPARTMENT OF THE INTERIOR

VOLUME I
(FES 76-15)

120.01
R299

038152

FINAL
ENVIRONMENTAL STATEMENT

Authorized

SAN FELIPE DIVISION
CENTRAL VALLEY PROJECT
CALIFORNIA

Prepared by

Bureau of Reclamation
Department of the Interior
(March 8, 1976)

Gilbert G. Stamm
Commissioner

C-038575

C-038575

A. DESCRIPTION OF PROPOSAL

1. Introduction

The San Felipe Division, Central Valley Project, was authorized for construction by Congress by the Act of August 27, 1967 (81 Stat. 173; P.L. 90-72). The Division service area encompasses part of Santa Clara, San Benito, Santa Cruz and Monterey Counties, all located along the central coast of California.

The environmental statement is submitted in compliance with Section 102 (2) (C) of the National Environmental Policy Act of 1969, Public Law 91-190. The statement covers only the portion of the Division lying in Santa Clara and San Benito Counties that is proposed for immediate construction. An additional Environmental Statement will be prepared at the appropriate future date for the deferred portion of the Division, the Watsonville subarea in Santa Cruz and Monterey Counties.

Plate A-1, "Central Valley Project Comprehensive Plan," shows the San Felipe Division in relation to the Central Valley Project, Bureau of Reclamation, Mid-Pacific Region.

Plate A-2, "Plan of Development," shows the subareas of the Division in Santa Clara and San Benito Counties and its principal features.

2. Purpose of the Division

Historically the Division area has attempted through local, State and Federal efforts to maintain a balance between its agricultural water needs, its increasing municipal, industrial water demands and its available water supplies. In periods when demand exceeded supply the difference was made up by overpumping ground water particularly in the North Santa Clara subarea. This caused very large declines in ground-water levels in this area which in turn caused extensive and damaging land surface subsidence. At times this subsidence has been temporarily checked by increasing ground-water recharge, resuming again when demands exceeded supply. This phenomenon has been extensively documented (Subsidence and Its Control, 1972, and the references there cited).[1/]

The San Felipe Division works will convey some 200,000 acre-feet of water annually from the Central Valley to meet projected Division urban and agricultural demands. It is anticipated that this will stabilize ground-water levels and arrest subsidence on a long-term basis, as well as improve water quality and quantity available to the service areas.

1/ See part I, 2.

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3. Plan of Development

The San Felipe water supply will be developed by the facilities of the Central Valley Project. It will be diverted from the Delta and conveyed through State or Federal facilities to San Luis Reservoir on the west side of the Central Valley or east side of the Diablo Range. From San Luis Reservoir the 10.4-mile Pacheco Tunnel will convey the water through the Diablo Range into the Santa Clara Valley. In the Santa Clara Valley the Division canals and pipelines will link the imported supply to local facilities including ground-water recharge areas. About three-fourths of the imported water will be delivered into the Santa Clara conduit of the San Felipe Division. This conduit will run northward to serve the North and South Santa Clara subareas. The remaining one quarter will go to the Hollister Conduit of the San Felipe system. This will run southwesterly to serve the Hollister subarea.

Water conveyed to the Santa Clara subarea will supplement the area's available supply as shown in the tabulation on page A-13. Based on the subarea demands in 2020, the project supply will amount to a little over 25 percent of the supply available. As explained subsequently in the report, the 62,800 acres of crops shown in the 1973 agricultural crop report for Santa Clara County are expected to decline to 38,300 acres by 2020 with an irrigation demand of about 82,400 acre-feet. About 31,500 acre-feet of this demand will be supplied by the project.

The remaining project supply of 113,500 acre-feet will be utilized to meet the 2020 municipal and industrial demands.

In the Hollister subarea, the project will supply supplemental irrigation water to about 18,000 acres. The remaining productive acres, including about 13,000 acres of land not now irrigated will utilize the ground-water basin for their full supply. Water now pumped for municipal and industrial use will be supplied by the project. Percolated irrigation water will also add to the additional ground water required. The estimated irrigation requirement is 33,900 acre-feet in 1990 declining to 28,100 acre-feet in 2020. Municipal and industrial use is estimated at 12,000 acre-feet in 2020. (See table A-2).

Further details of the plan of development are shown on plate 2 and described in this and the following sections.

Water for the San Felipe Division will be conveyed from the Sacramento-San Joaquin Delta to the existing O'Neill Forebay either through the north portion of the State's California Aqueduct or the Federal Delta-Mendota Canal. The California Aqueduct will be used,

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SUMMARY

( ) Draft (x) Final Environmental Statement

Department of the Interior, Bureau of Reclamation, Mid-Pacific Region

1. Type of action: (x) Administrative ( ) Legislative

2. Brief description of action: The proposed action is the construction and operation of the San Felipe Division facilities to provide about 200,000 acre-feet of supplemental municipal, industrial and irrigation water to parts of Santa Clara and San Benito Counties, California. The Division facilities will import water from the Central Valley through a tunnel and distribute it through a system of open and closed conduits and relift pumping plants. Construction activities would occur for approximately 7 years.

3. Summary of environmental impact and adverse environmental effects: Providing supplemental water to about 18,000 acres in the Hollister subarea and stabilization of the ground-water levels in the Santa Clara subarea would be the principal impacts. Urban growth is expected to continue with or without the San Felipe water supply. Ground-water stabilization will prevent the land surface subsidence which accompanies water-level decline.

   Project facilities will require about 1,345 acres of land with corresponding losses of flora and wildlife habitat. Some 21 archeological sites might be affected.

   Stabilization of water levels and provision of minimum fishery pools at existing reservoirs will increase recreational use.

   Diversions from the Sacramento-San Joaquin Delta for the San Felipe Division will amount to about 1.5 percent of the Delta outflow.

4. Alternatives considered:

   Waste-water reclamation.
   Local conservation plans.
   Alternative canal and tunnel routes.
   No action.

5. Comments have been requested from the following:

   See the listing following this summary.

6. Date final statement made available to CEQ and public:

   Draft Statement: 2/19/75
   Final Statement:

DISTRIBUTION LIST

FINAL ENVIRONMENTAL STATEMENT
SAN FELIPE DIVISION, CALIFORNIA

Department of the Interior
*Bureau of Indian Affairs
*Bureau of Outdoor Recreation
*Fish and Wildlife Service
*National Park Service
*Geological Survey
*Bureau of Land Management
*Bureau of Mines
*Office of Water Research and Technology
Secretary's Field Representative, San Francisco, Calif.
Bureau of Indian Affairs, Sacramento, Calif.
Bureau of Outdoor Recreation, San Francisco, Calif.
Fish and Wildlife Service, Portland, Oregon, and Sacramento, Calif.
National Park Service, San Francisco, Calif.
Geological Survey, Menlo Park, Calif.
*Bureau of Land Management, Sacramento, Calif.
Bureau of Mines, Spokane, Washington

Other Federal Agencies
Department of the Army, Corps of Engineers
*Environmental Protection Agency, Region IX
*Department of Agriculture
*Department of Commerce
*Advisory Council on Historic Preservation
*Department of Health, Education, and Welfare, Region IX
Department of Housing and Urban Development
*Department of Transportation, Region IX San Francisco
*Federal Power Commission
*Department of Agriculture
Forest Service, San Francisco, Calif.
*Soil Conservation Service, Davis, Calif.
*Department of the Army, Corps of Engineers, San Francisco, Calif.
Federal Power Commission, San Francisco, Calif.

State and Local Agencies
*California State Clearing House, Office of the Lt. Governor, Sacramento, Calif.
City of San Jose, Santa Clara County, Calif.
City of Gilroy, Santa Clara County, Calif.
City of Hollister, San Benito County, Calif.
City of Watsonville, Santa Cruz County, Calif.
City of Cupertino, Santa Clara County, Calif.

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State and Local Agencies (continued)

City of Sunnyvale, Santa Clara County, Calif.
City of Campbell, Santa Clara County, Calif.
*City of Morgan Hill, Santa Clara County, Calif.
*City of Santa Clara, Santa Clara County, Calif.
City of Salinas, Monterey County, Calif.
Board of Supervisors, Santa Clara County, Calif.
Board of Supervisors, San Benito County, Calif.
Board of Supervisors, Santa Cruz County, Calif.
*Board of Supervisors, Monterey County, Calif.
Santa Clara County Farm Bureau, Santa Clara County, Calif.
*Santa Clara Valley Water District, San Jose, Calif.
San Benito Water Conservation and Flood Control District, Hollister, Calif.
Pacheco Pass Water District, Hollister, Calif.
Santa Cruz Flood Control and Water Conservation District, Santa Cruz, Calif.
San Felipe Committee, San Jose, Calif.
*County of Santa Clara, Fish and Game Commission, San Jose, Calif.

Other Agencies or Organizations

President, California Wildlife Federation, San Jose, Calif.
*Sierra Club, Northern California Regional Conservation Committee, San Francisco, Calif.
*Environmental Defense Fund, Berkeley, Calif.
California Water Resources Association, Glendale, Calif.
Audubon Society
League of Women Voters
Natural Resources Defense Council, Palo Alto, Calif.
California Native Plant Society, Berkeley, Calif.
Friends of the Earth, San Francisco, Calif.
National Wildlife Federation
*New York Archeological Council, Buffalo, New York
*State of California, San Francisco Bay Conservation and Development

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*Comments received and included in attachments.

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VOLUME 1

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PART B. DESCRIPTION OF EXISTING ENVIRONMENT

PART C. ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

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PART E. UNAVOIDABLE ADVERSE IMPACTS

PART F. THE RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

PART G. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

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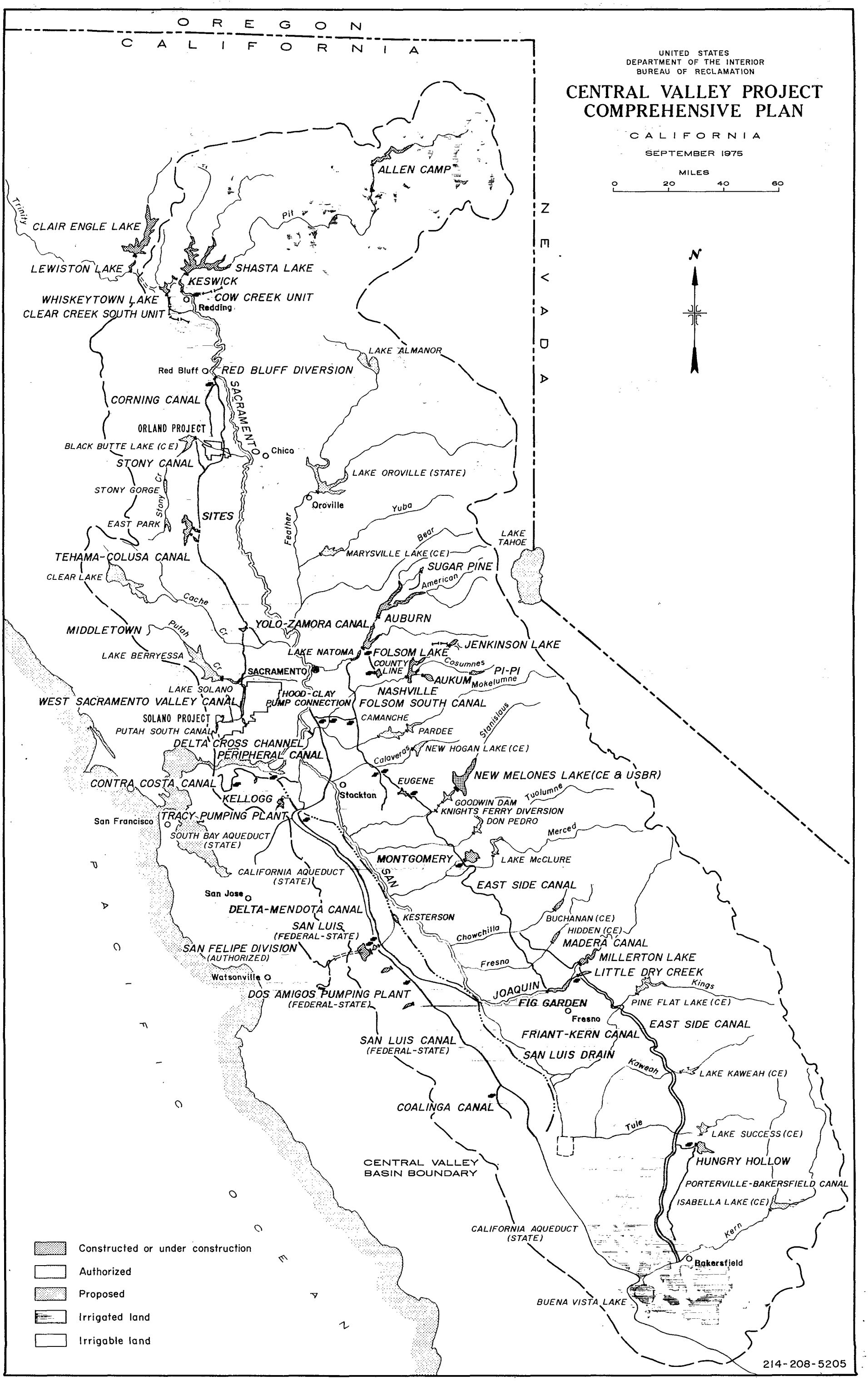

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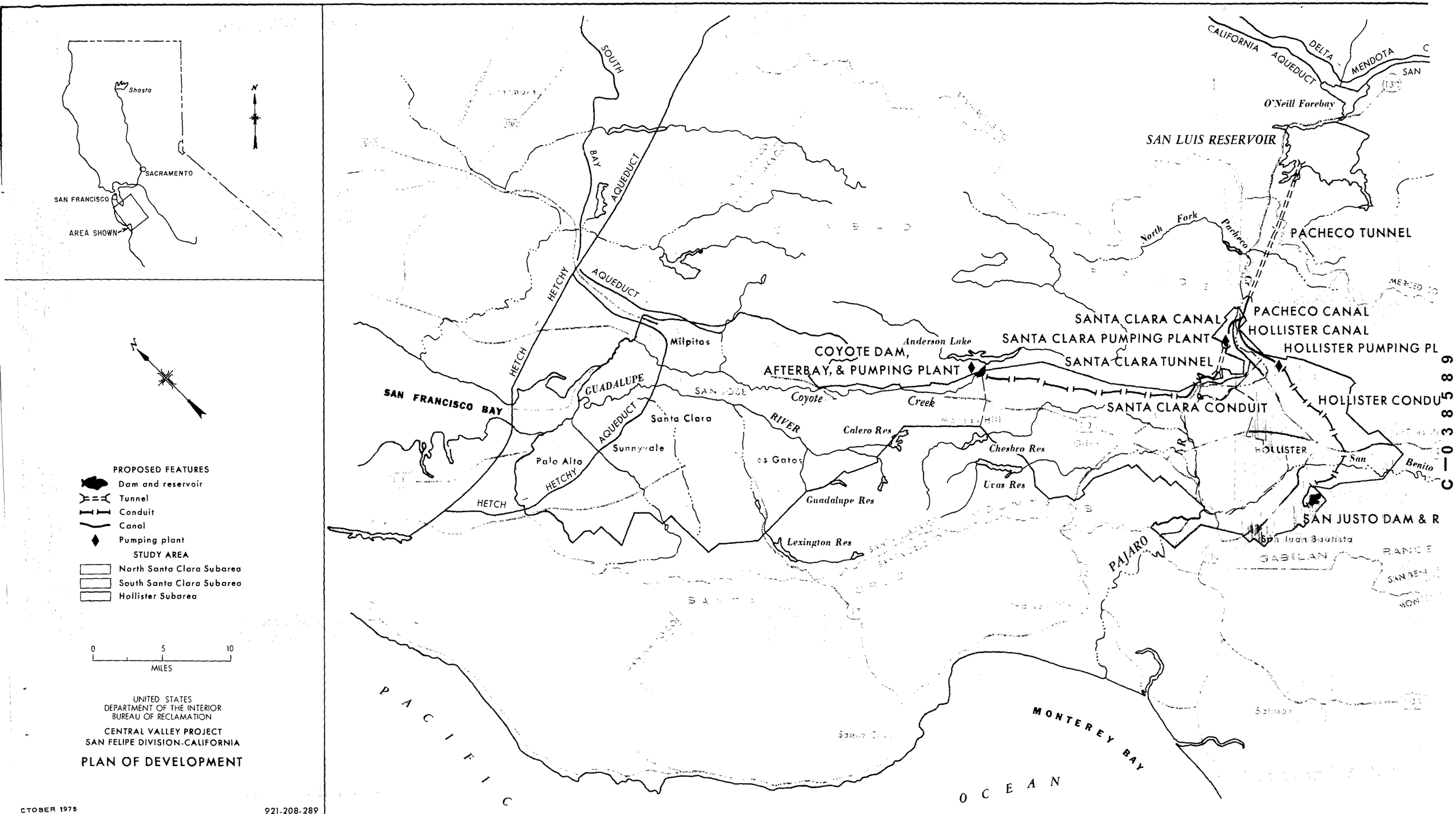
PLATE A-2



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CENTRAL VALLEY PROJECT
SAN FELIPE DIVISION-CALIFORNIA

PLAN OF DEVELOPMENT

CTOBER 1975

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if satisfactory contractual arrangements are completed between the United States and the State for use of sufficient capacity in both the Delta Pumping Plant and the northern portion of the Aqueduct. The alternative way of conveying San Felipe water from the Delta to O'Neill Forebay would be to use the existing Delta-Mendota Canal and the Tracy and O'Neill Pumping Plants.

Conveyance to the San Felipe service area from San Luis Reservoir will be by the 10.4-mile-long Pacheco Tunnel. Its intake and the first 1.8 miles were constructed prior to the completion of the San Luis Reservoir. The tunnel intake is set below the minimum operating storage level of the reservoir, to permit diversions even while San Luis Reservoir is drawn to its lowest stage.

The concrete-lined Pacheco Canal will originate at the Pacheco Tunnel outlet and have a capacity of 413 ft^3/s for its first 1.2 miles. At mile point 1.2 a bifurcation structure will divert 330 ft^3/s to the 2.6-mile-long concrete-lined Santa Clara Canal and 83 ft^3/s to the 5.9-mile-long concrete-lined Hollister Canal. These canals terminate at their respective subarea pumping plants. The Santa Clara Pumping Plant will have a total design head of 202 feet and a nominal flow of 330 ft^3/s. A 1,000-foot-long pump discharge pipe will terminate at the inlet of the 2.9-mile-long Santa Clara Tunnel. Flows from the Santa Clara Tunnel will enter the Santa Clara closed pipe conduit which terminates at Coyote Afterbay. The Santa Clara Conduit will consist of 95,000 lineal feet of reinforced concrete pipe with a diameter of 9.5 feet. The Coyote Pumping Plant will be constructed on the 62-acre-foot-capacity Coyote Afterbay and will be capable of pumping water to either Anderson Lake or Calero Reservoirs. The discharge lines from the Coyote Pumping Plant will be built by a local agency and are not part of the San Felipe Project facilities.

Coyote afterbay is designed to provide the following storage allocations:

Dead storage	13 acre-feet	Below Elev. 408
Inactive storage	4 acre-feet	Elev. 408-410
Active storage	45 acre-feet	Elev. 410-421
Flood surcharge	12 acre-feet	Elev. 421-423

The outlet works are designed to release 230 ft^3/s and, in conjunction with the spillway, will be capable of discharging up to 450 ft^3/s into the streambed below. This design will meet anticipated future downstream requirements and municipal and industrial needs. The spillway at Anderson Dam routes any floodflows around Coyote Afterbay.

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About 60 percent of the Santa Clara requirement will be distributed in the North and South Santa Clara subareas through percolation ponds for ground-water recharge. Conveyance to higher and more distant percolation sites on the west side of the North Santa Clara Valley will require a cross-valley conduit which will be built by a local agency.

San Felipe water for the Hollister basin will be transported through a system of conduits, because faults, ground-water barriers, and the ground-water quality in this area minimize opportunities for direct ground-water percolation. The 5.9-mile Hollister Canal will end at the Hollister Pumping Plant. This plant will have a design head which fluctuates between a maximum of 252 feet and a minimum of 154 feet depending on the stage of San Justo Reservoir. The pumping plant will discharge directly into the 89,900-foot-long Hollister Conduit which in turn terminates at the 10,700 acre-foot-capacity San Justo Regulating Reservoir. San Justo Dam, located about 4 miles southwest of the town of Hollister will be 126 feet high with a crest length of 730 feet. A saddle dike 36 feet high and 750 feet long will be required at the northern end of the reservoir.

San Justo Reservoir is designed to provide the following storage allocation:

Dead storage	100 acre-feet	Below Elev. 395
Inactive storage	50 acre-feet	Elev. 395-400 feet
Active storage	10,550 acre-feet	Elev. 400-496 feet
Flood surcharge	700 acre-feet	Elev. 496-500 feet

The outlet works are designed to release up to 300 ft^3/s, and the spillway is designed for 386 ft^3/s. As the reservoir has essentially no drainage basin, flood waters, which will be primarily rainfall on the reservoir, will normally be contained within the reservoir storage.

The initial contract for construction will be let to complete the Pacheco Tunnel. This tunnel will probably be constructed from two or more headings at the contractor's option. Two shafts will be excavated near the inlet portal. One shaft will be a construction access shaft and will serve as an O&M shaft after construction. The finished diameter can be a maximum of 40 feet at the contractor's option. The second shaft will be the control gate shaft. This shaft will have a finished diameter of 10 feet. Another access shaft location to be used at the contractor's option will be available at

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mile point 9.2 on the tunnel alinement. Tunnel excavation and other construction activities such as placing steel reinforcing and concrete can be accomplished at the access shaft as well as at the outlet portal.

The approximate distance from the nearest railroad main line shipping terminal at Gilroy is 17 miles to the western portal of the tunnel. State Highway 152 from Gilroy to Los Banos approaches within approximately 1,000 feet of the western portal and parallels the entire tunnel alinement at varying distances not exceeding 1 mile. The State highway is adequate for construction hauling. Numerous unimproved dirt roads run from the highway to parts of the tunnel alinement. Power for tunnel construction is available from a 115-kV transmission line which parallels the tunnel alinement. Spur transmission lines to each access shaft and to the outlet portal will vary in length from a few thousand feet to about 1 mile.

Waste excavated material (spoil) obtained from the inlet of the tunnel, about 180,000 yd^3, will be deposited in a small arm of San Luis Reservoir. This material will extend 1,100 feet into the reservoir filling a small embayment and will be utilized as a vehicle parking area after construction is completed. San Luis Reservoir capacity will be reduced by 100 acre-feet between elevations 544 and 505 feet. This feature was coordinated with the California Department of Parks and Recreation. Spoil from the outlet end of the tunnel will be placed against a hill on the south side of Pacheco Creek. When completed, this spoil area will contain about 180,000 yd^3 and occupy a space about 1,900 feet in length, averaging about 400 feet in width with a maximum depth of 25 feet. The slope will be contoured to the hillside with slopes ranging from 6 to 1 up to 26 to 1. Waste excavated material (spoil) and its disposition are discussed in the later sections on Scenic Impacts and Mitigation and Protective Measures.

Sand and gravel will be available from a gravel plant at Hollister. A large cement plant is located near Cupertino, some 40-50 highway miles from Gilroy. Steel fabricating plants are located in San Jose, Oakland, and San Francisco representing a haul-distance to the tunnel portal of between 40 and 70 miles. Temporary batch plants to mix the sand, gravel, and cement will probably be constructed at both the inlet and outlet portals of the tunnel. Canal crossings of Pacheco Creek will be by inverted siphon.

Construction of the 9.7 miles of open canals will be primarily in cut sections requiring disposal of excavated material. Possible places for disposal include waste berms contoured along

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the canal, use of the tunnel outlet portal disposal area, slope stabilization along the Hollister Canal, and highway fill. Material for lining the canals will be available from the same sources as discussed for the Pacheco Tunnel.

Large trenching machines, backhoes or draglines will be required to prepare trenches for the 35 miles of concrete pipelines.

The 18-mile-long Santa Clara Conduit will cross seven county roads between the Santa Clara Tunnel and the Coyote Afterbay. The 17-mile-long Hollister Conduit will cross 10 farm roads, 12 county roads, and one highway. The San Benito River will be crossed by an inverted siphon.

Pumps, motors and accessory electrical equipment will be obtained from the most economical source as determined by response to bids. The Pacific Gas and Electric Company has a network of 69-kV transmission lines in the vicinity of the pumping plants. Single pole transmission lines from the company lines would be required to wheel CVP power to the pumping plant switchyards. The length of these spur lines would be between 1 and 3 miles.

Coyote Afterbay Dam, located at the base of the Santa Clara Valley Water District's Anderson Dam and Reservoir, will be an earthfill structure with rock facing. The dam will be 30 feet high and 880 feet long containing 39,000 yd^3 of earthfill and 24,000 yd^3 of rock. Maximum capacity will be 62 acre-feet with a water surface area of about 5 acres. Minor amounts of concrete and steel, associated with the outlet structure, will be required. Coyote Afterbay Dam will replace a small impoundment which is part of a public park. The 5-acre reservoir area will be cleared, resulting in the removal of large trees, shrubs and vines. Existing picnic facilities will be relocated on the perimeter of the reservoir. A road will be constructed on top of the dam to provide access to the Coyote Pumping Plant on the north side of the reservoir. The outlet pipe valve house at the base of Anderson Dam will have to be raised above the maximum water surface of the afterbay.

San Justo Dam, located about 4 miles southwest of Hollister, will be constructed on a small tributary of San Juan Creek, although there is no distinct channel from this drainage area three-quarters of a mile below the damsite. The main dam will contain 365,600 yd^3 of impervious material, 15,300 yd^3 of pervious material and 131,300 yd^3 of rock materials. The saddle dike will contain about 77,000 yd^3 of impervious material and 24,700 yd^3 of rock materials. Impervious material will be obtained from within the reservoir area and possibly from the excess material

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obtained from the pipeline construction. Pervious material will be obtained from either the San Benito River or from the gravel plant in Hollister. Rock will be obtained from an existing quarry near San Juan Bautista. The upstream face of the dam will have a slope of 3 to 1, and the downstream slope varies between 2.5 to 1 and 4 to 1. Heavy rock facing will provide stability to the structure. The reservoir area is grass covered and completely void of trees or shrubs. The maximum water surface area will encompass about 200 acres at elevation 500 feet. An additional 200 acres around the reservoir will be purchased. There are no structures in the reservoir area, but a mile of dirt road will be inundated and relocated. A paved road will be extended 1 mile to the damsite. Power to operate the gates and valves at the dam will be furnished by extending an existing powerline about 2 miles to the dam. San Justo Dam will be operated by remote control from the Hollister Pumping Plant or from a central operating office.

A breakdown of the required right-of-way, by facility, is shown in the following tabulation:

Facility	Acres
Pacheco Canal	40
Santa Clara Canal	100
Santa Clara Conduit	240*
Santa Clara Pumping Plant	15
Coyote Afterbay and Pumping Plant and Switchyard	10
Hollister Canal	170
Hollister Conduit	185*
Hollister Pumping Plant and Switchyard	5
San Justo Reservoir	400
Pacheco and Santa Clara Tunnels	160*
Tunnel Spoil	20
TOTAL	1,345

*Permanent easement

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Pertinent data for the San Felipe Project facilities and ultimate water deliveries are shown on Tables A-1 and A-2.

As mentioned previously, immediate service will not be furnished to the Watsonville subarea. Representatives of the counties of Santa Cruz and Monterey (Watsonville subarea) believe their area will not require supplemental water for 10 to 15 years. These counties, therefore, are unable to contract for a specific quantity of water from the San Felipe Division at this time.

Because of the impracticability of enlarging Pacheco Tunnel after its construction, the tunnel will be built full-size with a diameter of 11 feet to provide for future service to the authorized Watsonville subarea. At the time additional conveyance facilities are required for Watsonville service an environmental statement will be prepared for that portion of the project.

4. Operation

Water delivered to O'Neill Forebay will be pumped into the existing San Luis Reservoir through the existing San Luis Pumping-Generating Plant (see part 8 - Relationship to Other Projects). From the San Luis Reservoir the water for the San Felipe Division will flow by gravity through the Pacheco Tunnel to the San Felipe service area. The diversion patterns from San Luis Reservoir and to each subarea are shown on table A-3.

Table A-4 shows the estimated buildup of San Felipe import demands in acre-feet per year for the Santa Clara and Hollister subareas by decades. For this table and the discussion that follows, the North and South Santa Clara subareas have been grouped together as the Santa Clara subarea. Both subareas will normally require year-round import supplies. Additional interim water may be supplied during the buildup period to recharge the ground-water basins.

a. Santa Clara Subarea. Santa Clara subarea will ultimately require 152,500 acre-feet of water from the San Felipe Project including unavoidable conveyance and operation losses of 7,500 acre-feet. This leaves 145,000 acre-feet for service area demands. Facilities are presently sized to deliver all of the Santa Clara subarea supplemental water requirement to Coyote Afterbay via the Santa Clara Conduit, and at this point it will enter the district's system for further distribution, percolation, or storage. The peak monthly requirement occurs in July and is estimated as 13.3 percent of the total requirement. Santa Clara Valley Water District's studies indicate that about 60 percent of the San Felipe imported water should ultimately be percolated in existing and proposed percolation ponds and the balance diverted through treatment plants for direct municipal use. Irrigation in this subarea utilizes

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Table A-1. Project Facilities

	Dimensions	Capacity (In cubic feet per second unless otherwise noted.)
Pacheco Tunnel	Dia = 11.0 feet L = 10.4 miles [a]	480
Pacheco Canal	L = 1.2 miles	413
Santa Clara Canal	L = 2.6 miles	330
Santa Clara Tunnel	Dia = 8.5 feet L = 2.9 miles	330
Santa Clara Conduit	Dia = 9.5 feet L = 18.0 miles	330
Hollister Canal	L = 5.9 miles	83
Hollister Conduit	Dia = 4.25 feet L = 17.0 miles	83
San Justo Dam Earth and Rockfill	H = 126 feet L = 730 feet	
San Justo Reservoir	Surface Area = 200 acres	10,700 acre-feet
Coyote Afterbay Dam Earthfill	H = 30 feet L = 880 feet	
Coyote Afterbay Reservoir	Surface Area = 5 acres	62 acre-feet
Santa Clara Pumping Plant	HP = 12,000	330
Hollister Pumping Plant	HP = 3,500	83
Coyote Pumping Plant	HP = 5,000	200

[a] 1.8 miles of this tunnel have been constructed.
Abbreviations
Dia = diameter; L = length; H = height; HP = horsepower
Dimensions and locations are based on preliminary designs.
Final designs may be slightly modified depending upon condition encountered during construction.

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Table A-2. Project Water Deliveries
(Acre-Feet)

	North and South Santa Clara Subareas	Hollister Subarea	Both Subareas
Municipal and Industrial Deliveries			
Direct	56,500	10,300	66,800
By Percolation	57,000	1,700	58,700
Subtotal	113,500	12,000	125,500
Agricultural Deliveries			
Direct	--	27,000	27,000
By Percolation	31,500	1,100	32,600
Subtotal	31,500	28,100	59,600
TOTAL DELIVERIES	145,000	40,100	185,100
Losses	7,500	3,700	11,200
Total supply at San Felipe Tunnel Outlet	152,500	43,800	196,300

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Table A-3. Project Diversions - Percent of Total

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Diversions from San Luis Reservoir	4.2	5.0	5.7	6.4	9.9	12.4	12.9	12.1	12.0	9.1	5.9	4.4	100.0
Diversions to Santa Clara Subarea[a]	4.0	4.9	5.1	6.1	9.8	12.8	13.3	12.2	12.1	9.7	5.8	4.2	100.0
Diversions to Hollister Subarea[b]	5.1	5.1	7.7	7.5	10.2	11.3	11.6	11.6	11.3	7.1	6.4	5.1	100.0
Hollister Subarea Demands	1.1	1.1	3.8	7.5	10.2	16.3	19.9	18.5	13.1	4.8	2.5	1.2	100.0

[a] Also Santa Clara subarea demands.

[b] Includes pumping to San Justo Reservoir-October through March.

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Table A-4. Projected Diversion Schedule
(Acre-Feet)

Year	Santa Clara Subarea			Hollister Subarea			Project Total
	M&I	Agriculture	Total	M&I	Agriculture	Total	
1980	20,200	12,500	32,700	3,700	12,600	16,300	49,000
1990	58,800	29,100	87,900	6,100	36,600	42,700	130,600
2000	81,200	32,200	113,400	8,500	35,300	43,800	157,200
2010	103,900	33,700	137,600	10,900	32,900	43,800	181,400
2020	119,400	33,100	152,500	13,000	30,800	43,800	196,300

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pumped ground water which is metered and taxed to provide recharging water. Water is applied to the crops by sprinkler irrigation and use of gated irrigation pipe with furrows.

In order to estimate more precisely the population and employment projections and municipal, industrial, and agricultural water requirements, the Santa Clara subarea was divided into five geographical areas by the engineering staff of the Santa Clara Valley Water District. Based on the assumption that adequate import supplies would be available for all uses, the safe ground-water and reservoir yield were computed and assumed constant through the year 2020. This yield together with local surface and existing import supplies gives the total water available for the Santa Clara subareas. The demands, based on population and the agricultural projections, minus the assumed water available, give the import supply required from the San Felipe project. However, contract provisions provide for utilization of about 15,000 acre-feet of reclaimed waste water, as it might become available, in lieu of a portion of San Felipe supplies. The following tabulations present the district's calculations for the year 2020:1/

	Santa Clara Valley Basin (acre-feet)	Coyote Basin (acre-feet)	Llagas Basin (acre-feet)
M&I Demand	412,400	2,900	48,100
Ag Demand	7,500	14,400	60,600
Total	419,900	17,300	108,700

Estimated Demand and Supply in 2020

	Acre-feet per year
M&I Demand	463,400
Agricultural Demand	82,500
Total Demand	545,900
Ground-water Yield	-223,100
	322,800
Local Surface Supply	- 14,000
Import Water Requirement	308,800
South Bay Aqueduct Supply	- 100,000
Hetch-Hetchy Supply	- 63,800
Required from San Felipe Project	145,000

1/ SCVWD-Masterplan-Expansion of In-County Water Distribution System-Preliminary, December, 1974.

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During winter and spring seasons, San Felipe water will be routed to ground-water recharge to the maximum extent possible and local stream runoff will be accumulated and held in storage in the Santa Clara Valley District's reservoirs for later release in the summer and fall seasons. This will result in sustained water levels in the existing reservoirs through the warm seasons of the year to the considerable advantage of fishery and recreational uses over the present, since many of the reservoirs are now dry in the warm seasons.

Directors of Santa Clara Valley Water District have agreed to maintain water in storage in their seven principal storage reservoirs throughout the year, subject to the availability of water, for the protection of the fishery resources from one season to the next when their facilities are completed.2/ The minimum pools of water to be so maintained amount to about 20 percent of the total capacities of the reservoirs. The District is willing to provide minimum pools in its reservoirs for fishery purposes after San Felipe water supply is available but cannot afford the loss of storage capacity for capture of local streamflows until additional water supplies are assured.

b. Hollister Subarea. The Hollister subarea was divided into 12 subunits based on geographical position, geologic structure, and water quality. A safe ground-water yield (pumpage) of each subunit was computed, and along with the projected water requirement, a supplemental water requirement was determined. The total safe yield (pumpage) for the Hollister subarea under ultimate conditions was estimated to be about 56,200 acre-feet. The projected agricultural water requirement is 84,300 acre-feet and the projected M&I water requirement is 12,000 acre-feet. By subtraction the total water requirement minus the safe yield results in a supplemental water requirement demand of 40,100 acre-feet.

Hollister subarea will be served by a high-pressure closed pipe conveyance and distribution system delivering 40,100 acre-feet annually. Unavoidable losses will add 3,700 acre-feet to this demand. The distribution system will provide supplemental water to about 18,000 arable acres. Operation of the pumping plant and San Justo Reservoir will provide sprinkler-head pressure to about two-thirds of the distribution system area. Presently, most of the area uses sprinkler irrigation with the remainder using furrows supplied by gated metal pipe.

In order to meet the supplemental water requirements, while maintaining minimum sized facilities, the Hollister Pumping

2/ Santa Clara Valley Water District - Resolution No. 605.

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Plant discharges will be coordinated with releases from 10,700 acre-foot-capacity San Justo Reservoir. Between the months of October through April, the Hollister Pumping Plant will provide the M&I requirements in the area and water to the reservoir. San Justo Reservoir will be full at the end of April. During the months of May through September, service area demands will be met from both the Hollister Pumping Plant and San Justo Reservoir. The reservoir will be drawn down to dead storage each year by the end of September. With this operation, the peak month for deliveries through the Hollister Conduit occurs in July and is 11.6 percent of the yearly requirement. San Justo Reservoir is one of the last facilities planned for construction and probably will not be needed for about 10 years.

Recreation values at San Justo Reservoir will probably be minimal because of the annual drawdown, and no recreation and fish and wildlife benefits were considered. Minimum sanitary and safety facilities will, however, be provided as part of the Division.

This project will be constructed in a seismically active area (see Section B-2 Geology--general and D-5, Seismicity). Final location of the conduits and canals may be changed to provide the best protection from earthquake activity.

Plate A-3 shows the project facilities proposed location plotted on USGS topographic maps.

A master agency or individual districts, such as the Santa Clara Valley Water District and the San Benito County Water Conservation and Flood Control District, will be responsible for the operation of project facilities.

Electric energy will be required to pump San Felipe water from the Sacramento-San Joaquin Delta, from O'Neill Forebay to San Luis Reservoir and to lift the water in the service area via the Santa Clara, Coyote and Hollister Pumping Plants. This pumping energy requirement, estimated to be 49 million kWh during the first year of operation and increasing to 206 million kWh per year by year 2020, would be provided from Central Valley Project sources.

5. Project Water Rights

The water rights for the portion of San Felipe Division covered in this Final Environmental Impact Statement (FEIS) and for which initial service is contemplated will be supplied through American River Permits Nos. 11315 and 11316; Trinity River Permits Nos. 11968, 11969, 11971, and 11973; Clear Creek Permit No. 12364;

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Stony Creek Permit No. 13776; and North Fork American River and Knickerbocker Creek Permits Nos. 16209 and 16212.

6. Actions Required to Implement the Proposal

The actions required to implement the proposal include the filing of the Final Environmental Impact Statement with the Council of Environmental Quality, execution of a contract with the Santa Clara Valley Water District and award of the construction contracts. Congress has approved funds to initiate construction during Fiscal Year 1976. Construction of the facilities, as shown graphically on plate A-4, is scheduled over a 7-year period. The timing of these actions is dependent upon the rate of appropriation of funds by Congress.

7. Previous Studies

Previous to, and during the early planning stage of the San Felipe Project, the population of California and many of the counties in the State experienced phenomenal growth due to immigration and rising birth rates. California had a growth rate of 53 percent in the 1940-1950 decade; 48 percent in the 1950-60 decade; and 27 percent in the 1960-70 decade. During the same decades, Santa Clara County had growth rates of 66, 121, and 66 percent. During the late 1960's and early 1970's, the inmigration slowed considerably. This, coupled with the declining live birth rate, made it apparent that previous population projections were in error. Water requirements for the San Felipe Division, specifically those related to the municipal and industrial demands in Santa Clara County were obviously also in error when compared to the revised projections. Continuous updating and refinement of data during the 1960-70 period also resulted in a revision of the ground-water yield in Santa Clara County. Additionally, during this same period the county secured a firm commitment for additional import supplies from the Hetch-Hetchy project. The following tabulation summarizes the change in water requirements for the Santa Clara subarea after the 1967 report was released.

	1967	1975
	1,000 acre-feet (ultimate)	
Total Demand	581.3	545.9
Local Supplies a/	-253.0	-237.1
Existing Imports b/	-120.0	-163.8
San Felipe Import c/	208.3	145.0

a/ Ground-water and surface reservoirs.
b/ South Bay and Hetch-Hetchy Aqueducts.
c/ Does not include conveyance losses.

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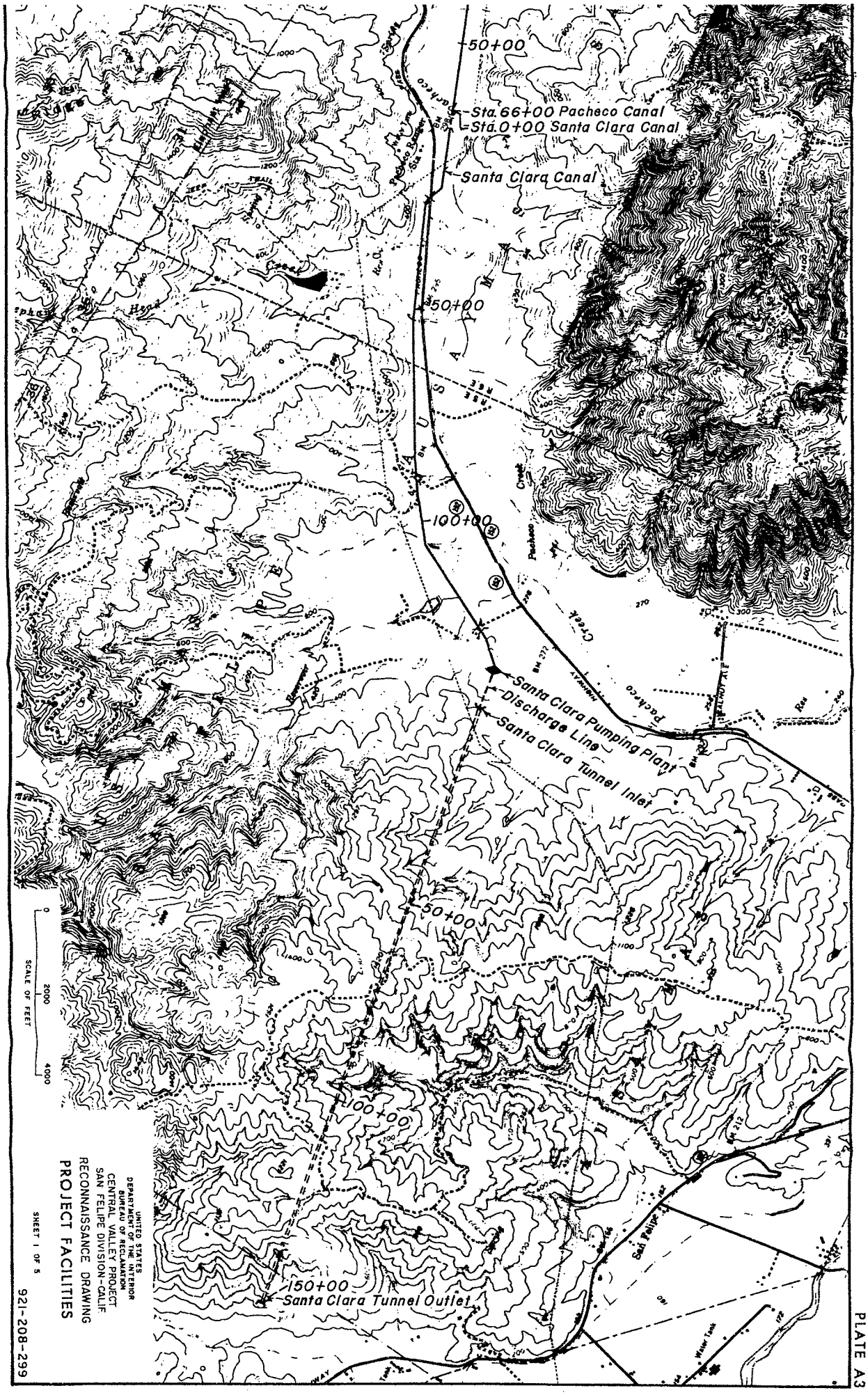

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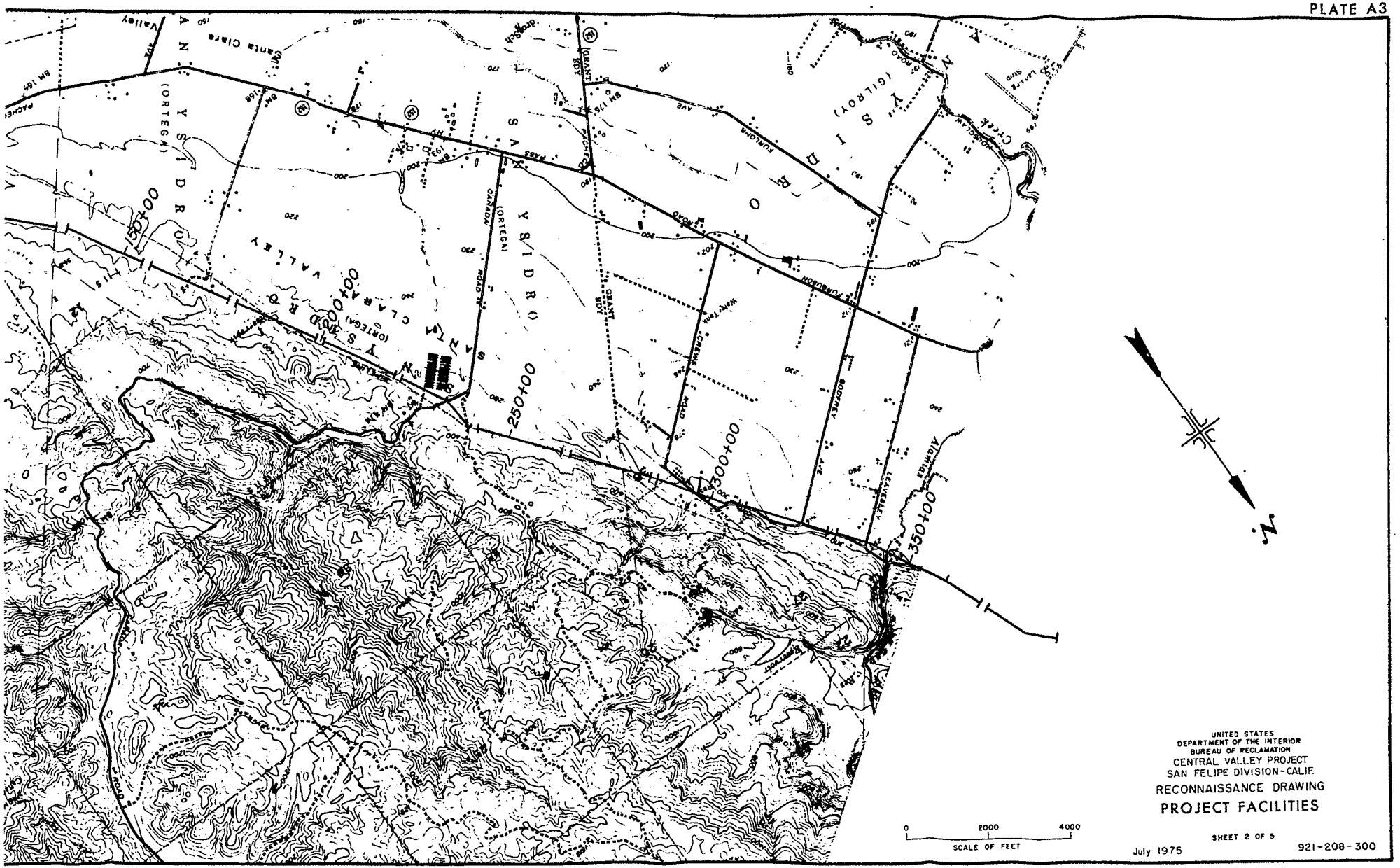

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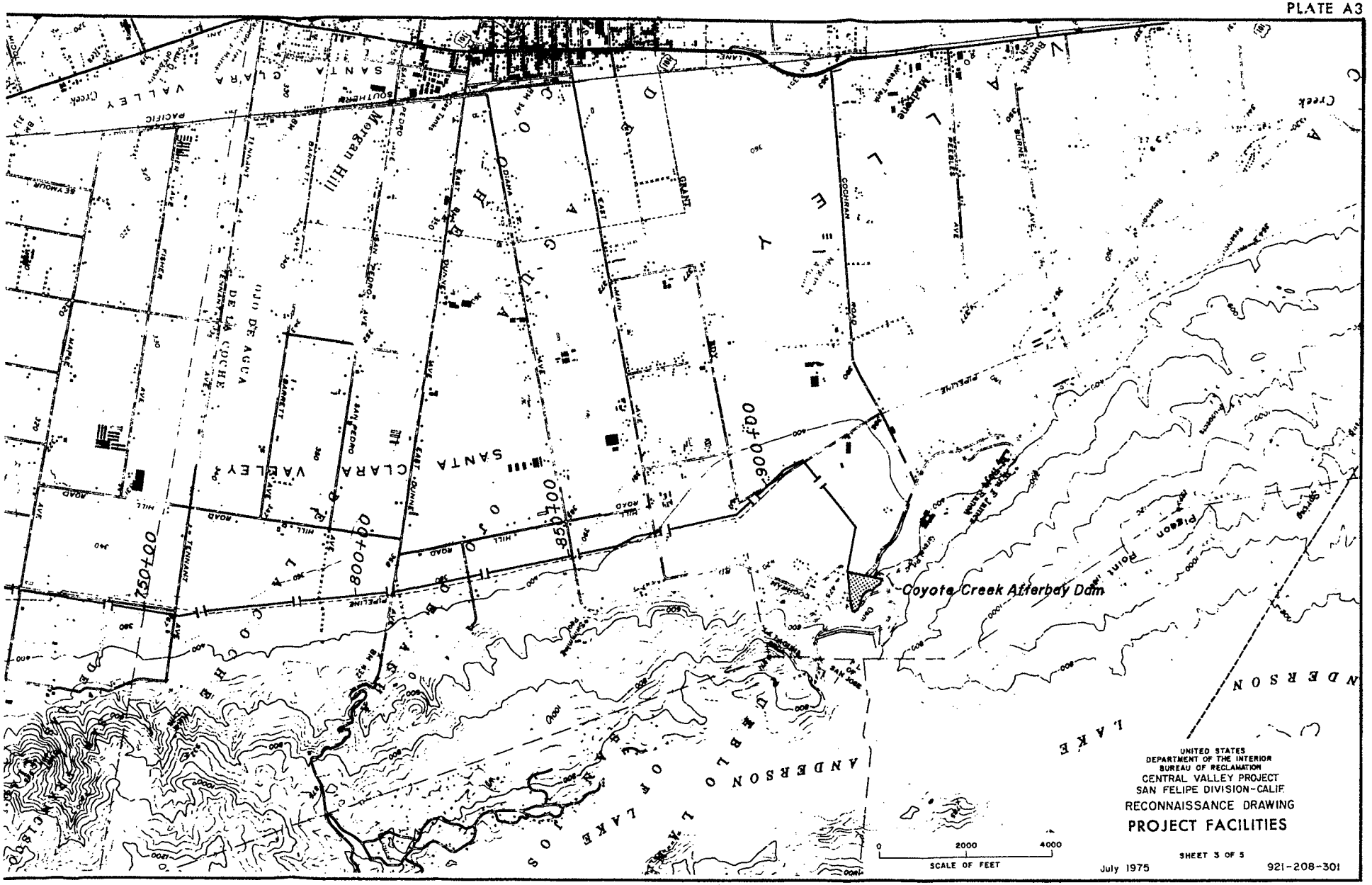
PLATE A3



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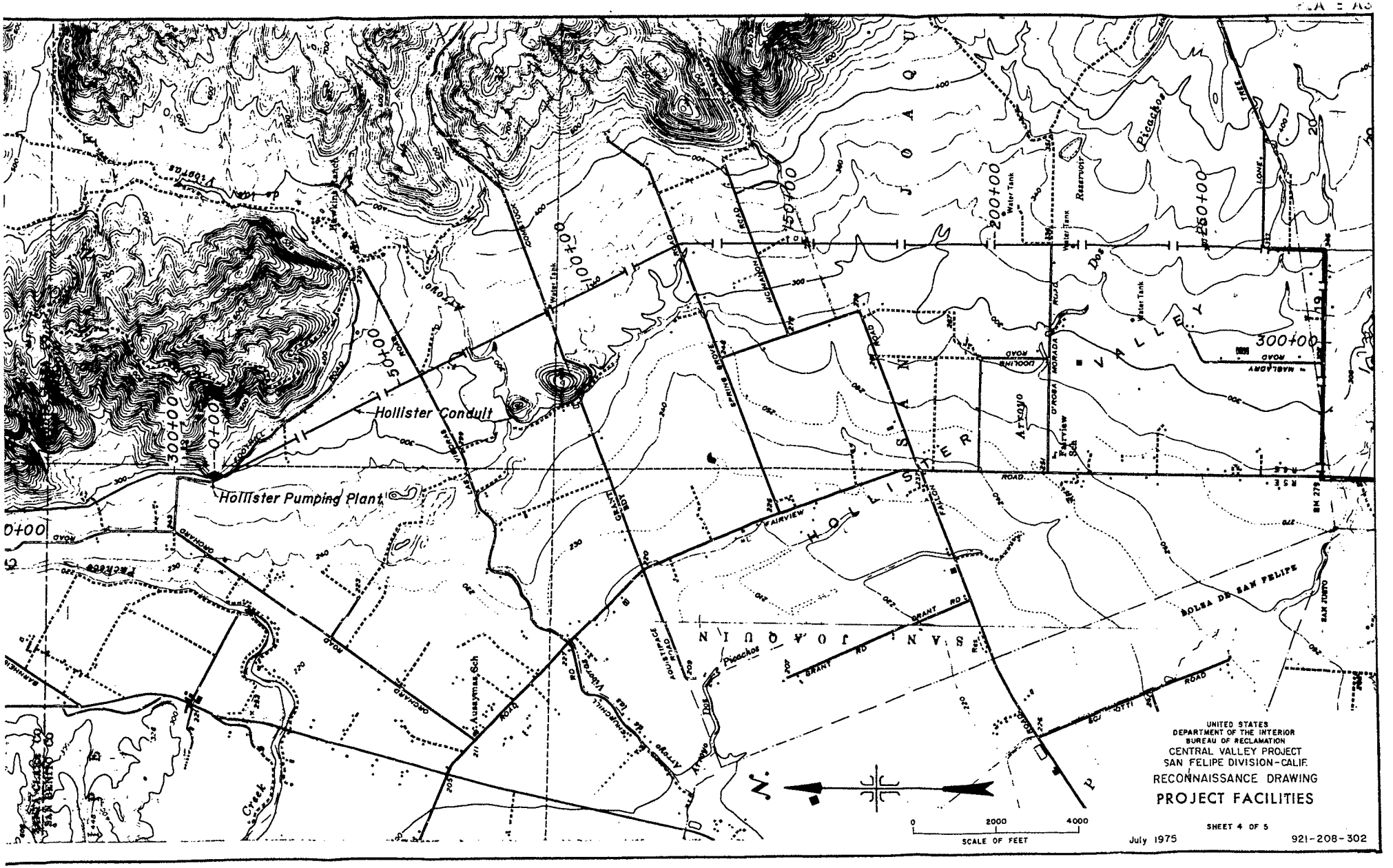

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PLATE A3

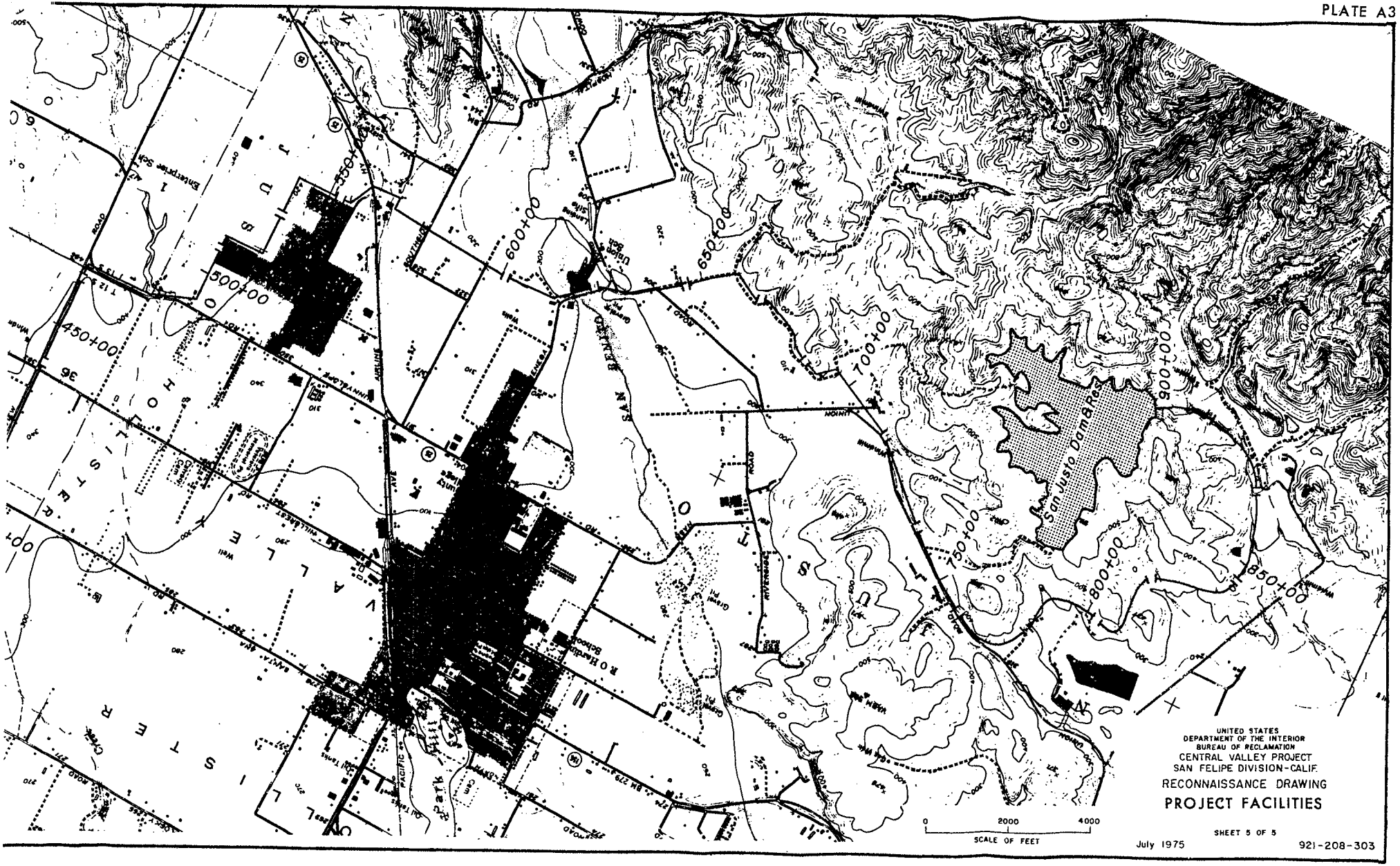

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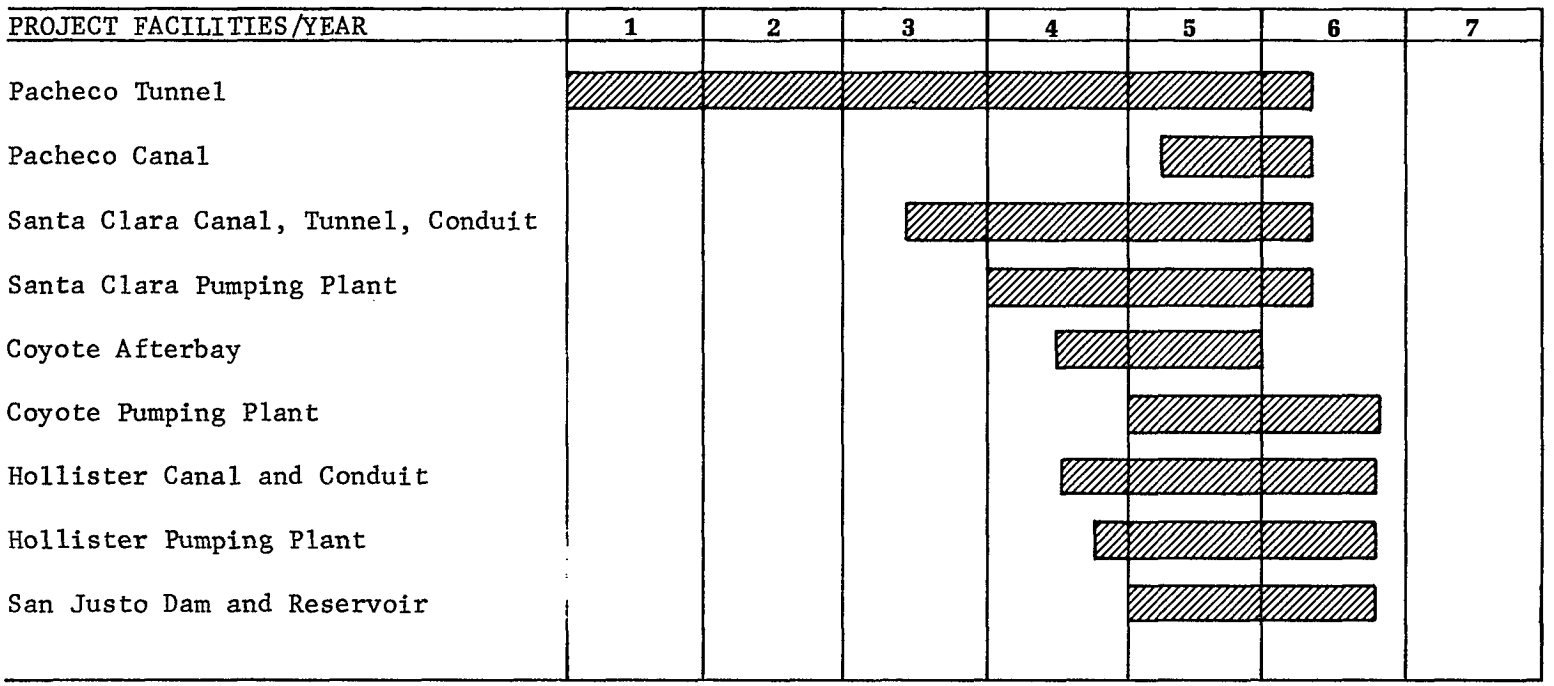
Plate A-4. Construction Schedule*



*** Year 1 begins upon award of the Pacheco Tunnel, Reach 2, specifications. The schedule may be varied by changed conditions and funding availability.**

Proposal

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The Bolsa area in San Benito County was determined to have a sufficient ground-water supply and was eliminated from the project service water. This action reduced the agricultural water requirement for the Hollister subarea by 5,900 acre-feet from that estimated in 1967. Table A-5 compares the San Felipe Project facilities described in this report with the 1967 document.

8. Relationship to Other Projects

a. Existing. As described in this EIS, the San Felipe Division will utilize water supplies from the Federal Central Valley Project, primarily originating in the Trinity Division. Water from this division is stored in the Trinity River Basin and transferred into the Sacramento River Basin where it mingles with other Central Valley Project and State Water Project supplies. During this transfer, energy is generated at the Trinity Powerplant (capacity 105 MW), the Judge Francis Carr Powerplant (capacity 141 MW), and the Spring Creek Powerplant (capacity 150 MW). Additional energy is generated after the water enters the Sacramento River as it passes through the Keswick Powerplant (capacity 75 MW), 9 miles downstream from Shasta Dam. The water leaves the Keswick Powerplant and flows down the Sacramento River joining releases from the State's Oroville Reservoir where the Feather River and the Sacramento River join. From there, the water continues down the Sacramento River joining flows from the American River near the city of Sacramento and continuing on into the Sacramento-San Joaquin Delta. Existing features of the Central Valley Project and the State Water Project, the Tracy Pumping Plant, and the State's Delta Pumping Plant, both located near Tracy at the southwestern edge of the Delta, divert water that has flowed across the Delta into conveyance canals flowing south. These two pumping plants have an existing capacity of about 11,000 ft^3/s with a planned enlargement of the State plant that would provide a total capacity of about 15,000 ft^3/s for both plants. The two canals, the Federal Delta-Mendota Canal, and the State Aqueduct provide about 14,200 ft^3/s capacity down to O'Neill Forebay. Water flows at this point either continue down the Delta-Mendota Canal, the Federal-State San Luis Canal (a 13,000 ft^3/s joint facility), or are pumped into San Luis Reservoir, a 2,100,000 acre-foot reregulating facility.

The general concept of operation of the projects is to divert surplus streamflows entering the Delta and as the streamflows diminish from winter and spring into summer utilize flows produced from upstream reservoir releases. San Felipe Division will receive water through the same general operation. The water would primarily come from the yield produced by the Trinity Division of the Central

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Table A-5. Comparison of Project Facilities 1975-1967

Canals or Conduits	1975 Length (miles)	1975 Capacity (ft^3/s)	1967 Length (miles)	1967 Capacity (ft^3/s)
Joint Use Facilities				
Pacheco Tunnel and Inlet Channel	10.4	480	10.6	670
Pacheco Canal	1.2	413	4.3	670-550
Santa Clara Subarea				
Open canal	2.6	330	21.6	550-450
Tunnel	2.9	330	--	--
Buried Conduit	18.0	330	5.8	550
Hollister Subarea				
Open Canal	5.9	83	34.8	315-25
Buried Conduit	17.0	83	0.9	165
Total Conveyance Conduits	58.0		78.0	

Reservoir Name	Dam Type	Dam Capacity (ac. ft.)	Dam Type	Dam Capacity (ac. ft.)
Coyote Afterbay	Earthfill	62	Earthfill	62
Hollister	--	--	"	21
Hudner	--	--	"	1,030
San Justo	Earthfill	10,700	--	--
Total Reservoir Capacity		10,762		1,113

Pumping Plants	Horsepower	Capacity (ft^3/s)	Horsepower	Capacity (ft^3/s)
Santa Clara (formerly Pacheco)	12,000	330	15,000	550
Hollister	3,500	83	1,500	94
Coyote	5,000	200	5,000	200
Total	20,500	613	21,500	844

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Valley Project and be routed through the Trinity Division facilities to the Sacramento River and then down the Sacramento River into the Sacramento-San Joaquin Delta. The water will be diverted from the Delta, along with other State and Federal project flows, and be conveyed by either the Delta-Mendota Canal or the State Aqueduct to O'Neill Forebay and pumped into San Luis Reservoir. Water for San Felipe Division will then flow through the reservoir into the Pacheco Tunnel. Three possible means of delivering water from the Delta to the San Felipe Division, through San Luis Reservoir, are discussed in the following paragraphs. The first option discussed is the one presently being considered; however, the other two are possible if negotiations with the State for capacity in the State Aqueduct are successfully completed or because of other Central Valley Project requirements enlargement of the Delta-Mendota Canal is undertaken.

(1) Use of Existing Delta Mendota Canal Facilities. The water would be pumped from the Delta through the existing Tracy Pumping Plant and conveyed through the Delta-Mendota Canal to the O'Neill Pumping Plant and lifted into the O'Neill Forebay. The water would then be pumped again by the San Luis Pump-Generator Plant into San Luis Reservoir. On an annual basis about 37,000 acre-feet of storage in San Luis would be required to meet the diversion schedule to the San Felipe Division. Delta diversions and San Luis Reservoir operations under this option would remain about the same as those presently occurring as the operation for the San Felipe Division would be about equivalent to existing operations of the system for interim water supply.

(2) Use of an Enlarged Delta Mendota Canal. Water would be pumped the same as explained in option (1) except it would use an enlarged Tracy Pumping Plant and Delta-Mendota Canal to convey about 500 ft^3/s to San Luis Reservoir. With this method, upstream releases could be regulated and water routed through San Luis Reservoir with only minor monthly regulatory storage required. The additional diversion at the Delta would be about 500 ft^3/s or about 4.5 percent of the Central Valley Project and State Water Project pumping capability (approximately 11,400 ft^3/s with a Tracy Pumping Plant enlargement). The additional pumping requirement at San Luis pump-storage plant could be accomplished by operating one of the eight units as a pump--a little over 20 minutes on the average each day. The forebay pumping plant would need to operate an additional three-quarters of an hour for one unit.

(3) Use of the State Water Project Facilities. The State Delta Pumping Plant would be used to divert water from the Delta into the State aqueduct where it would be conveyed to the O'Neill Forebay. The water would then be lifted by the San Luis

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Pump Generating Plant into San Luis Reservoir. The additional pumping requirement at the San Luis Pump Generating Plant is listed in (2). Only minor monthly regulatory storage would be required in San Luis Reservoir. The planned additional pumping units for the State Delta pumping plant would also probably be required to utilize this option.

b. Proposed. The only currently proposed additional facility that would have a significant relationship to the San Felipe Division is the joint Federal-State Peripheral Canal. As stated earlier, the water supply for the San Felipe Division must cross the Sacramento-San Joaquin Delta along with water for the existing pumped diversions. The existing process of water movement across the Delta has been beneficial to the Delta from a water quality standpoint. However, from a fishery standpoint problems resulting from pumping effects and attendant changes in natural flow patterns in the Delta channels have developed. Reversed net flows have apparently confused migrating anadromous fish. The channels used for water transfer have suffered decreases in aquatic food supply due to the flushing action of waters moving to the pumping plants. An undetermined amount of striped bass eggs, larvae, and small fish less than 1.5 inches in length that are spawned in the Delta have been lost to the pumping plants. The loss to the pumping plants is generally considered proportional to the concentration of eggs and larvae at the point of diversion. One result of these losses from the Delta, however, is that the eggs and larvae have created a significant striped bass fishery in O'Neill Forebay, Contra Loma and San Luis Reservoirs.

As pumping demands increase under the present method of water transfer through the Delta, an increasing amount of ocean salt will be picked up by the Sacramento River as portions of its flow reverse around the western portion of the Delta and move up the San Joaquin River on its way to the Federal and State pumping plants in the southern Delta. To offset this effect, more project yield would have to be dedicated to maintaining the desired quality at the export pumps.

The proposed Peripheral Canal could alleviate these problems by allowing managed releases to meet water quality and environmental needs in the Delta including the reestablishment of historical channel directional flow for fishery. The San Felipe Division would only be affected as it is one of the project service areas being supplied by the Delta diversion facilities.

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B. DESCRIPTION OF EXISTING ENVIRONMENT

The environment of the San Felipe Division area is described in the following pages. The environment of the Sacramento-San Joaquin Delta from which the water is diverted for the Division is described in Appendix I.

1. Topography

Boundaries of the San Felipe Division enclose an area extending from the eastern edge of the Diablo Range to the Pacific Ocean and from the south end of San Francisco Bay to slightly south of Hollister. This area is a series of mountain ranges and intervening valleys belonging to the northwest-trending Coast Ranges of middle California. The major relief features are from east to west: The Diablo Range; the Santa Clara and San Benito River Valleys; and the Gabilan Range and the Santa Cruz Mountains, linear ranges divided by the Pajaro Gap.

Most of the San Felipe Division service area lies on a flat, gently sloping valley floor. The valley floor is surrounded by low, rolling to steep foothills, which develop into the Diablo Range to the east and the Santa Cruz Mountains to the west. Tidelands occur to the north along the tip of San Francisco Bay. The valley floor ranges from sea level to about 450 feet. The hill elevation rises to over 900 feet. The Santa Clara area is divided into two drainages by an alluvial divide near the town of Morgan Hill. The North Santa Clara area is drained by two major streams, Coyote Creek and Guadalupe River. Other minor streams which flow across the San Jose Plain into San Francisco Bay also provide some drainage. Guadalupe River begins in the Santa Cruz Mountains above Guadalupe Reservoir and flows through urban San Jose on its way north to Alviso Slough and San Francisco Bay. The channel, steep in the mountains, becomes relatively flat as it enters the valley floor through its alluvial fan. Ground-water recharge ponds are located above the channel as the river leaves the foothills. Coyote Creek begins in the Diablo Range above Lake Anderson Dam and flows northward through rural and agricultural lands, through the cities of San Jose and Milpitas, and eventually through the South Bay marshlands to San Francisco Bay. The slope of the channel ranges from 6 to 8 percent in the foothills to less than 1 percent along the relatively flat valley floor near San Francisco Bay. South Santa Clara and the Hollister area are drained by the Pajaro River which flows through the Watsonville area into Monterey Bay. Principal tributaries to the Pajaro River are Llagas Creek and Uvas-Carnadero Creek in the South Santa Clara area and the San Benito River and Pacheco Creek in the Hollister area. The stream channels of the Pajaro and its tributaries are much the same as the Northern Santa Clara Valley drainage in slope,

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but flow through primarily agricultural land in the service area. Pacheco Creek and other small tributaries empty into San Felipe Lake which is the beginning of the Pajaro River. San Felipe Lake is the remainder of an early larger lake which covered the Bolsa area between Hollister and Gilroy.

2. Geology

a. General. Between the coastline and the San Andreas Fault, an area over 40 miles wide is underlain by crystalline basement rock; i.e., granitics, schists, and marbles. East of the San Andreas Fault, including the southern Santa Cruz Mountains and the Diablo Range, the basement rocks are the Franciscan complex, a series of highly deformed, often metamorphosed, marine sandstones and shales with associated chert, basic volcanics, and ultrabasic intrusives.

The San Andreas Fault is but one, though by far the largest, of several active faults in the area. It is notable for its known length, upwards of 600 miles, and for the dominance of horizontal over vertical movements. It is also well known for the number of destructive earthquakes it has generated. From south to north, the San Andreas Fault trends northwest along the eastern margin of the Gabilan Range, through the Pajaro Gap, along the western boundary of the southern Santa Cruz Mountains, and cuts diagonally through the Santa Cruz Mountains to the eastern flank of the range west of Palo Alto.

The Calaveras Fault starts near the San Andreas Fault zone southeast of Hollister, trends north-northwest through Hollister, and between southern Santa Clara Valley and the higher portions of the Diablo Range. The Hayward Fault forms the western edge of the Berkeley Hills portion of the Diablo Range, east and north of San Jose. Many microearthquakes have been recorded along the Calaveras and Hayward Faults. Both are characterized by active creep in many locations and both have generated destructive earthquakes in the historic past.

The southern Santa Cruz Mountains and the northern Santa Clara Valley between the San Andreas and Calaveras Faults are cut by a series of faults which are subparallel to the San Andreas Fault. One of these, the Sargent Fault, has been the source of many microearthquakes.

The Tesla-Ortigalita Fault is near the eastern margin of the Diablo Range close to the inlet to the Pacheco Tunnel. Minor quakes have been recorded in recent years along its trace, and there is evidence of recent movement along the fault. Plate B-1 shows the major active faults in the San Felipe service area. Material

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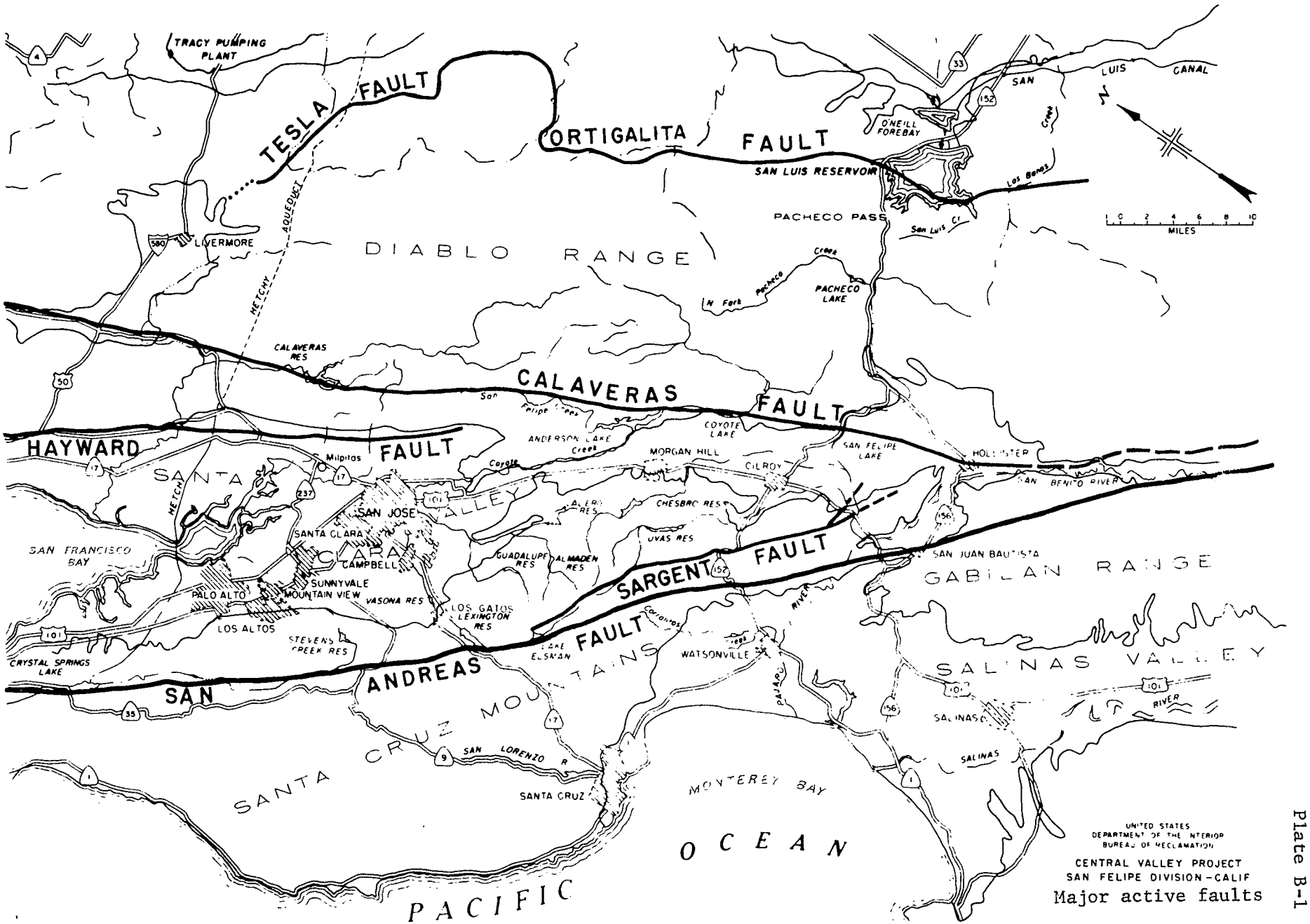

Major active faults

Plate B-1

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presented has been summarized from more detailed information contained in the geologic reports for the San Felipe Division.

b. Coordination. The Bureau of Reclamation has a long-term contract with the National Center for Earthquake Research of the U.S. Geological Survey at Menlo Park to provide data from their research for use in the design and construction of the project features. Close contact has been maintained with the State of California, Division of Mines and Geology personnel, including utilization of their preliminary mapping in the geologic analysis of conduit crossings of the Calaveras Fault. Direct contact has also been maintained with the U.S. Geological Survey in their studies of the geology and ground water in the Santa Clara and Pajaro Valleys.[3/][4/]

c. Geology at Structures

(1) Pacheco Tunnel. The Pacheco Tunnel will be constructed through the Franciscan complex which in this area is extremely deformed. Three units have been identified along the tunnel line which correspond to the Franciscan units identified in the USGS publication MF 343.[5/] Sheared and faulted rock was encountered in both the surface mapping and extensive drilling program; however, there was no evidence that any recent movement had occurred along the fault and shear zones. Depth of the tunnel varies from its portals at the land surface to more than 1,100 feet below the land surface. Average depth would be in the 500- to 600-foot range.

(2) Santa Clara Tunnel. The exact elevation of the Santa Clara Tunnel bore has not yet been decided, but regardless of the final location, it will penetrate Cretaceous age marine sedimentary rocks. Reconnaissance geologic mapping has indicated considerable folding and minor faulting along the proposed tunnel location, but neither is expected to particularly affect construction or selection of the final location.

(3) Santa Clara and Hollister Conduits. Both the Hollister and the Santa Clara conduits will cross the Calaveras Fault.

3/ USGS G.W. Report, Santa Clara Valley.
4/ USGS G.W. Report, Pajaro Valley.
5/ Cotton, Preliminary geologic map of the central part of the Diablo Range, Santa Clara and Alameda Counties, California, USGS publication MF 343, 1972.

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Preliminary mapping from the State of California, Division of Mines and Geology, and detailed geologic mapping by USBR geologists, at the Santa Clara crossing site, shows considerable creep and offset of manmade features. Precise measurements of creep and offset in this area are being conducted by the U.S. Geological Survey National Center for Earthquake Research. Design considerations at this site will include seismic motion-activated shutoff devices on both sides of the fault crossing and location of structures to minimize damage when a strong earthquake occurs.

Geologic investigation of the Hollister conduit crossing of the Calaveras Fault revealed no surface evidence of movement, but a few miles north, creep on the Calaveras Fault is offsetting curbs and streets, and damaging buildings. Additional exploration will be necessary to accurately delineate the fault location.

(4) San Justo and Coyote Afterbay Dams and Reservoirs. The San Justo Dam and Reservoir site is located in the Purisima Formation of Pliocene age. The geologic structure is obscured by the clayey soil and vegetative cover that develop on this formation.

The site is about 9,000 feet northeast of the San Andreas Fault zone. Future earthquakes along the San Andreas Fault could cause severe ground shaking at the dam, but the dam will be designed so as to survive the maximum expected earthquake. Minor faulting has probably occurred within the reservoir area, and it is anticipated that during the more detailed predesign and construction geologic investigation some minor faulting will be discovered. Two conditions noted in the geologic studies to date may require corrective treatment or specific operational requirements. The reservoir, as stated above, is located in the Purisima Formation, which consists of a series of alternating silts, clays, sandy silts and sandy, silty gravels. With this condition, leakage is possible. Comprehensive testing will be conducted in the reservoir area to determine surface permeability and the permeability of the formation as a whole. Leakage is not considered a major problem as various methods of developing impervious conditions are available.

The other condition is slope stability within the reservoir. Explorative testing, including shear testing of the reservoir soils under saturated conditions, will be accomplished to determine the potential of sliding under the proposed reservoir operation plan and earthquake vibrations. In any case, this type of sliding would only occur within the reservoir, in the zone near the water surface, and would not be large enough to cause any rapid displacement of water.

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The Coyote Afterbay damsite is located in Recent alluvium and the right side of the reservoir may rest against a brecciated, ultrabasic rock. The dam structure will be relatively small, 35 feet high, and 850 feet long. A short distance north of the reservoir site is the Silver Creek Fault and a sliver from this fault has been reported as causing damage to the lip of the Anderson Dam spillway.[6/] In June 1975, a close examination of the spillway lip was made by a geologist and an engineer with the consensus that the damage could have been the result of causes other than fault movement. More detailed exploration will be undertaken at the Coyote site prior to final design and construction.

d. Ground-water Geology. The San Felipe service area is comprised of the Santa Clara Valley and portions of the San Benito and Pajaro River Valleys. The Santa Clara Valley is separated into two sections by a low alluvial divide near Morgan Hill. The northern section, the Santa Clara Valley proper, drains northward via Coyote Creek into the south end of San Francisco Bay. The southern portion is drained by the Pajaro River through Pajaro Gap into Monterey Bay. During periods of continental uplift or depressed sea levels, the San Benito and the Pajaro Rivers have cut deep canyons along thier lower reaches. These canyons were subsequently drowned and then filled with river sediments. During Pleistocene time the Pajaro was dammed by fault movements and landslides, and Pleistocene Lake Benito filled the southern Santa Clara Valley south of Morgan Hill. Drainage of the lake left the present flat valley floor. The northern Santa Clara Valley is also deeply alluviated and Coyote Creek is slowly filling the south end of San Francisco Bay.

These alluviated areas are underlain by the ground-water reservoirs on which agriculture depends. Small reservoirs in the hills adjacent to the Santa Clara Valley conserve winter runoff which is used for ground-water recharge. The northern end of the Santa Clara Valley is vulnerable to seawater intrusion with lowering of the ground water.

Between the years of 1912 and 1933, North Santa Clara Valley recorded a maximum land subsidence of 4 feet around the cities of Santa Clara and San Jose. The U.S. Geological Survey prepared plate B-2 and plate B-3 which show land subsidence for the period of 1934 to 1967, and 1960 to 1967, respectively. These plates show that the maximum land subsidence for the 33-year period

6/ Radbruch, 1968, page I-7.

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was 8 feet and for the 7-year period, it was 3.5 feet. Total subsidence at one benchmark between 1912 and 1969 was 13 feet.7/

Records from municipal water utilities, private water companies, and water-well drillers show that during the 5-year period 1960 to 1966, over 250 wells were damaged by land surface subsidence. When the number of wells surveyed is prorated in proportion to the known number of wells in the subsiding area, the number of damaged wells probably approaches 1,000. The cost of repair (a few are damaged beyond repair and have to be replaced) ranges from $500 to $5,000 each and averages about $2,000. This represents an average direct cost of $400,000 per year during the 5-year period.

The present status of the North Santa Clara subarea ground-water basin is one of an accumulated overdraft state, although in recent years there has been some recovery of water levels. Current water levels in much of the basin are well below historic levels. With the basin in a depleted state, evidence of ground-water quality degradation from rising connate water has been noted.

The significant impacts of land subsidence include (1) heightening and constructing additional flood control levees in the Baylands; (2) higher cost of levee maintenance and of flood control channels due to changes in gradient which would affect sedimentation and erosion along the channels; (3) possible damage to large, "sensitive" structures such as the Ames Laboratory test facility; (4) rupturing of well casings; and (5) damage or rupturing of underground pipelines carrying water, sewage, and gas.

The significant impacts of the degradation of ground-water quality, either by saltwater intrusion, poor salt balance, or by rising connate water into the freshwater zone are (1) loss of storage which is essentially permanent (can be reclaimed only at an extremely high cost); (2) hazard to crops and public health or added cost of treatment of pumped water if feasible; and (3) a significant loss of alternative operational management of the ground-water basin.

Subsidence of the land surface occurs when intensive withdrawal of ground water results in lowered artesian pressures in areas of ground-water confinement. This increases the effective overburden load on the subsurface materials causing them to compact with correlative subsidence of the overlying land surface. Active

7/ Poland, Joseph F., "Land Subsidence in the Western States Due to Ground-Water Overdraft," Water Resources Bulletin Vol. 8, No. 1, February 1972.

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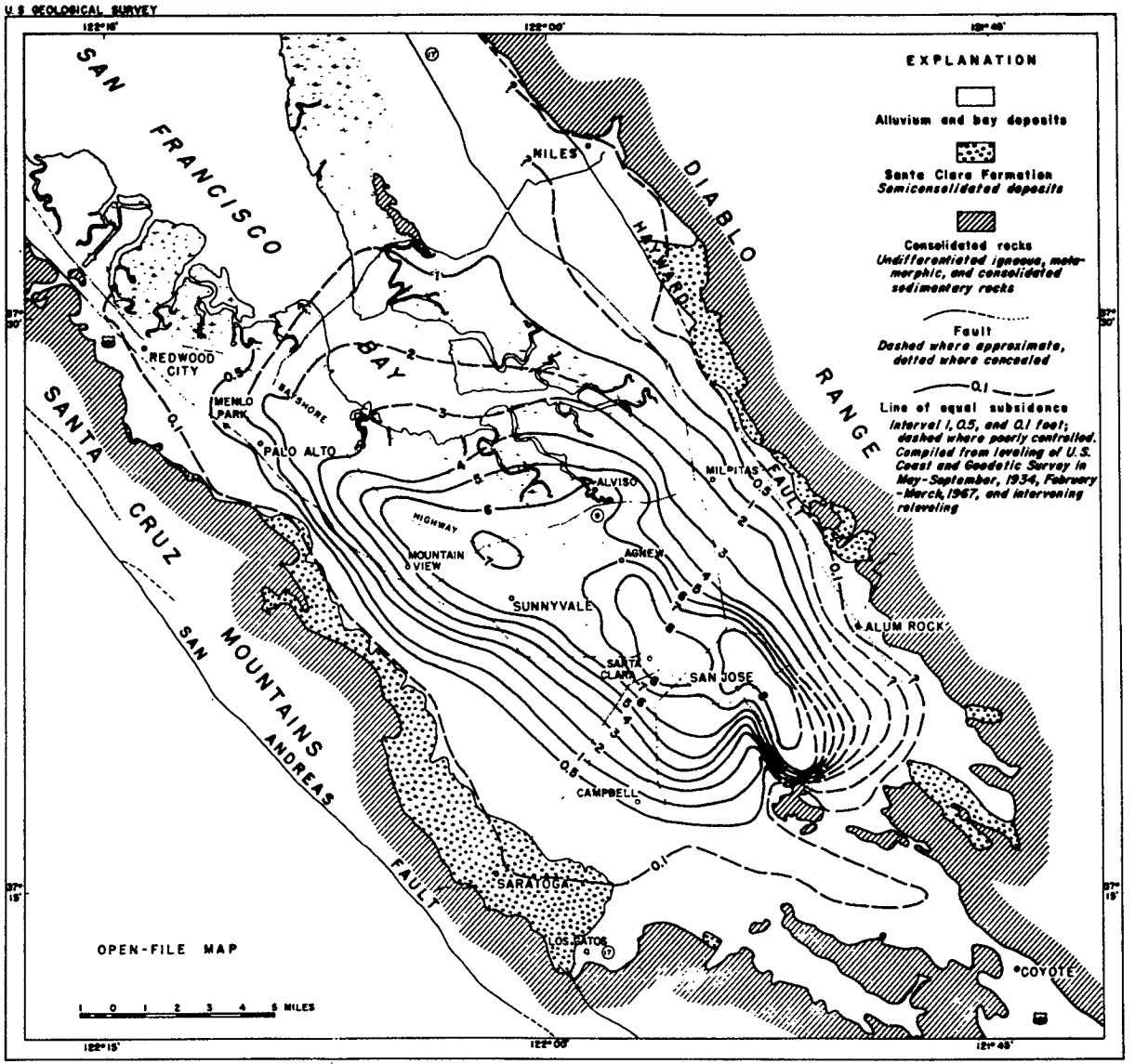

Compiled by J. F. Poland and R. L. Ireland, March 1968

LAND SUBSIDENCE FROM 1934 TO 1967, SANTA CLARA VALLEY, CALIFORNIA

Plate B-2

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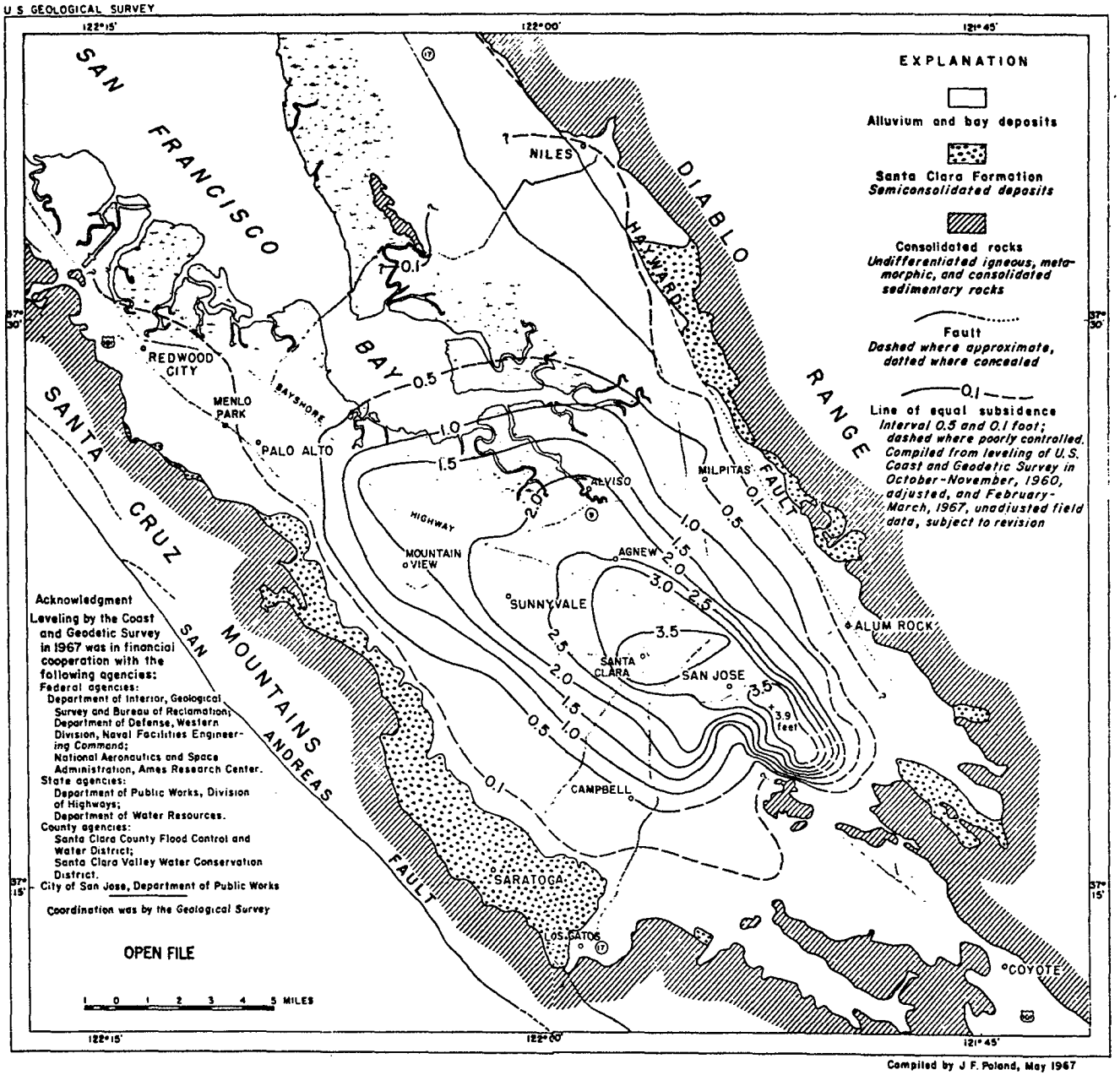

LAND SUBSIDENCE FROM 1960 TO 1967, SANTA CLARA VALLEY, CALIFORNIA

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subsidence stops when the pressures are restored. The District annually makes a survey across the north valley to check for subsidence. The survey for 1973 showed no change in elevation of the valley floor from that in 1972. Land surface subsidence has not occurred since 1969 because above-normal rainfall and imported water allowed ground-water levels to rise and remain above a critical pressure elevation. Land subsidence is, however, nonreversible and restoring ground-water levels would not cause the land surface to regain its former elevation. Both the Santa Clara Valley Water District and the U.S. Coast and Geodetic Survey monitor benchmarks in the valley periodically. The Santa Clara Valley Water District estimates that without additional imports, overdrafting the ground-water basin will again be necessary by 1978. The San Felipe water supply is expected to postpone the overdraft until 2020.

3. Soils

Soils in the San Felipe Division can be generally described using four broad physiographic groups:

Upland areas have shallow, residual soils with unfavorable relief and are found at the higher elevations.

Alluvial fans and flood plains have deep Recent alluvial soils of medium texture except near certain rivers and creeks where they are sandy or gravelly. In general, because of desirable soil depth, good drainage, smoothness of relief and moderate to good water retention, they form the most favorable agricultural soils.

Low terraces are mainly between the alluvial fans of the valley floor and the uplands. The relief is usually flat to rolling and may have considerable erosion with medium to heavy textured soils near the surface and with more compact, heavier textured subsoils.

Basin areas occur generally below the alluvial fans. The soils are heavy textured, dark colored, fertile, and comprise very flat relief. These soils are usually affected with varying amounts of soluble salts.

Soil types and textures vary within the above described groups for the different subareas depending on the parent source. In North Santa Clara, tidal marshes along the fringe of the San Francisco Bay are heavy textured and very saline. The South Santa Clara subarea also contains soils of heavier texture.

a. Santa Clara Subarea.

General. The soils on the uplands have developed on undulating to rolling topography and are underlain by bedrock at

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variable depths. They are formed largely on sedimentary rocks and the textures vary somewhat depending on the parent rocks from which they are derived. There are also some areas of heavy textured, shallow and rocky, dark colored soils that are residual on serpentine.

The terrace soils are usually on undulating to rolling relief and there is usually considerable erosion. The profiles, as a rule, contain medium textured soils having moderately dense subsoils. Some of the terraces have appreciable amounts of gravel throughout their profiles.

The alluvial fans and flood plains of the valley floor are, for the most part, deep soils with little or no profile development. They have textures varying from light with appreciable amounts of gravel to soils with clay throughout. The textures depend upon the source of the alluvium and the amount of textural sorting during deposition. There are a few soils with somewhat older profiles having some compaction in the subsoils. In the vicinity of Morgan Hill there are some soils on the valley floor with medium textured surface soils and very compact clay subsoils occurring at a fairly shallow depth.

The basin soils consist of heavy textured, dark colored soils around the fringes of San Francisco Bay, and in the interfan areas between Llagas and Carnardero Creeks, particularly in the southern part of the south valley near the Pajaro River. These soils are heavy textured throughout, occupy very flat relief and often have high water-table conditions and some have slight accumulations of salts. The tidal marshes along the fringe of the bay are heavy textured and very saline.

b. Hollister Subarea.

The general characteristics of soils in this subarea are described in the following paragraphs. Plate B-4 is a map showing soil associations and is useful in presenting a general idea of the soils in the area.

The Sorrento-Yolo-Mocho soil series association is nearly level to sloping, well drained, medium textured soils on flood plains and alluvial fans derived from alluvium of mixed origin. In this grouping are some of the most productive soils, and they are used to produce all the climatically adapted crops grown in the subunit.

The Clear Lake-Pacheco-Willows soil series association is nearly level and gently sloping, somewhat poorly drained, fine and medium textured soils on flood plains and in basins derived

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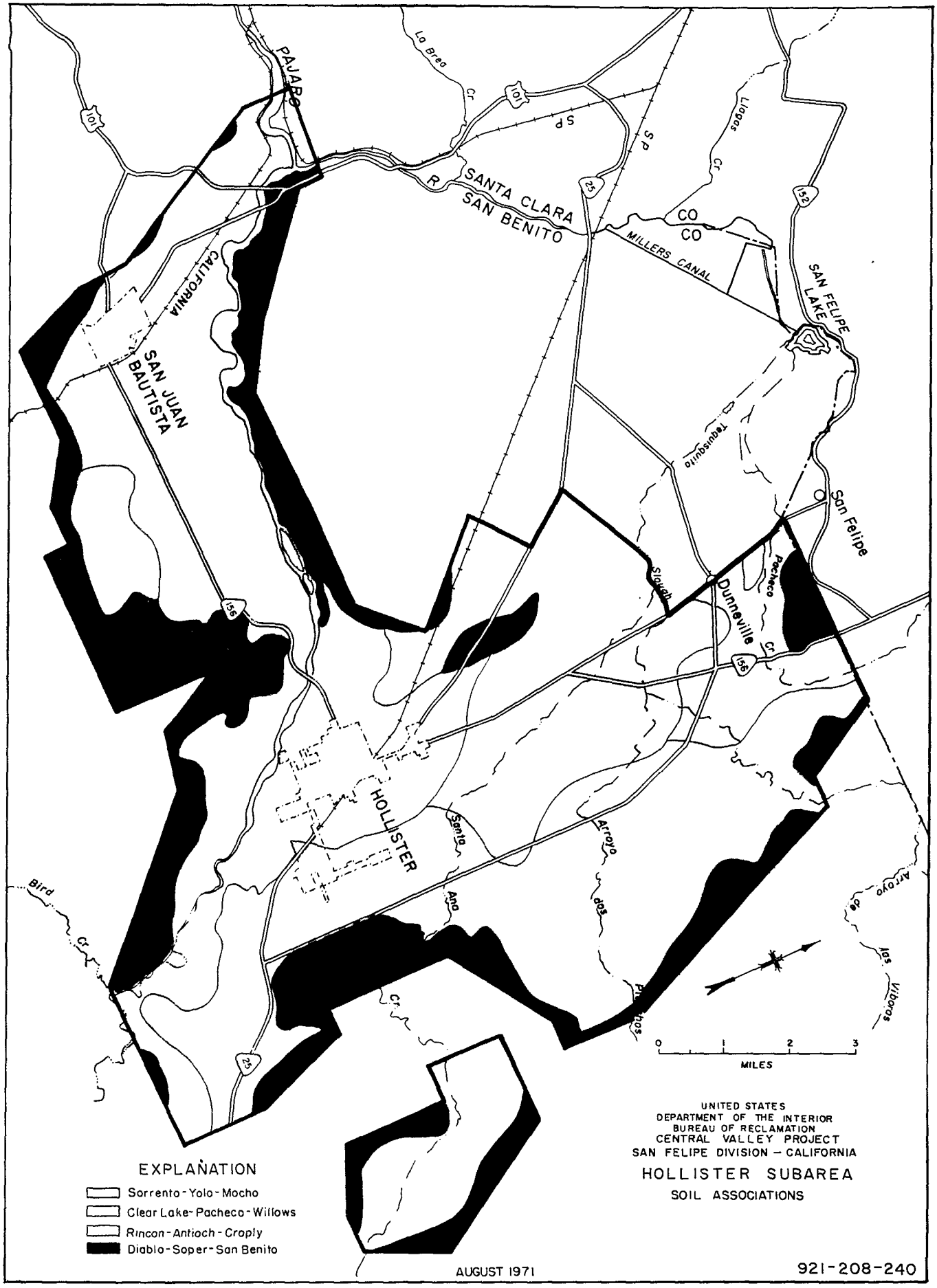
PAJARO
La Brea Cr
101
S P
S P
Llagas Cr
SANTA CLARA
R
SAN BENITO
25
152
CO
CO
MILLERS CANAL
SAN FELIPE LAKE
CALIFORNIA
SAN JUAN BAUTISTA
Tequisquito
San Felipe
Slough
Dunneville
Pacheco Cr
156
HOLLISTER
Santa Ana
Arroyo dos
Arroyo de Sal
Vibores
Bird Cr
Cr
Pitchos
0 1 2 3
MILES
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
SAN FELIPE DIVISION – CALIFORNIA
HOLLISTER SUBAREA
SOIL ASSOCIATIONS
EXPLANATION
Sorrento-Yolo-Mocho
Clear Lake-Pacheco-Willows
Rincon-Antioch-Cropley
Diablo-Soper-San Benito
AUGUST 1971
921-208-240

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from alluvium parent material of mixed origin. The soils of this association are intensively cultivated to row and field crops, alfalfa, and small grains.

The Rincon-Antioch-Croply soil series association is nearly level to sloping, well drained, and moderately well drained, medium to fine textured soils on terraces and alluvial fans. The soils of this association are used for fruit, nuts, alfalfa, row and field crops, and irrigated pasture. In some small areas the irrigation water is of a poor quality due to boron.

The Diablo-Soper soil series association is strongly sloping to very steep, well drained, fine and moderately coarse textured soils formed over sandstone and shale. The Diablo soil which makes up about 75 percent of this association and the Soper soils occur mainly on the smoothly rounded hills. They are very deep over clay shale and are used to produce annual grass pasture and grain.

4. Mineral Resources

The principal mineral resources in Santa Clara and San Benito Counties are sand, gravel, mercury, stone, clay and abestos. Limestone deposits are located in the Coast Range northwest of San Jose, Santa Clara County, and near San Juan Bautista, Fremont Peak, and Cienega, San Benito County. Deposits of antimony, magnesite, dolomite, and chromite are all found in the counties, although none are being mined today.

A large salt complex is centered around the South San Francisco Bay in northern Santa Clara County. Salt is obtained by solar evaporation of Bay waters. Only a small part of the local salt is processed in the form of table salt. Much of the salt is shipped in bulk and unrefined form to chemical industries, particularly in the Orient.

Small amounts of natural gas and petroleum are recovered in San Benito County each year. In 1972, 51 million cubic feet of natural gas were recovered, but in 1973 this dropped to 20 million cubic feet. In 1972, 65 thousand barrels of oil were recovered and 50 thousand barrels in 1973.[8/]

8/ California Statistical Abstract 1974.

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5. Climate

The climate of the San Felipe Division is a mediterranean one, characterized by wet winters and dry summers. The virtually rainless summer, together with the demands on surface water sources, results in intermittent stream systems which are usually dry or reduced to pools during the summer. Mean annual precipitation on the valley floor is about 13 inches at San Jose and Hollister. The temperatures have ranged from the extremes of 20° to 116°F within the service area. Greater rainfall occurs in the mountainous area than on the valley floors. The mean annual rainfall at the crest of the Santa Cruz Mountains is 44 inches while the Diablo Range has a mean annual of 29 inches.

Each subarea has characteristic climatic conditions due to its location. North Santa Clara, further inland than other subareas, has a fairly even climate, tempered also by its proximity to San Francisco Bay. South Santa Clara is more isolated by mountains and is subject to somewhat greater ranges in temperature. Sea breezes modify the climate of Hollister, which lies between two mountain passes, the Pacheco Pass on the east and Chittenden Pass to the west. The temperate climate of the service area provides an agricultural growing season of from 257 days to 305 days.

6. Air Quality

The climate in the service area, as discussed previously, is classed as mediterranean, although somewhat modified by the Pacific Ocean breezes in the northern and extreme southern portions. Generally, from an air quality standpoint, the local climate can be described as having an almost uniformly stable atmosphere in summer and a stable to unstable atmosphere in the winter. The summer stable atmosphere resists vertical movement (the warm upper air layers do not allow the lower cooler air layers to rise, thus creating an "inversion"), which would allow dispersal of pollutants and could cause precipitation. Atmospheric conditions in the winter, being more unstable, allow more pollutant dispersal vertically and are conducive to cloud formation with possible precipitation. However, winter also produces nighttime cooling of the air near the earth's surface and as cooler air is heavier than warm air, it tends to collect over the lowest terrain causing local morning inversion conditions which trap pollutants produced within and below the air mass. During the day the sun's radiation again warms the air, allowing vertical dispersion releasing the trapped pollutants. The air is also cleansed when preciptation occurs or when meteorological conditions are conducive to formation of winds. Pollutant levels also change on a seasonal basis. Oxidant excesses occur in

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the summer and fall; carbon monoxide (CO) excesses occur in the fall and winter. Both overlap in the fall, which then is the worst season for pollution.

Air pollution in the service area is not entirely a local problem. The Santa Clara Valley Water District's Distribution System EIR noted, "These data therefore indicate that there is a net annual flow of air from heavily populated upstream (northwest) sources into the Santa Clara Valley which reaches as far as the extreme southern portions of the County."[9/] This would indicate that the service area air quality is significantly affected by the northwestern populated areas with their associated traffic volumes and air pollution sources. The same EIR also mentions the existing poor air quality condition in the San Jose area. The southern part of the service area near Hollister has relatively the same conditions as described above, but is significantly influenced by the cooling Monterey Bay air flowing through the Pajaro and San Benito River gaps. A good indication of this is that the July maximum average temperature at Hollister is 5°F lower than at Gilroy.

Air quality data[10/] in the Hollister area is available for approximately 9 months during which time the carbon monoxide, oxides of nitrogen and the hydrocarbons were within allowable limits, but at peak periods the nitrogen dioxide was slightly elevated and the oxidant and particulate standards were exceeded.

The climate and terrain of this part of the service area are favorable for the development of air pollution. Abundant sunshine, light precipitation, and light winds in combination with narrow valleys surrounded by mountains provide opportunity for the accumulation of air pollutants. The general air circulation of winds moving longitudinally through the valleys permits long-distance transport of pollutants.

a. Air Quality Factors. Air quality factors in the Santa Clara County portion of the service area are described in the Santa Clara Valley Water District's EIR for the San Felipe Water Distribution System and have been included in the following paragraphs.

Table B-1 contains the California and national ambient air quality standards in effect for major pollutant categories in the Bay area and the Santa Clara Valley.

9/ Draft EIR, San Felipe Water Distribution System, Santa Clara Valley Water District, Environmental Science Associates, December 1974, p. 325.

10/ California Air Resources Board data from an air monitoring trailer located in Hollister from May 1973 to January 1974.

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Table B-1. Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards		National Standards[1]		
		Concentration[2]	Method[3]	Primary[2, 4]	Secondary[2, 5]	Method[6]
Photochemical Oxidants (Corrected for NO_2)	1 hour	0.10 ppm (200 ug/m^3)	Neutral Buffered Potassium Iodide	160 ug/m^3(7) (0.08 ppm)	Same as Primary Std.	Chemiluminescent Method
Carbon Monoxide	12 hour	10 ppm (11 mg/m^3)	Non-Dispersive Infrared Spectroscopy	–	Same as Primary Standards	Non-Dispersive Infrared Spectroscopy
	8 hour	–		10 mg/m^3 (9 ppm)		
	1 hour	40 ppm (46 mg/m^3)		40 mg/m^3 (35 ppm)		
Nitrogen Dioxide	Annual Average	–	Saltzman Method	100 ug/m^3 (0.05 ppm)	Same as Primary Standards	Proposed: Modified J-H Saltzman (O_3 corr.) Chemiluminescent
	1 hour	0.25 ppm (470 ug/m^3)		–		
Sulfur Dioxide	Annual Average	–	Conductimetric Method	80 ug/m^3 (0.03 ppm)	–	Pararosaniline Method
	24 hour	0.10 ppm (260 ug/m^3)		365 ug/m^3 (0.14 ppm)	–	
	3 hour	–		–	1300 ug/m^3 (0.5 ppm)	
	1 hour	0.5 ppm (1310 ug/m^3)		–	–	
Suspended Particulate Matter	Annual Geometric Mean	60 ug/m^3	High Volume Sampling	75 ug/m^3	60 ug/m^3	High Volume Sampling
	24 hour	100 ug/m^3		260 ug/m^3	150 ug/m^3	
Lead	30 Day Average	1.5 ug/m^3	High Volume Sampling, Dithizone Method	–	–	–
Hydrogen Sulfide	1 hour	0.03 ppm (42 ug/m^3)	Cadmium Hydroxide Stractan Method	–	–	–
Hydrocarbons (Corrected for Methane)	3 hour (6-9 a.m.)	–	–	160 ug/m^3 (0.24 ppm)	Same as Primary Standards	Flame Ionization Detection Using Gas Chromatography
Ethylene	8 hour	0.1 ppm	–	–	–	–
	1 hour	0.5 ppm				
Visibility Reducing Particles	1 observation	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70% (8)		–	–	–

NOTES:

1. National standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year.
2. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of Hg (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
3. Any equivalent procedure which can be shown to the satisfaction of the Air Resources Board to give equivalent results at or near the level of the air quality standard may be used.
4. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the Environmental Protection Agency (EPA).
5. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after implementation plan is approved by the EPA.
6. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.
7. *Corrected for SO_2 in addition to NO_2.*
8. Prevailing visibility is defined as the greatest visibility which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.

Source: ARB, 1974

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Since ambient air pollutant concentrations are related to the emission rates of the various contaminants, a source emission inventory is essential for assessing the effects of past emissions and the impact of future projected emissions on ambient air quality. Table B-2 presents such an airshed inventory of emission rates for the five major pollutants monitored by the Bay Area Air Pollution Control District in 1972: suspended particulates, organics (reactive hydrocarbons), nitrogen oxides, sulfur oxides, and carbon monoxide.

Transportation sources account for virtually all (94 percent) of the carbon monoxide and most (65 percent) of the oxides of nitrogen emissions. Organic (reactive hydrocarbon) emissions are divided almost evenly between transportation and nontransportation sources. It is evident, then, that transportation-related pollutants are the major ingredient in the formation of photochemical smog and that the future output of these materials will strongly influence smog-level trends. Transportation sources are also implicated in the production of 31 percent of the airshed's particulates.

Petroleum refining, chemical and other industries account for more than 78 percent of the sulfur dioxide output, thereby explaining why SO_2 is a problem only in restricted geographical areas.

Table B-3 presents emissions by county differentiated into district sources and transportation sources. Of the 1,472 tons/day of pollutants emitted in 1972, transportaion sources were responsible for 1,296. Transportation accounted for 48 percent of the particulate load, 55 percent of the organics, 80 percent of the nitrogen oxides, 54 percent of the sulfur dioxide, and almost 100 percent of the carbon monoxide. Table B-3 also indicates that Santa Clara County is itself a significant source region for all pollutants except SO_2, in comparison with other counties in the District. In addition, Alameda and San Mateo Counties, the principal upstream sources of pollutant flow into the Santa Clara Valley, produce 28 percent of the airshed's particulates, 34 percent of the organics (hydrocarbons), 30 percent of the nitrogen oxides, and 35 percent of the carbon monoxide.

The recent decline in airshed emissions of particulates, organics, and carbon monoxide, as shown in plate B-5, has been accompanied by a decline in the concentration of these pollutants in the air basin as a whole. Plate B-5 shows annual and 3-year moving concentration averages utilizing monitoring data from throughout the airshed. It should be emphasized that while the overall trend is downward, individual locations may show irregular or

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Table B-2. Airshed Emissions, 1972

TOTAL EMISSIONS	Particulate	Organics	Nitrogen Oxides	Sulfur Oxides	Carbon Monoxide
7,000 Tons/Day	160 Tons/Day	1,300 Tons/Day	760 Tons/Day	230 Tons/Day	4,600 Tons/Day

PERCENT DISTRIBUTION OF EMISSIONS

	PART.	ORG.	NO_x	SO_2	CO
DISTRICT SOURCES					
Petroleum Refining	6.5	6.3	8.3	32.3	.3
Gasoline Bulk Loading	0	1.6	0	0	0
Service Stations	0	5.6	0	0	0
Chemical & Other Ind.	21.6	2.6	.9	46.1	.7
Painting, Coating, Etc.	3.5	14.8	0	0	0
Solvent Degreasing	0	3.5	0	0	0
Dry Cleaners	0	.9	0	0	0
Rubber, Plastic Products Mfg.	.4	3.3	0	0	0
Other Solvent Usage	0	3.4	0	0	0
Metallurgical & Mineral Ind.	18.2	.2	0	.2	0
Domestic Fuel Usage	2.7	—	2.9	—	—
Commercial Fuel Usage	1.0	—	1.1	—	—
Industrial Fuel Usage	2.5	.3	8.6	3.5	.6
Electrical Generating Plants	2.3	—	8.7	5.2	—
Agric. Burning & Incineration	5.1	1.5	.1	.2	.9
Accidental Fires	2.2	.3	—	—	.3
Agricultural Tractors	.2	.8	.4	.1	1.0
Construction Equipment	.6	.2	.8	.4	.2
Ships	.6	—	.5	3.8	—
Locomotives	.4	.1	.5	.3	.1
Other Engines	1.2	1.4	1.8	.8	1.8
Sub-total	69%	47%	35%	93%	6%
TRANSPORTATION					
Air Carriers	4.0	.7	.9	.4	.4
General Aviation	.5	.3	.2	—	.4
Military Aircraft	2.7	.6	.6	.3	.4
Cars & Light Duty Trucks	19.7	46.4	45.7	3.6	84.0
Heavy Duty Trucks & Buses	3.7	3.8	18.0	2.8	7.9
Motorcycles	.1	1.3	—	—	1.0
Sub-total	31%	53%	65%	7%	94%
TOTAL EMISSIONS	100%	100%	100%	100%	100%

Source: BAAPCD, 1973

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Table B-3. Emissions by County - 1975

All values below are shown to only 2 significant figures as an indication of their certainty. Because of independent rounding, totals may not always equal exactly the sums of their parts.

	TONS/DAY				
	Part	Org.	NO_x	SO_2	CO
ALAMEDA					
District Sources	13	120	34	6.3	41
Transportation	10	160	120	3.6	1000
Total	**23**	**280**	**150**	**9.9**	**1000**
CONTRA COSTA					
District Sources	30	150	140	160	65
Transportation	5.0	89	65	1.9	560
Total	**35**	**240**	**200**	**160**	**630**
MARIN					
District Sources	2.0	14	3	0.2	6
Transportation	1.9	34	25	0.8	220
Total	**3.9**	**48**	**28**	**1.0**	**230**
NAPA					
District Sources	7.7	11	2	0.3	16
Transportation	1.1	15	11	0.3	91
Total	**8.8**	**26**	**13**	**0.6**	**110**
SAN FRANCISCO					
District Sources	13	78	29	5.3	20
Transportation	3.5	63	46	1.4	400
Total	**16**	**140**	**75**	**6.7**	**420**
SAN MATEO					
District Sources	11	61	10	1.0	19
Transportation	9.5	91	66	2.5	550
Total	**20**	**150**	**76**	**3.4**	**570**
SANTA CLARA					
District Sources	13	130	30	3.2	58
Transportation	12	160	120	3.8	1000
Total	**25**	**290**	**150**	**7.0**	**1000**
SOLANO					
District Sources	11	23	15	38	25
Transportation	3.8	39	28	1.0	240
Total	**14**	**62**	**43**	**39**	**260**
SONOMA					
District Sources	9.1	17	3	0.4	19
Transportation	2.1	37	27	0.8	240
Total	**11**	**54**	**30**	**1.2**	**260**
TOTAL — NINE COUNTIES					
District Sources	110	600	260	210	270
Transportation	49	690	500	16	4300
Total	**160**	**1300**	**760**	**230**	**4600**

	PERCENT Distribution of Emissions				
	Part	Org.	NO_x	SO_2	CO
ALAMEDA	15	22	20	4	23
CONTRA COSTA	22	19	27	70	14
MARIN	2	4	4	—	5
NAPA	6	2	2	—	2
SAN FRANCISCO	10	11	10	3	9
SAN MATEO	13	12	10	1	12
SANTA CLARA	16	22	19	3	23
SOLANO	9	5	6	17	6
SONOMA	7	4	4	1	6
TOTAL	**100%**	**100%**	**100%**	**100%**	**100%**

Source: BAAPCD, 1973

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reverse trends. Table B-4 contains average annual pollutant concentrations for San Jose for the period 1969 through 1973.

Because national ambient air quality standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year, the number of days on which a given standard is exceeded at a specific location is a more important value than the average annual pollutant concentration. The frequency of days over standard is an indication of the distance separating the national ambient air quality standards and the measured air quality. Table B-5 lists the number of days San Jose exceeded the indicated standards for the various pollutants. San Jose was chosen because it occupies a central position with respect to the population of North County and has the longest monitoring record in the county.

In terms of achievement of the national ambient air quality standards, nitrogen dioxide and sulfur dioxide currently present an insignificant problem. The common violations of the standards for suspended particulates, oxident, and carbon monoxide reflect both high local-source emissions and accumulation of pollutants from upstream sources. A high number of oxidant violations is common in sheltered basins downstream of population centers. San Jose and Livermore occupy such locations and regularly report high oxidant levels. Gilroy occupies a downstream position where intense surface heating may be expected to weaken or destroy the inversion, and where, according to one theory, maximum ozone readings may occur (Miller and Ahrens, 1969).

Until late spring of 1974, when the BAAPCD station at Gilroy was activated, there was no regular monitoring of South County air quality. The Gilroy data that has become available since then indicates that an oxidant problem somewhat less than that affecting San Jose, exists at the far southern end of the Santa Clara Valley. In 1974, the oxidant standard was exceeded at San Jose on a total of 87 days, and at Gilroy on 63 days. The high hour concentration in 1974 was 0.17 p/m at Gilroy, and was 0.28 p/m at San Jose.11/

The southern part of the service area's air quality factors are described in the Hollister Domestic Sewage Facilities Project Report.12/ "In 1970, 65 tons per day of pollutants were

11/ Bay Area Pollution Control District's letter to Santa Clara Valley Water District, April 22, 1975, Subject: Comments on DEIR: San Felipe Water Distribution System.

12/ Project Report-Hollister Domestic Sewage Facilities, City of Hollister in consultation with CSO International, Inc., February 1974.

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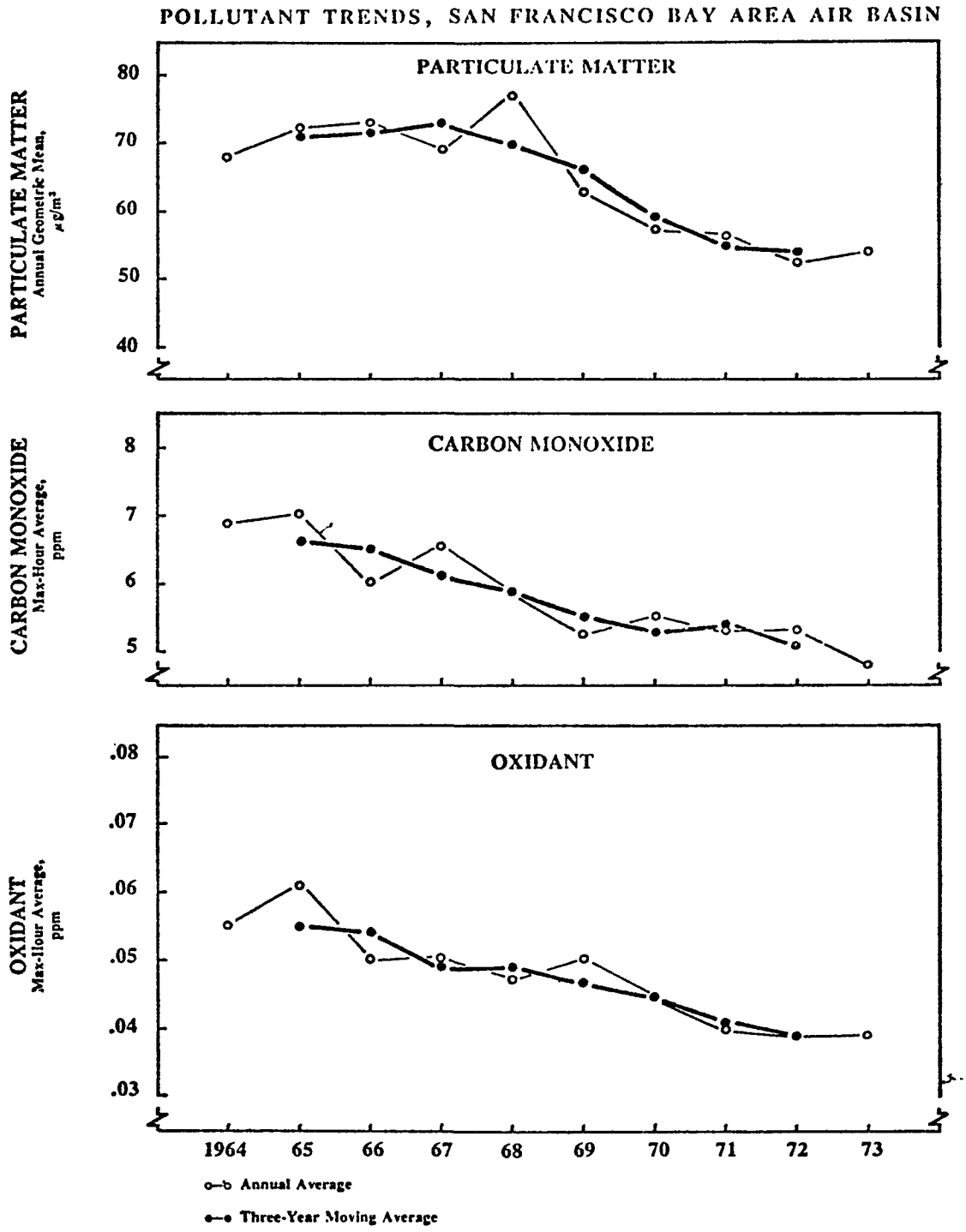
Existing Environment



POLLUTANT TRENDS,
SAN FRANCISCO BAY AREA AIR BASIN
Source: Air Resources Board, 1974

Table B-4. Average annual pollutant concentrations for San Jose, 1969-1973

	1969	1970	1971	1972	1973
Suspended Particulates (Annual geometric mean, ugm^3)	60	61	77	66	61
Oxidant (Average high-hour oxidant concentration for days with comparable temperature and inversion conditions, ppm)	.13	.12	.08	.10	.11
Nitrogen Dioxide (Annual average, pphm)	3.6	3.6	3.4	3.9	3.9
Sulfur Dioxide (West-Gaeke 24-hour samples, annual average, ppm)	.0026	.0015	.0007	.0010	.0012
Carbon Monoxide (Annual average, ppm)	3.0	3.5	3.4	3.8	3.7

Source: ESA compilation of BAAPCD file data

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Table B-5. Number of days standards exceeded for selected pollutants at San Jose, 1969-1973

	1969	1970	1971	1972	1973
Suspended Particulates (% of days over 100 ugm^{-3} state standard)	18.7	18.8	25.3	17.4	10.6
Oxidant (number of days over .08 ppm current federal standard)	83	70	27	26	44
Nitrogen Dioxide (number of days over .25 ppm state standard)	0	0	0	0	0
Sulfur Dioxide (number of days over .04 ppm state standard)	0	0	0	0	0
Carbon Monoxide (number of days over indicated standard)	0 (20 ppm, 8 hr.)	3 (10 ppm 12 hr.)	12 (same)	11 (same)	33 (9 ppm, 8 hr.)

Source: ESA compilation of BAAPCD file data

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emitted in the county. Motor vehicles were the largest source of reactive organic gases, carbon monoxide and oxides of nitrogen in the County." The report also discussed the results of the 9 months monitoring period in Hollister cited previously:

> "The atmosphere pollutants measured were oxidant, carbon monoxide, nitrogen dioxide, total hydrocarbons, suspended particulate matter and particulate lead concentrations. In 1973, the oxidant standard of 0.08 parts per million was exceeded many times. The eight-hour standard for carbon monoxide, nine parts per million, the one-hour standards for carbon monoxide, 35 parts per million, and nitrogen dioxide, 0.25 parts per million, were not exceeded. The 24-hour particulate matter standard, 100 micrograms per cubic meter, was exceeded on several occasions. Examinations of the monthly variation of pollutant concentrations showed that the highest oxidant concentrations occur during the late spring through early fall period. For nitrogen dioxide, hydrocarbons, carbon monoxide, suspended particulate matter (COH), and particulate lead, the highest concentrations occur during the fall and winter months. These peak periods are due to the abundance of sunshine during the late spring through early fall and to the more stable atmosphere with light winds during much of the fall and winter.
>
> "As previously mentioned, suspended particulate concentrations exceeded the 24-hour standard, however, analysis of the total suspended particulate showed about 65 percent of the material originates from the soil.
>
> "The major air pollution problem in San Benito County are the frequent occurrence of oxidant concentrations above standard during the late spring through early fall months and the average level suspended particulate matter which exceeds the 24-hour standard. Even though the oxidant concentrations exceeded the one-hour standard of 0.08 ppm, with a maximum hour for the year of 0.13 ppm, they did not approach the first alert level of 0.20 ppm. There is limited evidence that some oxides of nitrogen are being transported into the County.
>
> "There is a potential for high levels of air pollution in the County and this should be considered in future planning for growth."

b. Air Quality Agencies, Regulations and Control Strategies. The State of California Air Resources Board (ARB), which was created

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by the Mulford-Carrell Air Resources Act of 1967, has the major responsiblity for the State program of motor vehicle emissions control. This agency establishes emission standards for new cars sold in California, conducts tests on exhaust-emission controls, and administers and evaluates the effectiveness of the used car retrofit program. In addition to these vehicle-related activities, the ARB is responsible for coordinating the activities of the various air pollution control districts throughout the State.

The Bay Area Air Pollution Control District (BAAPCD) was created by the California Legislature in 1955 to police non-vehicular sources of air pollution (primarily industrial and agricultural) within the Bay area. The BAAPCD jurisdiction encompasses all of Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, and Napa Counties, the southwestern portion of Solano County, and southern Sonoma County. Regulations enacted by the District ban dump fires and control agricultural burning, require construction permits for sources that emit air contaminants, and directly control particulate matter, sulfur compounds, lead, nitrogen oxides, and odorous substances emitted by industrial and commercial sources. Other district regulations control the formulation, shipment, and storage of reactive hydrocarbons such as solvents, paint and gasoline, define the levels associated with the air-pollution-episode plan, and give the District's Vehicle Patrol the authority to arrest individuals who violate the provisions of the Vehicle Code relating to automotive emission.

The United States Environmental Protection Agency (EPA), formed in 1970, is responsible for Federal air pollution control activities. Under the Clean Air Act, the EPA is authorized to adopt Federal Air Quality Standards, and every State is required to submit an implementation plan to the EPA explaining control stratagems which will be used to attain those standards.

In order to meet and maintain the Federal standards, the EPA has initiated indirect source review and transportation control strategies. Indirect Source Review (ISR) requires review of the air quality impacts of traffic-stimulating facilities such as shopping centers, industrial parks, airports, highways, educational facilities, apartments, and condominiums. These facilities do not necessarily emit air pollutants directly, but they indirectly cause pollutants to be emitted by the automobile traffic that they attract or generate.

The ISR regulations, effective as of January 1, 1975, focus on possible local carbon monoxide hotspots, seeking to eliminate such problems by forcing redesign of facilities or attaching other ameliorating conditions to the ISR permit to assure

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that no violations of ambient CO standards will occur where none now exist. Under the regulations an ISR permit must be secured before the indirect source may be built. A facility subject to the ISR regulations which is constructed without the approval of the EPA Administrator will expose its owner or operator to the penalties specified under the Clean Air Act.

The threshold level for bringing an indirect source within the coverage of the regulation is the number of cars attracted to the facility. Within a Standard Metropolitan Statistical Area (all of Santa Clara Valley lies within the San Jose SMSA), the ISR rules apply to: (1) any new parking facility or other new indirect source with an associated parking area which has a new parking capacity of 1,000 cars or more; (2) any new highway project with an anticipated average annual daily traffic volume of 20,000 or more vehicles per day within 10 years of construction; (3) a modified parking facility or modified associated parking area which increases parking capacity by 500 cars or more; and (4) any highway modification which will increase average annual daily traffic volume by 10,000 or more vehicles per day within 10 years after modification. New airports or airport expansions are also covered specifically.

The Transportation Control Plan (TCP) promulgated by the EPA for the San Francisco Bay Area (38FR 31232, November 12, 1973) is designed to insure that the region will meet and maintain the photochemical oxidant standard by 1977. This regulation is based on the conclusion that factory control of new car emissions will not be sufficient to achieve the legislatively mandated 1977 standard. The TCP includes three major types of controls: (1) controls on stationary sources; (2) retrofit devices on individual automobiles; and (3) controls to reduce the total number of vehicle miles traveled (VMT). A fourth control, gasoline rationing, is under consideration but has not been promulgated.

The controls to reduce the total number of vehicle miles traveled involve incentives to improve mass transit, steps to encourage carpooling, and management of parking-supply regulations. Parking management regulations require an air quality impact review of new or modified parking facilities (after July 1, 1975) that provide more than 250 spaces. Except for exempt religious and residential facilities, construction of a parking facility will not be approved if the design or operation will be inconsistent with VMT reduction goals, or if emissions from the facility will prevent or interfere with the attainment or maintenance of any national ambient air quality standard at any time within 10 years from the date of application. Where the Indirect Source and the Parking Management regulations overlap

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(Santa Clara County), the facility will receive one combined review under the Parking Management regulations.

7. Water Resources

a. Santa Clara County (Santa Clara subarea). Santa Clara County has three existing sources of water supply: (1) Natural ground water; (2) surface reservoirs; and (3) imported water from the South Bay Aqueduct of the State Water Project and the Hetch-Hetchy Aqueduct of the city of San Francisco. The ground-water supply and imported South Bay Aqueduct water surface reservoir are raw water sources, which are used in part in recharging the county's ground-water basin.

The county's existing sources of water supply are discussed in the following subsections. Plate B-6 show the present subarea facilities and distribution of water from the various sources.

(1) Ground Water. Three major interconnected ground-water basins exist within the subarea. These ground-water basins are the Santa Clara Valley, the Coyote and the Llagas Basins, which together occupy about 240,000 acres of the 849,000 acres in Santa Clara County. The ground-water basins in the valley are used as the main conveyance of water to the users.

In recent years, these three ground-water basins have been heavily pumped, resulting in an overdraft condition in the Santa Clara Valley Basin. During the period of July 1, 1971, through June 30, 1972, a very dry year, the net change in storage had deficiencies of 42,000, 6,000, and 46,000 acre-feet for the Santa Clara Valley, Coyote, and Llagas ground-water basins respectively. However, all three ground-water basins registered an increase in water levels during the year 1972-73, following the previous year's drastic drop. This was one of the wettest years on record and ended with increases in ground-water storage of 53,000 acre-feet in the Santa Clara Valley ground-water basin, 10,000 acre-feet in the Coyote ground-water basin and 33,000 acre-feet in the Llagas ground-water basin.

Over-pumping of the ground-water basins causes such related problems as subsidence, increased pumping costs, and increased potential for salt-water intrusion from the bay. A program for recharging the basins has been implemented to help alleviate these problems. This program includes both on-stream and off-stream percolation facilities to receive both local and imported water supplies.

Santa Clara County's ground-water basins have a total natural ground-water yield of about 162,000 acre-feet per

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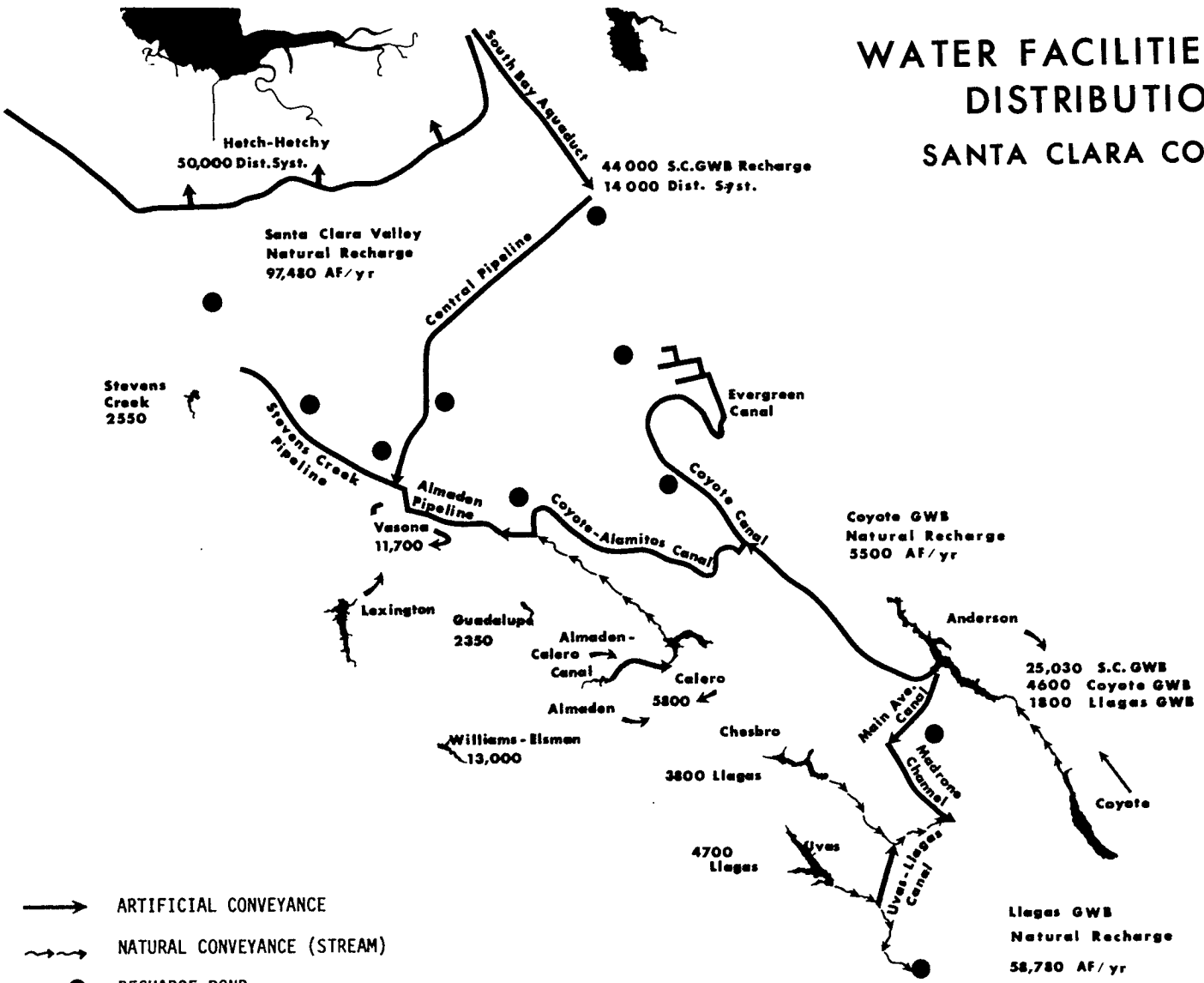
WATER FACILITIES AND DISTRIBUTION

SANTA CLARA COUNTY



Source: WRE

PLATE B-6

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year as estimated by the Santa Clara Valley Water District. The natural ground-water yield is that amount of local water, exclusive of controlled releases from surface reservoirs, that flows or seeps into the aquifers of the ground-water basin. The yield also represents the annual amount of water which could be pumped from the basin without changing, on the long-term average, the quantity of water in storage.

Ground-water pumpage is metered and taxed to provide for the costs of recharge water.

(2) Surface Water. This subarea is drained by three primary streams and their tributaries which are shown on the Plan of Development map, plate A-2.

Table B-6 presents the maximum and minimum discharges for these streams during the period of record as listed in the U.S. Geological Survey Water Resources Data for California 1973.

Table B-7 lists the storage reservoirs in Santa Clara and Hollister subareas. The long-term average yield of the reservoirs in the Santa Clara subarea is about 75,400 acre-feet annually according to the Santa Clara Valley Water District. The yield represents the average quantity of water available for either ground-water recharge or surface deliveries.

The present average annual controlled recharge capability of the basin with existing recharge facilities and present operational procedures is about 143,000 acre-feet per year. District studies show that with additional water, the percolation capacity in the county could be increased by increasing the capacity of existing percolation facilities and construction of new facilities.

(3) Imported Water. The primary source of imported water for Santa Clara Valley is the South Bay Aqueduct of the State of California, constructed in 1965. During the 1973-74 water year, 86,600 acre-feet of water was delivered to Santa Clara County through this facility. Of this import, about 45,000 acre-feet was diverted to a treatment plant for delivery to consumers through retail water agencies. In addition, about 550 acre-feet of raw water was delivered directly from District pipelines to individual contractors. The remaining 41,000 acre-feet was percolated through the Santa Clara Valley Water District's recharge facilities.

A second source of imported water comes from the Sierra Nevadas via the San Francisco Water Department's Hetch-Hetchy Aqueduct. During the water year 1973-74, this system delivered

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Table B-6. Average streamflows - San Felipe Division

	Pajaro River[a/] (1955)	Guadalupe River[b/] (1958)	Coyote Creek[c/] (1911)
Maximum (ft^3/s)	24,000	9,150	25,000
Average (ft^3/s)	147	--	65
Minimum (ft^3/s)	0	0	0
	(1939-1973)	(1929-1973)	(1902-1912) (1916-1973)
Drainage area (sq. mi.)	1186.	144	196

a/ Pajaro River at Chittenden, California.
b/ Guadalupe River at San Jose, California.
c/ Coyote Creek near Madrone, California.

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Table B-7. Principal existing storage and regulating facilities

Owner	Reservoir	Capacity acre-feet	Year completed	Stream
North Santa Clara Subarea				
Santa Clara Valley Water District	Anderson	91,300	1950	Coyote Creek
	Coyote	23,700	1936	Coyote Creek
	Lexington	20,200	1952	Los Gatos Creek
	Calero	10,200	1935	Calero Creek
	Stevens Cr.	3,600	1935	Stevens Creek
	Guadalupe	3,700	1935	Guadalupe Creek
	Almaden	1,800	1935	Alamitos Creek
	Vasona	400	1935	Los Gatos Creek
San Jose Water Works	Lake Elsman	6,200	1950	Los Gatos Creek
South Santa Clara Subarea				
South Santa Clara Valley Water Conservation District	Uvas	10,000	1959	Uvas Creek
	Chesbro	8,100	1955	Llagas Creek
Hollister Subarea				
San Benito County Water Conservation and Flood Control District	Hernandez	18,000	1962	San Benito River
	Paicines	4,500	1912	Off-Stream
Pacheco Pass Water District	Pacheco Lake	6,150	1939	No. Fork Pacheco Creek

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about 52,200 acre-feet directly to the supply systems of the cities of Milpitas, Sunnyvale, Mountain View, Palo Alto, and to the Purissima Hills County Water District. Table B-8, furnished by the engineering staff of the Santa Clara Valley Water District, is an inventory of water supply and water disposal. The table shows the effect of importing State water on the water supply balance of the ground-water basin.

(4) Water Quality. The quality of the surface water is shown on tables B-9, B-10, and B-11. The local surface water in Santa Clara Valley is calcium-magnesium-bicarbonate in type, and its hardness varies from hard to very hard. The total dissolved solids (TDS), which is a measure of mineral content, is generally good except for the Pajaro River which is relatively high at times.

Streams in the west side of the valley, which originate in the Santa Cruz Mountains, generally contain lower concentrations of minerals than waters in streams originating in the Diablo Range in the east side. This fact is probably due to the differing geologic characteristics and also to the higher flows generated in the Santa Cruz Mountains.

Abnormally high concentrations of boron, which are deleterious to plant growth, have been found in the Penitencia Creek area. The boron in this stream probably originates from hot mineral springs in the vicinity of Alum Rock Park. High mercury concentrations have been found in both sediment and fish samples in Calero and Alamitos Reservoirs in the Almaden Valley. However, the mercury content of the water in the same area is within the 1962 public health standards for drinking water.

Water imported from the State Water Project through the South Bay Aqueduct originates in the Northern California Mountains and is very high in quality. The quality, as measured by TDS, of water delivered in Santa Clara County, is presently on the order of 250 mg/l.

Water imported by the San Francisco Water Department through the Hetch-Hetchy System originates in the Sierra Nevada Mountains. However, a high quality is maintained in the water throughout the system. It contains very low levels of dissolved minerals and low hardness.

The ground-water quality in Santa Clara County, although hard, is generally of good quality and meets the U.S. Public Health standards for drinking water (see table B-12 and plate B-13). The mineral content of the ground water is in part dependent upon the quality of the surface water supplies and in part from the

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Table B-8. Annual Water Supply and Water Disposal
Santa Clara Valley Ground-water Basin
(acre-feet)

	Water Years				
	1965-1966	1967-1968	1971-1972	1972-1973	1973-1974
Water Supply					
Precipitation	160,000	179,000	101,000	331,000	231,000
Stream and Surface Inflow	96,000	108,000	90,000	183,000	199,000
Subsurface Inflow	43,000	56,000	29,000	36,000	27,000
Import	48,000	86,000	123,000	142,000	139,000
Subtotal	347,000	429,000	343,000	692,000	596,000
Water Disposal					
Consumptive Use	288,000	279,000	261,000	290,000	273,000
Stream Outflow	23,000	30,000	14,000	208,000	133,000
Subsurface Outflow	--	--	--	--	--
Export (sewage)	90,000	103,000	122,000	141,000	146,000
Subtotal	401,000	412,000	397,000	639,000	552,000
Water Supply Minus Water Disposal					
Surplus (+) or Deficiency (-)	- 54,000	+ 17,000	- 54,000	+ 53,000	+ 44,000

Source: Santa Clara Valley Water District

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Table B-9. Surface Water Quality
Santa Clara County

Constituent*	Local	Hetch Hetchy	Delta Import
Ca	41	8.5	36
Mg	17	3.6	7
Na	18	3.8	32
K	2	0.6	2.5
Cl	12	3.2	48
SO_4	42	5.9	36
HCO_3	180	34	103
CO_3	2	4	0.7
NO_3	2	0	1.5
SiO_2	12.5	4.0	20
TDS	235	49	235
Hardness	185	31	100

*All expressed as the constituent except hardness, which is expressed as Ca CO_3. Data from Water Reclamation and Reuse Consoer-Bechtel, July 1973.

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Table B-10. Water Quality Characteristics of Coyote Creek near Madrone[a]

Constituent, mg/l	Number of samples[b]	Range[c]	Average
Total dissolved solids	55	160 - 450	250
Total hardness	55	110 - 340	182
Noncarbonate hardness	55	10 - 42	23
Calcium	46	20 - 80	41
Magnesium	46	10 - 35	18
Sodium	55	10 - 40	20
Bicarbonate	55	100 - 380	186
Chloride	55	8 - 40	14
Potassium	11	1.5 - 2.5	2
Sulfate	10	30 - 65	37
Nitrate	10	0.6 - 3.7	2.3
Fluoride	4	0.2 - 0.4	0.2
Silica	10	6 - 12	9.9
Boron	55	0.0 - 0.4	0.1
Sodium, percent	42	16 - 23	20
Hydrogen ion concentration, pH	55	6.8 - 8.5	8.1
Dissolved oxygen, percent saturation	55	70 - 150	107
Turbidity, JTU	46	1 - 140	25

[a] Source: State of California, Department of Water Resources, Hydrologic Data, Bulletin 130 series.

[b] Grab samples taken monthly, 1962 - 1968.

[c] Includes 95 percent of data available.

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Table B-11. Surface Water Quality in Pajaro River Basin[a]

Quality[b]	Pajaro River at Chittenden	San Benito River near Bear Valley	Llagas Creek at Llagas Road	Uvas Creek near Morgan Hill
Specific conductance (micromhos)	1,700	2,160	265	230
TDS	1,100	1,400	152	140
Hardness	450	645	118	110
Boron	1.2	1.8	0.07	0.04
pH (units)	8.2	8.4	8.1	7.7
Sodium	225	260	8.0	7.1
Chloride	260	192	5.4	5.5
Nitrate	2.2	0.3	0.7	0.8
Sulfate	210	356	18	22
Dissolved oxygen	9.7	10.0	-	10.8

[a] Water Quality Control Plan Report, Central Coast Basin (3), Regional Water Quality Control Board, May 1974.

[b] Reported in milligrams per liter unless otherwise noted.

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Table B-12

Summary of Ground-water Quality Characteristics in Santa Clara Subarea[a]

	High	Median	Low
Santa Clara Valley-North County			
TDS, mg/l	1,750	336	226
Chlorides, mg/l	698	25	6
Sulfates, mg/l	162	45	8.6
Total hardness, mg/l	778	242	96
Boron, mg/l	2.4	0.1	0.0
Sodium, percent	59	22	12

Santa Clara Valley-South County[c]

Characteristic[b]	Morgan Hill	San Martin	Gilroy
Specific conductance (micromhos)	350	340	490
TDS	205	252	296
Hardness	126	205	220
Boron	0.06	0.13	0.14
pH (units)	7.6	7.4	8.0
Sodium	16	13	17
Chloride	28	18	14
Nitrate	28	1.5	13
Sulfate	5	18	40

[a] From data supplied by California Department of Water Resources.

[b] Reported in milligrams per liter unless otherwise noted.

[c] Water Quality Control Plan Report, Central Coast Basin (3), Regional Water Quality Control Board, May 1974.

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Table B-13. Ground-water quality Santa Clara County

NUMBER	mg/l									
	Ca	Mg	K	SiO_2	Cl	SO_4	HCO_3	NO_3	Na	TDS
1	39	21	0.5	11	25	45	294	0.3		281
2	22	13	1.7	-	22	42	284	0.5	95	
3	43	19	-	-	68	53	265	2.0		
4	61	15	1.9	25	44	67	267	6.8	-	
5	58	25	2.4	29	158	68	379	2.7	90	568
6	97	49	0.9	-	134	191	328	0.5	104	
7	28	12	0.2	-	38	22	218	1.8	78	
8	22	12	2.6	18	11	48	263	0.5	22	334
9	35	9	2.0	27	48	35	225	1.0	-	240
10	14	87	0.7	-	145	105	270	40	192	650
11	43	14	4.1	22	31	32	252	0.7	60	335
12	-	23								
13	59	21	1.4	22	27	37	252	0.2	41	337
14	32	15	0.7	-	21	61	-		78	
15	44	25	2.0	36	61	47	268	-	-	
16	-	30	1.2	26	43	-	201	14	33	
17	138	67	2.8	17	56	113	152	1.1	192	645
18	57.5	24	1.6	22	83	56	208	0.2	65	406
19	64	13	1.9	-	58	53	7			
20	44.5	28.5	1.3	24	38	13	315	5.5	49	365
21	52	28	1.1	25	31	25	254	0.6	45	345
22	37.5	37	1.5	19	108	65	253	9.1	155	559
23	64.5									
24	63	27	1.4	28	37	19	324	10.8	44	400
25	62.5	28	1.6	30	42	27	-	23.8	28	395
26	-	-	-	-	26					
27	55	18.5	1.3	20	33	30	252	6.1	30	322
28	64.5	12.5	1.5	31	17	38	218	4.5	27	297
29	63	22.5	1.4	22	33	38	256	6.2	39	345
30	51	19.5	1.9	20	48	67	269	4.7	17.9	357
31	46									
32	79	42	1.7	26	46	23	18			
33	59	24	1.3	25	26	26	268	19.6	25	341
34	-	-	-	-	65					
35	80	43	1.8	-	71	88	-	25		
36	57	21	1.5	26	36	20	-	20	29	
37	64.5	18	1.3	24	29	28	293	8.4	41	363
38	61	19	2.0	26	30	27	-	8.6	32	340
39	58	24	1.7	25	36	18	-	14	37	444
40	65	26	1.4	24	33	42	285	15.7	20	382
41	55	25	1.7	30	12	31	228	4.8	30	310
42	73	22	1.9	28	21	76	256	7.8		368
43	42	12	0.8	28	46	29	216			
44	59	22	1.4	28	20	37	298	4.5		
45	57	34.5	1.6	24	48	48	-	6.0	62	430
46	81	52	1.9	19	116	69	-	-	58	
47	74	19	2.7	20	46	152	301	0.7	50	575
48	60.5	19.5	1.3	13	25	41	262	8.0		
49	59.5	30	2.1	26	33	24	289	10.5	38	368
50	70.5	23	1.4	27	1[illegible]	41	300	12.5	37	415
51	58	11	1.4	30	1[illegible]	31	220	6.9		
52	47	31.5	1.8	22	[illegible]0	42	-	8.0	20	345
53	99	24	1.4	25	4[illegible]	16	300	14		
54	57.5	23.5	1.3	24	21	52	302	14	52	399
55	85	40	-	-	30	80	349			
56	73	33	-	-	33	122	352			
57	-	-		-	18					
58	84	20	1.7	38	31	19	256	12	36	340
59	-	11	1.4	-	-	-	-	18		
60	48	-		27	12	20	191			

NUMBER	mg/l									
	Ca	Mg	K	SiO_2	Cl	SO_4	HCO_3	NO_3	Na	TDS
61	60	47	1.0	28	37	64	351	2.8		445
62	49	48	1.0	34	26	-	353	2.0		480
63	59	46	2.2	20	100	78	428	18	50	590
64	59	27	2.0	23	18	48	-	-	65	418
65	50	16	1.5	28	19	20	-	5.0	37	
66	58.5	12	1.5	24	17	34	192	13	19	277
67	44	16	1.2	24	13	36	186	16	16	283
68	68.5	19	1.1	26	26	36	298	18.5	18	338
69	25	31	1.2	-	33	58	292	4.6	78	400
70	49	20	0.8	24	16	38	253	2.8		300
71	56	40	0.8	29	23	53	346	8.4	20	406
72	60	45	-	-	28	68	342			
73	80	119	0.9	48	35	37	413	17		548
74	46	39	0.8	20	43	47	343	20.7	82	455
75	57	-	-	-	100					
76	36	-	1.0	-	-	19	-	1.5		
77	-	-	-	-	-	-	213			
78	-	18	-	31						
79	50.5	49	1.0	20	23	58	36	8.2	30	274
80	35	50	-	-	30	43	354			
81	32	98	0.8	20	89	32	485	7.6	30	550
82	-	-	-	-	-	-	421			
83	31	21	1.4	29	22	-	-	5	38	
84	-	-	-	-	-	-	238			
85	52	22	1.4	-	25	54	180	7.8		240
86	41	29	1.2	21	14	30	358	8.5	16	340
87	52	20	1.0	37	19	-	-	1.7		
88	57	51	0.6	20	41	61	356	9.3	54	480
89	-	-	-	-	18					
90	46	34	1.8	31	-	12	-	8.4	30	
91	30		2.7							
92	40	29	1.2	22	28	28	220	8.4	18	287
93	28									
94	40	17	1.2	-	18	-	179	9.0	19	
95	32.5	21.5	1.0	20	13	27	209	2.0		350
96	47	21	1.0	20	27	36	209	2.1	8.7	272
97	41	35	1.4	20	18	54	267	10.7	30	350
98	48	31	1.4	-	28	49	203	21.5	24	330
99	62	53	1.2	28	30	63	-	20.8	20	410
100	-	-	-	-	29					
101	33	23	1.0	-	18	34	166	1.7	18	336
102	35	24	1.6	20	18	36	194	11.2	15	250
103	90	62	1.1	20	29	116	441	38	20	600
104	-	-	-	-	18					
105	47	31	1.1	20	17	47	258	7.9	22	324
106	-	-	-	-	29					
107	-	-	-	-	7					
108	-	6	-	7	-	21	-	-	11	
109	-	-	-	-	-	29				
110	41	58	0.6	-	27	95	279	25	31.5	450
111	27	51	-	-	25	34	287	2		
112	-	-	-	-	-	-	-	24		
113	83	31	1.2	20	18	68	224	28.3	27	340
114	36	18	-	18	-	50	-	2.0	15	
115	-	22	-	-	16	67	239	7.0		
116	-	23	-	-	14	32	207	18		
117	-	24	-	-	21	27	211	22.5		
118	60	-	-	12						
119	-	28	-	-	24	19		22		
123	-	-	-	-	25	72				

NOTE: COMPUTATION OF TOTAL DISSOLVED SOLIDS (TDS):
$(HCO_3/2)$ + ALL OTHERS + 2 = TDS

FLOW-WEIGHTED AVERAGE TDS = 390 mg/l

NOTE: Average ground-water quality for 1962-1969 period. Data obtained from State Department of Water Resources, U.S. Geological Survey, California Water Service Company, and San Jose Water Works. Compiled by Consoer-Bechtel - 1973 - "Water Reclamation and Reuse".

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nature of the ground-water basin. The water which is percolated from surface runoff from the Santa Cruz Mountains and later pumped from wells, is predominantly a calcium-magnesium-bicarbonate type and contains relatively low concentrations of boron and sodium.

However, mineral properties of ground water originating in the Diablo Range on the east side varies from place to place, probably due to drainage of the area by more numerous small streams which produce water of differing quality. Some of the ground water in the Penitencia Creek alluvial fan area and the Silver and Dry Creeks areas has been found to contain high boron and high magnesium contents. These minerals, in high enough concentrations, result in a ground water unfit for prolonged irrigation use.

Ground water in the upper aquifers of North Santa Clara Valley in the tideland area of San Francisco Bay has been found to be contaminated by chlorides, presumably from saltwater intrusion.

Some wells in the Los Altos, Morgan Hill and Gilroy areas have at times contained high nitrate concentrations, sometimes exceeding U.S. Public Health Standards. High fluoride concentrations have been observed in the Morgan Hill area.[13/]

In many cases, improperly constructed wells have been responsible for the poor water quality. The Santa Clara Valley Water District is working to establish well construction and sealing standards which would help alleviate many of the ground-water quality problems in the valley. Ground-water quality for a number of wells is shown on table B-13. Plate B-7 shows the location of these wells.

(5) Drainage. Under present conditions, both in North and South Santa Clara subareas, there are no serious drainage problems relating to agricultural use. Pumping from the confined acquifers has been great enough to allow a downward migration of the semi-perched water table overlying the confined zone, thus keeping the water level 5-20 feet below ground surface. In the few critical areas, drainage facilities have been provided to carry excess water into natural channels. Urban drainage has generally been the problem of the landowner or constructed as part of a subdivision.

The major drainage for the San Felipe service area within Santa Clara County is northwesterly toward San Francisco Bay. South of the Coyote divide, drainage is southeasterly to the Pajaro River. Coyote Creek, which has the most extensive drainage

13/ "A Study of Reclamation and Reuse," Consoer-Bechtel, 1972.

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system in the county, flows to the northwest from Coyote and Anderson Reservoirs. Coyote Creek parallels Highways 101 and 17 until just north of Milpitas where it turns west to flow into the Bay, forming a portion of the northern county boundary. Eastside drainage of the proposed project service area north of Coyote Narrows is generally tributary to Coyote Creek. The Guadalupe River, which flows to the northwest through downtown San Jose, drains Calero, Almaden and Guadalupe Reservoirs. Various drainage and flood control projects have been built along these streams and more are planned for the future. Significant flood control problems associated with urban development exist in the county, such as in the east zone and south county.

(6) Flooding. The Santa Clara Valley Water District, in addition to the task of insuring an adequate supply of water to residents of Santa Clara County, maintains an ongoing countywide flood control program. This program is financed by ad valorem taxes. The actual tax rate varies among 5 zones of benefit within the district boundary.

The district's flood control program includes the actual planning of flood control facilities (this includes the gathering and dissemination of historical and projected flood information), a capital improvement program amounting to approximately $5 million annually, and a flood control facility maintenance program.

The district works closely with the various cities and the county in all phases of planning, design and construction of flood control facilities. In fact, each jurisdiction has its own specific responsibilities for providing their share of overall drainage. Generally, the local agencies are responsible for provision of standards for private site drainage and the transmission of this runoff from small watersheds to the "main arterial" channels under the water district's jurisdiction. In most cases the district is responsible for natural tributaries which have upstream watersheds of 320 acres or more. Local storm drains and small natural tributaries are the responsibility of the local agency.

The water district plays an active role in the review of private development proposals within the county and various cities. This is on a referral basis and is done with an eye toward advising developers and purchasers of land as to the nature of the flood hazard on their property. Where a flood hazard exists, the district assists the owner toward designing flood control improvements where possible.

Also, as part of the land development review process, the district often requests of cities and the county that, as a

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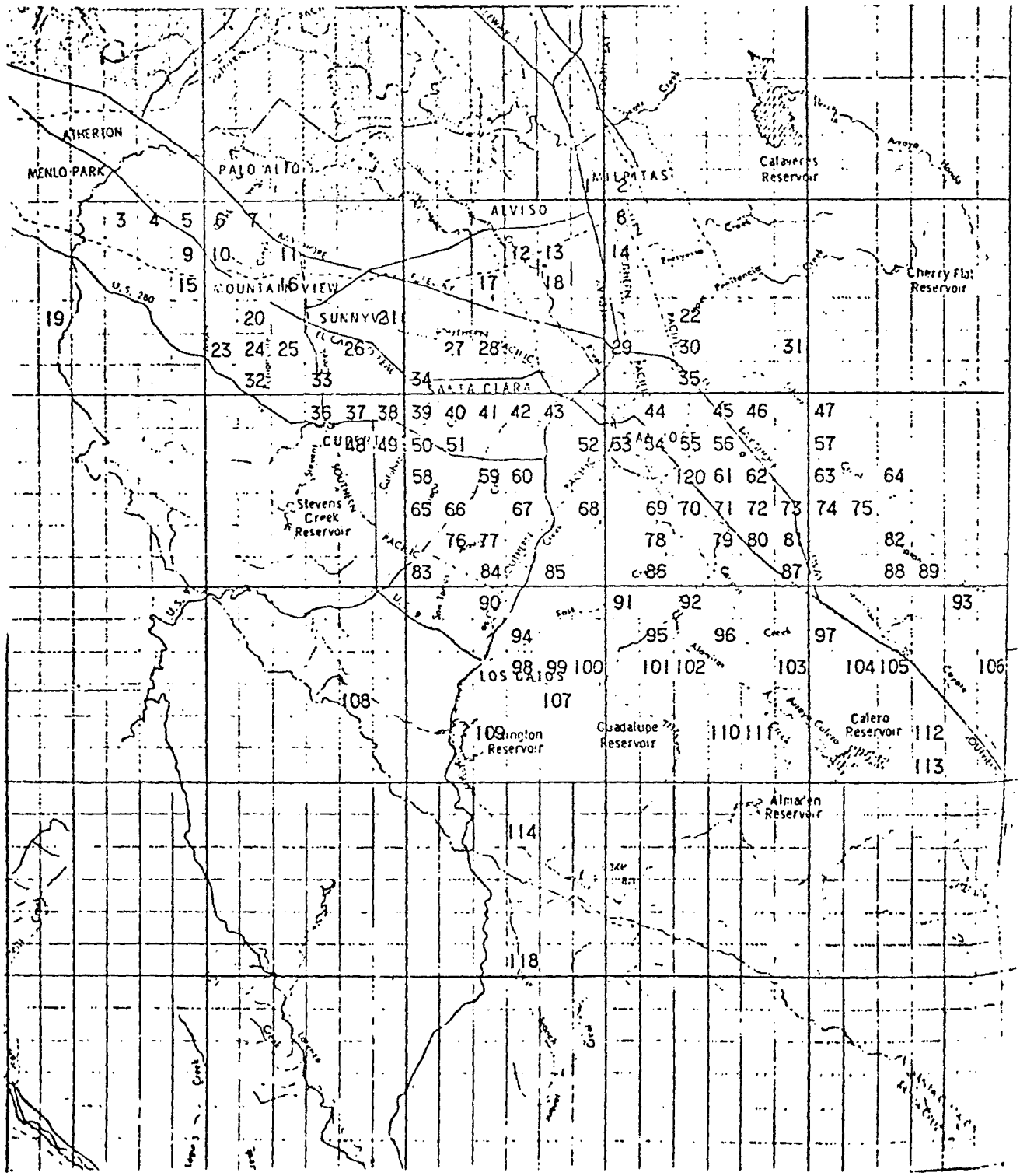
Location of ground-water wells
Santa Clara County



NOTE:

Data obtained from State Department of Water Resources, U.S. Geological Survey, California Water Service Company, and San Jose Water Works. Compiled by Consoer-Bechtel - 1973 - "Water Reclamation and Reuse".

condition of development, certain minimum rights-of-way be set aside or dedicated to the district for flood control for those properties affected by a natural creek. This is done to insure that development is not allowed to encroach in areas needed for future flood control improvements.

Flooding and flood control in Santa Clara County are discussed in Santa Clara Valley Water District's December 1974 Draft EIR on the San Felipe Water Distribution System:

> "An important flood control problem in Santa Clara County is tied directly with land subsidence caused by past ground-water mining. In the tidal lowlands, high surface runoffs combine with tidal waters to cause extensive inundation and ponding.
>
> "Since 1910 the valley floor has settled from approximately 6 feet at Alviso to approximately 13 feet in downtown San Jose as a result of a cumulative ground-water overdraft on the order of 600,000 acre-feet. The settling at Alviso and other points along San Francisco Bay has allowed occasional salt water inflow to valuable agriculture lands. The danger from tidal flooding has also greatly increased due to land subsidence. Alviso and many other points would be flooded many times a year by the high tides of the Bay if it were not for existing tidal gates and dikes. If subsidence continues, the effectiveness of this flood control system will be compromised.
>
> "Although dikes give protection from tidal flooding, they cause greater ponding of surface runoff on the flat valley plain adjacent to San Francisco Bay. Thus, diking which prevents tidal flooding makes inundation of valuable land a critical problem. This ponding also makes it harder to dispose of storm runoff once it reaches the flat plain adjacent to the Bay.
>
> "Flood control problems in the creeks draining into the valley have been aggravated by the sinking of the valley floor resulting from ground-water overdrafting. Continued subsidence has the effect of making existing flood control channels in the valley floor area inadequate to carry flood runoff. If subsidence resumes, dikes and levees must be raised. Recently, ground-water recharge operations have halted or reduced land subsidence and subsidence-related flood control problems . . . So long

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as current ground-water levels and storage volumes are maintained, subsidence will probably not be significant. Any further overdrafting of the County's ground-water basins, particularly the Santa Clara Valley basin, will almost certainly have adverse effects and impacts.

"Some relatively important flooding problems exist, especially along parts of Coyote and Guadalupe creeks in the North County region and along Llagas Creek in the South County region, although channelization projects planned by the U.S. Soil Conservation Service and the U.S. Army Corps of Engineers should alleviate South County problems by the early 1990's. North County flooding problems are more difficult, and the solutions will require a great deal of close coordination of the timing and location of urban growth and the development of flood control measures.

"Generally speaking, existing reservoirs in Santa Clara County are not well-suited for further expansion. Most remaining flood control problems must be solved through a combination of watershed management programs, including regulatory zoning of floodplains, and local drainage improvements. Current policies seem to be consistent with this approach. For this reason, projected increases in surface water supply storage facilities, or in urbanization due to new water imports, will probably have little effect on flood control in Santa Clara County."

b. San Benito County (Hollister subarea). The water supply for this area comes from two sources--ground-water and surface storage reservoirs. The reservoir storage is primarily used for percolation to the ground-water basins.

(1) Ground Water. The water supply for the Hollister subarea is obtained from ground-water wells. Recharge of the underground basin is from deep percolation of irrigation water, stream recharge, subsurface inflow, and precipitation. Some of the 12 subunits in the Hollister subarea are separated by barriers, generally fault zones, which crisscross the area. Because of these barriers, water quality and ground-water elevations differ between some of the subunits.

There are areas within the county, such as the West Bolsa region, that have been excluded from the study area. This is an area that historically had a high-water table. The existing ground-water supply is adequate to meet the needs of the West Bolsa and continued pumping is necessary to keep the high-water table under control.

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Ground-water levels have historically fluctuated; however, the recent trend has been one of receding water tables. The present ground-water conditions in some locations have lowered over 100 feet from pre-irrigation times. Along the east side of the subarea, the depth to water is about 50 feet and around the town of Hollister, where a cone of depression has developed, water levels are over 200 feet below ground.

Plate B-8 shows the generalized ground-water depth in the spring of 1969.

With proper monitoring, pumping will allow management of the water tables to insure the elimination of major drainage problems and allow sufficient outflow to maintain a favorable salt balance.

The safe ground-water yield (pumpage) is estimated to be about 56,200 acre-feet annually.

(2) Surface Water. This subarea is drained by the Pajaro River whose flows are summarized in table B-6. Two of the principal tributaries are the San Benito River and Pacheco Creek. Water resource developments are located on both of these tributaries which, during the summer months, are dry where they meander through the service area.

In 1962, San Benito County Water Conservation and Flood Control District constructed Hernandez Dam and Reservoir on the San Benito River located about 50 miles southeast of Hollister. The reservoir has a capacity of 18,000 acre-feet and an average annual yield of 4,100 acre-feet. Controlled releases from Hernandez Reservoir are either percolated in the San Benito River at the time of release or stored temporarily at the 4,500-acre-foot off-stream Paicines Reservoir for later release to the San Benito River.

The Pacheco Pass Water District consists of about 5,400 acres in the northeastern corner of the Hollister area. The district completed construction of North Fork Dam on that branch of Pacheco Creek in 1939 and developed a storage reservoir with 6,150 acre-feet of capacity. Water stored in the reservoir is released down the Pacheco Creek streambed for percolation into the ground-water basin after natural streamflow diminishes. Studies indicate that this development on Pacheco Creek efficiently utilizes practically the full absorptive capacity of the stream channel available during months of no natural flow. Only part of the irrigation requirements of the district are met through this operation.

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(3) Water Quality. Ground-water quality in the Hollister subarea is generally good; however, it is difficult to generalize about the quality of the ground water because of the complex geological fault system of the area.

There are several faults within the area which, in addition to being ground-water barriers, may provide avenues through which deep seated water of poor quality can move upward into fresh ground-water bodies.

The Quaternary alluvium and stream terrace deposits in the floor of the ground-water basin are the principal fresh-water producing deposits. The Purisima Formation, which underlies the younger, more prolific water-bearing deposits, contains ground water in its upper, more permeable portion; however, it is high in salts, is of relatively poor quality, and is of limited use. The occurrence of saline water in the upper portion of the Purisima Formation indicates that water has moved upward from the underlying marine portion of the formation. It is possible that poor quality water produced by water wells in the valley floor area has migrated from the underlying and adjacent Purisima Formation.

Under present conditions the quality of the ground water is approximately 600 p/m as shown by tables B-14, B-15, and B-16 and is of a magnesium, calcium, sodium bicarbonate type. In one ground-water subunit containing about 5,700 acres boron is present in amounts that have been harmful to production of certain sensitive crops. Boron is an essential element for plant growth. Normally, it is present in soils in very small amounts (less than a few p/m), but when present in greater amounts, it is toxic to plant growth. One usually associates boron with an arid condition and saline soils; but it can be present in other climates. See plate B-9, for boron concentration in ground water.

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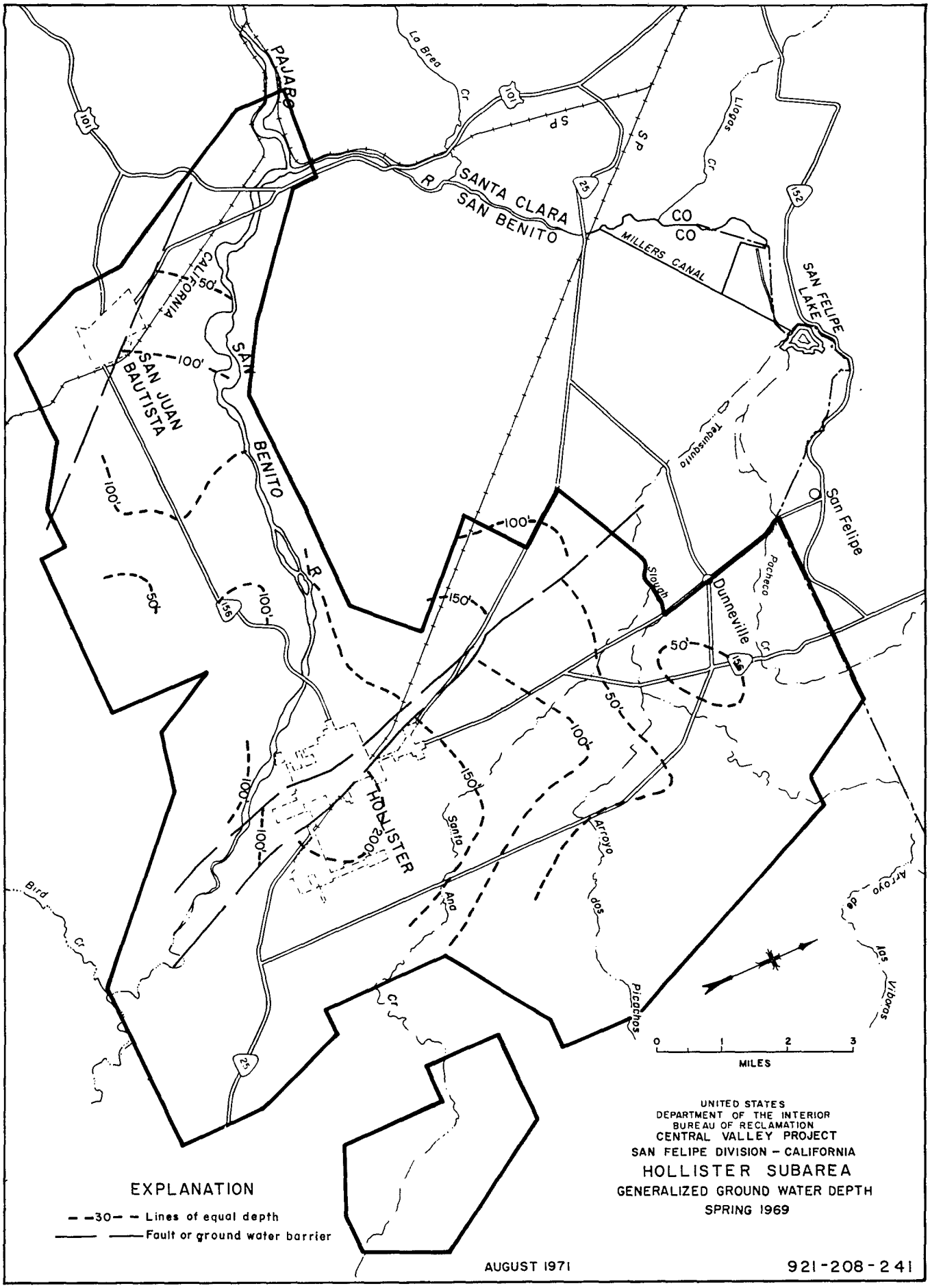
PAJARO
La Brea Cr
SP
SP
Llagas Cr
SANTA CLARA
R
SAN BENITO
CO
CO
MILLERS CANAL
SAN FELIPE LAKE
CALIFORNIA
SAN JUAN BAUTISTA
SAN BENITO R
Tequisquito
San Felipe
Slough
Pacheco Cr
Dunneville
HOLLISTER
Santa Ana
Arroyo dos Picachos
Arroyo de las Viboras
Bird Cr
50'
100'
150'
200'
0 1 2 3
MILES
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
SAN FELIPE DIVISION - CALIFORNIA
HOLLISTER SUBAREA
GENERALIZED GROUND WATER DEPTH
SPRING 1969
EXPLANATION
30 Lines of equal depth
Fault or ground water barrier
AUGUST 1971
921-208-241

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Table B-14
Water Quality
Hollister Subarea

Constituents	Units	Ground water
Ca	mg/l-meq.	51 - 2.6
Mg	"	37 - 3.1
Na	"	46 - 2.0
K	"	0
CO_3	"	0
HCO_3	"	363 - 5.9
SO_4	"	38 - 0.8
Cl	"	41 - 1.1
B	"	0.6
NO_3	"	-
TDS	"	576
Na	%	26
SAR		1.3
pH		-
EC	micromho	900

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Table B-15
Typical Ground-Water Quality
in the Pajaro River Basin

Characteristic[a]	Hollister	Tres Pinos	San Felipe
Specific conductance (micromhos)	1,900	1,480	970
TDS	1,210	940	580
Hardness	740	510	240
Boron	1.0	1.6	0.3
pH (units)	8.3	7.9	8.2
Sodium	170	140	120
Chloride	116	125	80
Nitrate	7.6	4.2	0.6
Sulfate	262	240	70

[a] Reported in milligrams per liter unless otherwise noted.

Water Quality Control Plan Report, Central Coastal Basin (3), Regional Water Quality Control Board, May 1974.

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Table B-16. Partial chemical analyses of water from wells in the northern half of Hollister Valley

Well number	Date of collection	Temperature (°C)	Sodium (Na)	Sulfate (SO_4)	Chloride (Cl)	Boron (B)	Dissolved solids (residue at 180°C)	Specific conductance (micromhos)
			(concentration in milligrams per liter)					
11S/4E-13A2	8-26-68	18	--	185	406	0.27	1260	2020
11S/4E-23Q1	8-24-68	24	--	35	30	.27	352	570
11S/4E-24C1	8-24-68	18	--	61	78	.22	524	904
11S/4E-25H1	8-23-68	--	--	192	88	.91	764	1240
11S/4E-34G1	9-25-68	17	--	135	33	.28	504	838
11S/4E-35R1	9-27-68	21	--	125	156	.74	708	1160
11S/5E-17R1	9-03-68	17	--	121	46	.65	464	735
11S/5E-21K1	9-04-68	17	--	67	41	.41	332	599
11S/5E-21N1	9-03-68	18	--	73	30	.40	384	656
11S/5E-28B1	8-23-68	18	--	47	28	.72	358	593
11S/5E-29R1	6-23-68	18	--	93	44	.70	472	762
11S/5E-30H1	8-23-68	23	--	215	88	.70	680	1090
11S/5E-31F2	8-24-68	22	--	395	156	.99	1170	1660
11S/5E-31R1	8-23-68	18	--	1025	290	1.0	2450	3020
11S/5E-33B2	8-22-68	18	--	46	24	.33	332	551
11S/5E-34Q1	9-03-68	18	--	46	38	.58	380	650
11S/5E-35B4	5-16-68	19	143	21	152	2.2	556	1030
11S/5E-35C3	5-16-68	17	91	30	58	1.5	264	665
11S/5E-36A2	5-16-68	21	39	35	36	.74	376	668
11S/5E-36M10	5-16-68	18	66	38	184	.71	792	1250
11S/5E-36M11	5-20-68	21	178	3.0	113	2.1	688	1320
11S/5E-36P4	5-16-69	17	163	21	156	1.9	620	1150
11S/6E-31M2	5-15-68	17	34	30	26	.41	326	540
12S/4E-2J1	9-26-68	25	--	50	148	.59	592	1000
12S/4E-3C2	9-26-68	21	--	63	75	.39	500	780
12S/5E-1H2	5-20-68	20	87	36	72	1.4	552	781
12S/5E-1N2	5-17-68	18	100	45	131	2.4	660	1200
12S/5E-1Q2	5-17-68	22	244	1.0	182	5.0	812	934
12S/5E-2F1	5-20-68	19	233	87	284	1.8	992	1660
12S/5E-5A3	8-22-68	22	--	156	88	.85	740	1180
12S/5E-7N3	8-22-68	26	--	3.0	192	.42	624	1040
12S/5E-8B1	8-22-68	17	--	228	120	.96	924	1480
12S/5E-9J1	8-22-68	18	--	236	94	.93	780	1280
12S/5E-10R2	9-04-68	18	--	240	152	.95	876	1460
12S/5E-12A5	5-17-68	--	148	1.0	136	3.1	556	934
12S/5E-12M3	5-18-68	18	70	95	129	2.3	772	1190
12S/5E-12M6	5-18-68	18	90	79	130	3.3	644	1150
12S/5E-12P3	5-15-69	18	178	7.0	218	9.4	664	1220
12S/5E-14M3	5-17-68	19	120	169	78	.93	612	1000
12S/5E-14R2	5-17-68	23	282	86	262		980	1610
12S/5E-16F2	8-22-68	17	--	252	136	.89	804	1540
12S/5E-16Q2	8-23-68	18	--	208	100	.82	812	1290
12S/5E-17D1	8-22-68	31	--	20	288	.24	712	1290
12S/5E-21A2	9-04-68	18	--	236	110	.78	864	1370
12S/5E-21P1	9-04-68	21	--	212	98	.70	772	1260
12S/5E-22C1	8-24-68	18	--	348	188	1.1	1200	1790
12S/5E-23P2	5-18-68	18	133	271	115	.80	892	1440
12S/5E-24A4	5-17-68	19	59	17	74	2.0	356	652
12S/5E-24N3	5-17-68	20	144	165	96	1.0	560	1060
12S/5E-25F1	5-17-68	22	149	167	90	.75	372	1010
12S/5E-28G1	9-07-68	16	--	296	120	.85	992	1500
12S/5E-36N2	9-20-68	22	--	168	100	1.2	672	1100
12S/6E-5M1	5-15-68	23	138	12	87	4.8	562	1010
12S/6E-6B1	5-16-68	17	35	37	29	.51	308	648
12S/6E-6P4	5-16-68	20	81	13	54	1.1	384	684
12S/6E-7J1	5-20-68	19	77	26	64	.83	452	759
12S/6E-7P3	5-15-68	25	9.0	90	30	.65	302	477
12S/6E-18G1	5-15-68	19	30	25	24	.21	222	404
12S/6E-18P1	5-15-68	21	70	16	65	4.4	288	593
12S/6E-30L5	5-18-68	20	317	229	275	4.3	1240	2140

NOTE: Data from U.S. Geological Survey, "Ground-water Hydrology Hollister & San Juan Valleys," Open File Report, August 1972.

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The following tabulation[14/] shows the relative tolerance of plants to boron in irrigation water:

Tolerant to 4.0 p/m	Semitolerant to 2.0 p/m	Sensitive to 1.0 p/m
Asparagus	Tomato	Walnut
Sugar beets	Field pea	Navy bean
Alfalfa	Barley	Plum
Onion	Wheat	Pear
Turnip	Corn	Apple
Cabbage	Milo	Grape
Lettuce	Oat	Cherry
Carrot	Bell pepper	Peach
	Sweet potato	Apricot
	Lima bean	

14/ Data from U.S. Salinity Laboratory Staff Agricultural Handbook No. 60, USDA 1954.

These ground waters that contain boron have been used to irrigate trees and vines and the results vary from complete abondonment of orchards (see photograph following this page) to orchards that only exhibit boron toxic symptoms on the leaves.

Boron is accumulated in the soils from the irrigation water but the winter rains remove some from the root zone. It then becomes a question of how much boron remains in the soil after the winter rains and if the amount added during the growing season is sufficient to damage the crop. Experience has proven that this boron problem is becoming more serious with time, probably due to applying more of the toxic ground water and pumping from greater depths.

The surface water quality in the Pajaro River is described in the Regional Water Quality Control Board Water Quality Control Plan Report for the Central Coastal Basin (3).

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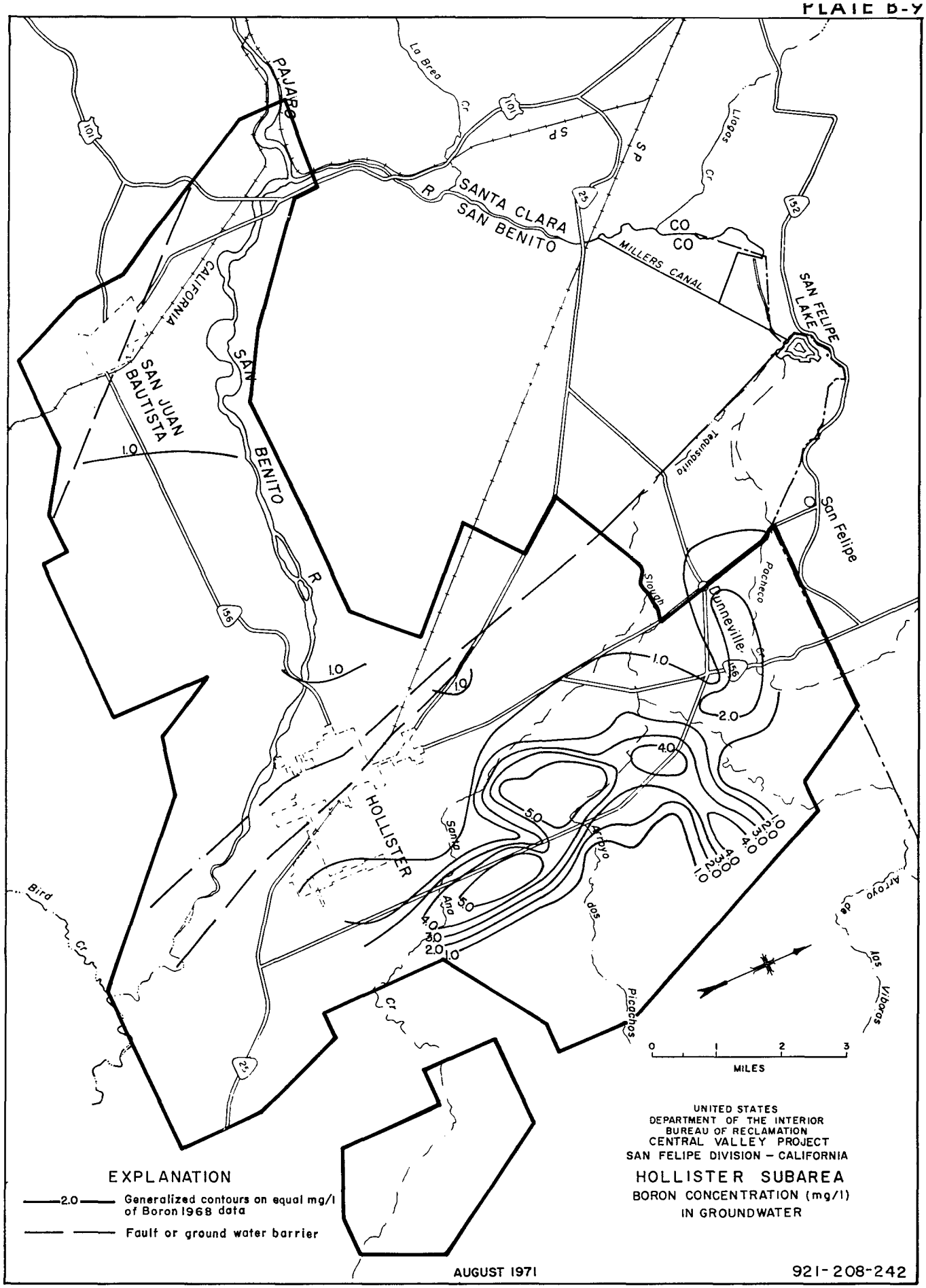
PAJARO
Lo Brea
Cr
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SP
Ligos
Cr
SANTA CLARA
R
SAN BENITO
CO
CO
MILLERS CANAL
SAN FELIPE LAKE
CALIFORNIA
SAN JUAN BAUTISTA
SAN
BENITO
R
Tequisquita
San Felipe
Slough
Pacheco
Dunneville
Cr
1.0
1.0
1.0
1.0
2.0
4.0
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HOLLISTER
Santa
Ana
Arroyo
dos
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Bird
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Cr
Arroyo de los Vibores
0 1 2 3
MILES
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
SAN FELIPE DIVISION – CALIFORNIA
HOLLISTER SUBAREA
BORON CONCENTRATION (mg/l)
IN GROUNDWATER
EXPLANATION
2.0 Generalized contours on equal mg/l of Boron 1968 data
Fault or ground water barrier
AUGUST 1971
921-208-242

C—038664

DYING ORCHARD IN BORON AREA (HOLLISTER SUBAREA ALONG FAIRVIEW ROAD BETWEEN COMSTOCK AND FALLON ROAD INTERSECTION)

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"Pajaro River Subbasin

"Most of the streams in the Pajaro River Subbasin are intermittent and flow from late fall through early summer. Table 14-2 (Table B-11 in this report) gives values which are typical of present conditions, although wide variations occur in practically all of the streams. Surface water quality in South Santa Clara Valley is generally satisfactory for all beneficial uses. However, quality in Llagas Creek near the mouth is unsatisfactory for irrigation at low flow conditions.

"Quality of surface flows in the Pajaro River steadily deteriorates from the headwaters in San Felipe Lake throughout its length to the ocean. San Felipe Lake is supplied primarily by Pacheco Creek. Most of the water quality degradation in the Pajaro River Basin results from mineralization by irrigation return flows; however, bacterial contamination has occurred in adjacent coastal waters."

(4) Drainage. Historically the Pajaro River, which is in the northern part of the Hollister Valley, separating Hollister Valley from South Santa Clara Valley, was the direction in which both surface and ground waters moved; i.e., waters from the southern Santa Clara Valley moved southward and those in Hollister Valley moved northward. Outflow was accomplished by the Pajaro River.

Irrigation development using ground water created a cone of depression in the vicinity of the city of Hollister resulting in the altering of the direction of flow of the ground water toward the cone of depression. (See plate B-8). This is a reversal of flow direction between Pajaro River and the cone of depression caused by irrigation development. If this condition is allowed to continue over time, it will result in the deterioration of the quality of ground water.

Plate B-8 shows the depth to ground water, as of the spring of 1969, as ranging from about 50 to 200 feet with the gradient toward the cone of depression near the city of Hollister.

About one-third of the study area is presently being irrigated with some development going back about 70 years. Drainage problems have occurred mainly in the Bolsa area which is outside of the project service area. This area is positioned in the bottom of the valley and includes San Felipe Lake.

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In the Bolsa area there have been some deep drains installed and some fields have tile drainge systems. Also, irrigation development is continuing with the installation of wells. It is expected that this practice will continue in the future.

Within the project study area, drainage works consist of shaping fields to provide surface runoff as part of the preparation for irrigation. Also, there is a network of stream channels that provide outlet and removal of both winter rainfall and surface irrigation waters. In addition, there is a network of ditches along some of the county roads.

(5) Flooding. As stated in the San Benito County "General Plan,"15/ the most significant flood-plain area in the county is in the vicinity of San Felipe Lake on the northern county boundary. Flooding in that area occurs only in periods of heavy and continuous storms. In order to alleviate this situation, the Miller Canal was dug to drain the excess floodwaters into the Pajaro River, the boundary line between Santa Clara, Santa Cruz and San Benito Counties.

This flood-plain area is extensively used for agricultural purposes except during the rare periods when it is inundated by floodwaters.

There are also scattered areas which could be indicated as flood plains which lie along the San Benito River. These are relatively narrow shelves, and since they are almost exclusively surrounded by agricultural land of one type or another, they need no separate identity.

Three reports16/ of the U.S. Army Corps of Engineers include information on the floodflows and the area that would be inundated from the intermediate Regional Flood and Standard Project Flood. These reports were requested by the County Board of Supervisors and provide a suitable basis for the adoption of land use controls to guide a flood-plain management plan. The reports cover most of this subarea except the Pajaro River between San Felipe Lake and its junction with the San Benito River and the Pacheco Creek drainage.

15/ County of San Benito, Land Use-Housing-and Scenic Highways Elements of the General Plan 1973.

16/ Flood Plain Information San Benito River - Pajaro River to Tres Pinos Creek, U.S. Army Engineer District - San Francisco Corps of Engineers, June 1974.
and
Flood Plain Information San Felipe Lake, Corps of Engineers, June 1975.

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In a 1965 review report on the Pajaro River Basin[17/] the U.S. Corps of Engineers described the capacity of the Pajaro River between its junction with Uvas Creek and San Felipe Lake as ranging from 7,000 to 10,000 ft^3/s. The channel through the canyon between the Uvas Creek junction and Lower Pajaro Valley was described as about 200 feet in width and 13 feet in depth for the normal channel. However, during floodflows the water surface ranged between 500 and 1,000 feet in width, covering berm and benchland to average depths of about 30 feet. Channel capacity through the canyon, including the berms, was estimated at 40,000 ft^3/s. They also listed the San Benito River from the confluence of Tres Pinos Creek to the Pajaro River as having a capacity of 7,000 to 10,000 ft^3/s. Uvas Creek from State Highway 152 downstream to Bloomfield Road was described as having a capacity that varies between 5,200 ft^3/s and 9,800 ft^3/s. In this reach, the channel varies from 100 to 500 feet wide and from 10 to 20 feet deep. From Bloomfield Road to the Pajaro River, channel capacities diminish to approximately 3,500 ft^3/s near the mouth. Channel dimensions vary from 40 feet to 200 feet in width and from 7 to 18 feet in depth.

The following runoff peaks at Chittenden on the Pajaro River are listed in the Corps of Engineers' Reports:

Runoff During Major Flood Events
Pajaro River at Chittenden
(1,188 square miles)

Date	Instantaneous maximum discharge (ft^3/s)	Number of days duration	Runoff in inches over basin
26 February-5 March 1940	9,880	9	1.2
8-14 February 1941	10,100	6	1.2
28 February-9 March 1941	10,300	9	1.3
4-9 April 1941	11,100	5	0.7
1-7 February 1945	10,700	7	0.8
12-19 January 1952	10,000	8	1.4
22-27 December 1955	24,000	6	1.7
1-7 April 1958	23,500	7	2.3
31 January-3 February 1963	11,000	4	0.6
25 February 1969	17,800	-	-

17/ Draft-Review Report for Flood Control and Allied Purposes, Pajaro River Basin, Corps of Engineers, April 1965.

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8. Land Use Patterns

a. Santa Clara County. Within the State of California, Santa Clara County ranks 37th in area and 5th in population. The U.S. Census Bureau estimated the Santa Clara County 1970 population at 1,066,174.

The principal land use in the northern part of Santa Clara County, which includes the San Jose metropolitan area, is urban. The southern part of Santa Clara County, from Morgan Hill south, has a population of about 32,000. This part of the county is substantially agricultural and will undoubtedly remain an important agricultural area. Incorporated towns in South Santa Clara County are Gilroy and Morgan Hill with populations of 12,655 and 6,485 respectively.

The communities of Coyote, Morgan Hill, and Gilroy are agriculturally oriented. This fact should not be overlooked because of the urban impact of the San Jose metropolitan area. However, this urban center is presently causing pressures on the agricultural community in the southern portion of Santa Clara County.

Of the 1,300 square miles within Santa Clara County, approximately 350 square miles are valley floor lands. The intensive agricultural development and most of the urban development, including 8 square miles of tidal marshes used for salt production, are located on the valley floor lands. The balance of the land is considered mountainous with the economic uses confined to cattle grazing and minor timber harvesting. Recreation activities are primarily associated with the 14 square miles of reservoir surface acres in the area.

The last Bureau of Reclamation land use inventory for Santa Clara County, was made in 1967. At that time, 111,000 acres were considered urban development. Projecting the results of that data to 1974, the following conclusion may be made: 58,000 acres are in houses, primarily single-family dwellings; 30,000 acres are in streets and roads; 15,000 acres are devoted to commerce, manufacturing, warehousing, and industrial purposes; and 42,000 acres are occupied by public building and public open places. It would appear from the above, the urban development increased about 23 percent since 1967.

In Santa Clara County the institutions which have power to directly regulate economic and land use development are the city governments of the fifteen incorporated areas, the Santa Clara County Board of Supervisors, the Local Agency Formation

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Commission (LAFCO), the Bay Conservation and Development Commission (BCDC), and the regional water quality and air pollution control boards.

The regional organizations are largely advisory rather than regulatory. Only BCDC and the air pollution and water quality control boards have powers to restrict proposed developments. The Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC) are voluntary organizations attempting to serve a role in coordination and regional planning. The Santa Clara County Planning Policy Committee and the Santa Clara County Transportation Committee have advisory functions to the Board of Supervisors. These committees are composed of council members from each of the cities, and they serve to coordinate planning at city and county levels.

Among the various legislatve controls is that of the Local Agency Formation Commission (LAFCO). This Commission was created by State Statute in 1963 to discourage urban sprawl and encourage the orderly growth of local government. LAFCO has the responsibility for regulating the formation of cities and annexation of territory to cities and to special districts. The Commission is made up of two county supervisors, two city councilmen, and one public representative.

The Planning Policy Committee of Santa Clara County was created in 1967 by the Inter-City Council and the Board of Supervisors to work on joint planning problems and develop countywide planning policy. This committee recommended that LAFCO's policy for Santa Clara County be implemented. In May 1974, the County Board of Supervisors adopted zoning ordinances designed to combat urban sprawl in county areas near cities in Santa Clara County. These ordinances restrict land use in these areas to single-family residences on parcels 2-1/2 acres or larger and to agriculture or related uses.

In 1970, the California State Legislature directed each city and county to prepare an Open Space Element of its General Plan. The 1971 Legislature required LAFCO to develop a plan to determine the maximum service area and service capacities of local government agencies. The Open Space Element Legislation was amended to require an action program and an open space zoning ordinance to be completed by June 30, 1973.

The nine cities in Santa Clara County have established urban limit boundaries. In April of 1970, Santa Clara County's LAFCO adopted guidelines which established a general policy for further expansion of urban development. Essentially, it recommends

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that urban development into undeveloped areas occur only when such expansion is necessary and could be provided with urban services and facilities in an orderly and efficient manner.

The California Land Conservation Act (Williamson Act) is one means for reducing the tax burden of agricultural land. Present taxing procedures of agricultural land at its highest and best use usually forces farmland near urban development out of production. A farmer may choose to put his land under the Williamson Act for a period of years and remain in an agricultural tax rate. The California Legislature is presently considering amendments to this Act which should strengthen the legislation and bring more agricultural land under these contracts.

During the 5-year period from 1964 to 1969, the average annual conversion of farmland to urban uses was 4,400 acres in Santa Clara County. Santa Clara County Planning Department anticipates this rate will decline in the future. However, during 1971 more than 6,000 acres of bearing orchards were removed of which about 2,000 acres were put to urban use. The remaining 4,000 acres were taken out of production because of unfavorable economic conditions for the tree crops involved, and for the most part is classified as urban vacant.

The historical trend toward greater urban land use patterns in Santa Clara County is expected to continue in a more controlled fashion either with or without a San Felipe Division water supply. Controls will be exercised by local government to prevent urban sprawl, insure open space and otherwise protect the urban environment.

The 1973 Agricultural Crop Report for Santa Clara County includes data for the entire county, but most of the irrigated agricultural crops fall within the San Felipe service area. The following tabulation is a condensation of information obtained from the 1973 Agricultural Crop Report. The report does not indicate irrigated acres.

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Crops	Acres
Fruit and nuts	25,511
Berries	328
Seed	1,120
Vegetable	14,468
Nursery products	473
Subtotal	41,900

Field Crops	Acres
Barley	1,400
Hay	13,650
Pasture	5,000
Sugar Beets	850
Subtotal	20,900
Total	62,800

Other field crops noted in the crop report as harvested include 223,000 acres of rangeland.

The leading types of farm produce in the San Felipe service area are truck, seed, and specialty crops such as lettuce, celery, cauliflower, garlic, beans, peppers, cucumbers, tomatoes, onions, and brussels sprouts; orchard crops including apples, prunes, apricots, pears, cherries, and walnuts; berry crops; miscellaneous field crops such as alfalfa, barley, sugar beets, and grain hay; as well as varietal wine grapes, nursery stock, livestock, and dairying.

Previous appraisals of the lands in the service area were made on the physical properties of the lands as part of the soil survey of the Santa Clara and Gilroy areas by the University of California. The same area has also been covered by physical soil mapping by the Loma Prieta Soil Conservation District over a period of several years. Th Bureau used this previous work in its determination of the economic potential for irrigation classification. Since the area is proven by time for its agricultural production of high-value crops, the Bureau did not make the numerous soil profile observations usually required. As a result of examination and correlation with the various features of the area, with the previously made soil inventories, the arability of the lands was determined. This is shown in the following tabulation:

C—038672

C-038672

Santa Clara Subarea

Land Class	% of Total
1	48
2	34
3	14
4	4
Total	100

Class 1 lands are highly suitable for irrigated farming, being capable of producing sustained high yields of a wide range of climatically adapted crops. These soils occur on the valley floor on the flood plains and alluvial fans. They are deep, permeable to roots and water, have moderate to high water holding capacity, smooth slopes, and no drainage problems. These soils make up nearly 50 percent of the lands classified. Class 2 soils are adapted to fewer crops or are more expensive to prepare for irrigation or more costly to farm. They consist of soils with moderately course texture or soils with moderately dense subsoils. Some small amounts of soluble salts and some drainage problems were identified. Class 2 lands comprise about one-third of the area. Class 3 lands are suitable for irrigation development but are approaching the limit of suitability because of deficiencies in soils, topography, or drainage, or combination of the three. Class 4 lands consist of terraces with both medium and heavy textural surface soils on rolling relief. These soils require special irrigation practices, careful management and are more costly to farm. However, because of their location along the valley fringe, they do have the potential for raising specialty crops.

b. San Benito County. San Benito County encompasses an area of about 1,395 square miles which includes the 98 square miles in the San Felipe (Hollister) service area. San Benito County's economy is based principally on agriculture, although cattle, minerals, petroleum, and forest products are important industries. About 15 percent, or 134,000 acres, in San Benito County are considered prime agricultural lands.

Public domain land includes about 115,000 acres and about 481,000 acres are in agricultural preserve under the Land Conservation Act (Williamson Act) which together total nearly 66.7 percent of the total county area.

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San Benito County, through their consulting engineers and others, has prepared several reports relative to land use. These are: "The General Plan, City of Hollister," 1969; "Open Space Element of the General Plan," 1972; "Land Use Housing and Scenic Highways Elements of the General Plan," 1973; Nestor Barrett and "Overall Economic Development Program," 1971, prepared under the direction of the San Benito County Economic Development Committee.

The two cities within San Benito County - Hollister and San Juan Bautista - in compliance with the State Planning Act, have adopted Open Space Elements of their General Plans. Under this Act each city is required to select some area outside its boundary into which it can expand in the orderly process of urban growth. When these areas have been defined, the county can proceed with the adoption of its Open Space Plan, which it has done.

The planning area for the city of Hollister contains 9,850 acres, but this is a far greater area than the city is likely to grow into in the foreseeable future. The area within the city limits at the present time is 1,411 acres. As in the case of San Juan Bautista, much of this area is in cultivated farmlands and constitutes a considerable open space asset around the outer perimeter of the city.

The area around San Juan Bautista is quite large, containing 5,203 acres. However, since the city limits enclose about 297 acres, much of the land which remains outside the present limits has been placed in agricultural open space. There is a small area of residential reserve which has been laid out immediately south of the city.

The Hollister subarea is, and is expected to remain, a major agricultural center. Hollister and San Juan Bautista are the only two incorporated towns in San Benito County. Their 1970 populations were 7,663 and 1,164, respectively. Total population of San Benito County in 1970 was estimated at 18,226 by the U.S. Census Bureau.

The 1974 San Benito County Department of Agriculture Report includes the following information:

C—038674

C-038674

Crops	Acres
Fruit and nuts	15,830
Seed	930
Vegetable	14,780
Nursery products[a]	NA
Subtotal	31,540
Field Crops	**Acres**
Alfalfa	1,100
Barley	7,450
Grain hay	20,200
Sugar beets	670
Misc. field	1,050
Permanent pasture	700
Subtotal	31,170
Total	62,710

a/ Acres not available, 1974 gross value was $1,510,000.

Other field crops noted as harvested in the crop report include 508,000 acres of pasture and range. The report does not indicate irrigated acres of the pasture and range.

Following is a land use summary of the Hollister subarea compiled in 1967, by the Bureau of Reclamation:[a]

Land Use	Acreage	Irrigated	Nonirrigated
Grain and Hay	1,157	253	904
Field	815	815	
Forage	786	786	
Truck	9,318	9,318	
Orchard	12,756	12,620	136
Vineyards	291	255	36
Urban	1,887		1,887
Native	35,940		35,940
Total	62,950	24,047	38,903

a/ Updated in March 1973. Land Classification, Agricultural Land Use and Water Requirement Appendix, USBR.

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IRRIGATED ROW CROP IN FOREGROUND - ORCHARD IN BACKGROUND (Hollister subarea)

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C-038676

GROWING PLANTS FOR SEED NEAR SAN JUAN BAUTISTA (Hollister subarea)

C-038677

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Of the 40,793 acres of arable land classified by the Bureau of Reclamation in the Hollister subarea, 41 percent was Class 1, 33 percent Class 2, 19 percent Class 3, and 7 percent Class 4. Class 1 lands are nearly level alluvial soils occurring on flood plains and fans and are highly suitable for all climatically adapted crops. Classes 2 and 3 are nearly level to sloping alluvial soils on terraces and alluvial fans, but are less suitable than Class 1 soils due to limitations in soil, topography, and drainage. Class 4 lands occur on steeper rolling terraces or uplands and are predominantly suitable for fruit due to steep topography with good soil and air drainage.

The irrigated cropland in San Benito County declined by nearly 7,000 acres between 1965 and 1973 due to the lack of an adequate supply of good quality water. There was a dramatic decline in the amount of brush and eroded land during this period. This was caused by a vigorous campaign of reclamation which switched 78,000 acres from a brush and eroded classification to pasture and rangeland.

9. Native Vegetation

Although most of the nonurban land in the subareas is used for agricultural purposes, native trees and shrubs fringe some of the natural drainage courses. Willows, alders, cottonwood, black walnut, and sycamores, with an understory of California blackberry, sage, wild radish and other annual plants are common along these intermittent stream courses.

The foothills between the mountain ranges and valley floors are generally grassland and utilized for dry pasture. The mountains to the west support medium to heavy growths of native trees and shrubs such as various species of oaks, coyote brush, various species of *Ceanothus* and poison oak. Remnants of redwood-associated plant communities exist on the upper slopes of the Santa Cruz mountains and irregularly along the Pajaro River.

Cover in the Diablo Range, Santa Clara Valley's eastern boundary, is of the oak-brush type consisting of chaparral plants such as manzanita, chamise, toyon, several species of *Ceanothus*, in addition to several species of oak. Here grasses, such as wild oats, foxtail and wild barley and herbaceous plants, consisting of wild mustard, filaree, buttercup and California poppy, now occur in restricted areas only, due to agricultural and urban development.

Table B-17 shows the areas of various types of vegetative complexes defined in terms of wildlife habitat.

C—038678

C-038678

Table B-17. Santa Clara County Wildlife Habitat

Habitat type	1963 Acreage	Percent of county total	Habitat value
Woodland-Chaparral	282,420	33.8	High--best for deer
Woodland-Grass	113,400	13.6	Moderate
Grassland	110,900	13.3	Low
Urban-Industrial	106,636	12.8	Low
Agriculture	96,134	11.5	Variable--good for pheasants
Chaparral	77,850	9.3	Low in old growth as browse for deer; high in new growth after fire or mechanical clearing
Hardwood	21,500	2.6	Important to deer, band-tailed pigeon, quail
Lakes, Bays and Reservoirs	8,340	1.0	Bay very important for waterfowl; reservoirs, moderate
Salt ponds	7,600	0.9	Good for shore bird resting and production of brine shrimp
Redwood	7,300	0.9	Low except where opened by logging or burning
Marsh	3,118	0.3	Most important for waterfowl

Source: Santa Clara County Planning Department: A plan for the Conservation of Resources; June 1973.

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NON-IRRIGATED LAND (Hollister subarea)

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10. Fish and Wildlife

Anadromous fish, including steelhead and silver salmon, run into suitable streams with access to the sea. These runs occur primarily during years of normal and above-normal runoff.

Steelhead use the lower Pajaro River and Llagas Creek and such tributaries as Uvas Creek, Pacheco Creek, South Fork Pacheco Creek, and Cedar Creek. Migrating adult steelhead support a fall-winter sport fishery, and juvenile steelhead provide a summer fishery during the general trout season if there is sufficient streamflow.

Some of the important spawning areas for steelhead have been blocked by dam construction, and special agreements have been made in some instances to provide mitigation. For instance, water is released down Uvas Creek (a tributary of Pajaro River) from South Santa Clara Valley Water Conservation District's Uvas Reservoir for fishery purposes by agreement with the California Department of Fish and Game. This release, primarily for steelhead purposes, is 20 ft^3/s from December 15 to April 30, and 10 ft^3/s from May 1 through December 15 as long as 11,000 acre-feet is captured by April 16th of the year.

The native fishes of the streams tributary to San Francisco Bay and Monterey Bay are the same as those of the Sacramento-San Joaquin River systems. Included were western suckers, hitch, squawfish, roach, and speckled dace. Other species were introduced purposely by the State as well as inadvertently by bait fishermen. These have included exotics such as carp, mosquito fish, golden shiners, threadfin shad, and additional native minnow species from the former Central Valley bait minnow industry.

The conservation reservoirs in Santa Clara County support a variety of warm- and cold-water fish species. Present fish life consists of exotic species such as introduced rainbow and brown trout, introduced warm-water fish such as largemouth black bass, bluegill, sunfish, green sunfish, crappies, and catfish, and those native fishes which could adapt to the intermittent flow and pollution from various sources in the streams and the fluctuating reservoir environment. These species, except for trout, are on a sustaining basis in those reservoirs that do not go dry.

A catchable-trout stocking program is conducted by the California Department of Fish and Game within the Santa Clara subareas. This program is not restricted to the spring and early

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summer seasons, but also includes a major winter stocking effort. This program augments the several warm-water reservoir fisheries which are open year-round.

Coyote Reservoir supports a major warm-water sport fishery and is also stocked with catchable trout, thus providing diverse angling opportunity. Anderson Reservoir is not stocked with trout but supports a year-round warm-water fishery.

Reservoir fishing pressure is somewhat proportional to the amount of stored water over a given period of time. The recreational facilities of the reservoirs, fishing, boating, and picnicking, are operated by the Santa Clara County Park and Recreation Department.

Fish and wildlife species in Santa Clara and San Benito Counties are generally similar as the two counties share similar climates and habitats.

The service area has amphibia fauna which partially reflect the former coast redwood forest character of the native plant community. Included is the tiger salamander, rough-skinned and California newts, yellow-eyed and Monterey salamanders, California slender salamander, arboreal salamander, western spadefoot toad, California toad, Pacific tree frog, red-legged and yellow-legged frogs, and the introduced bullfrog.

Except for the western pond turtle, California red-sided garter snake, and the western aquatic garter snake, the reptiles are less dependent upon water than the amphibians. Following is a list of reptiles occurring in the service area. Some are uncommon and are not easily seen.

Northwestern fence lizard	Sharp-tailed snake
California side-blotched lizard	Alameda striped racer
California horned lizard	San Joaquin whipsnake
Western skink	Western yellow-bellied racer
California whiptail	Pacific gopher snake
San Francisco alligator lizard	Coast mountain king snake
California legless lizard	California king snake
Pacific rubber boa	Coast garter snake
Pacific ringneck snake	Northern Pacific rattlesnake

The larger wildlife are associated with the natural areas generally on the uphill side of the proposed canals and conduits. The intensive cultivation of the valley floors limits wildlife in these areas to smaller forms such as cottontail rabbits, striped

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and spotted skunks, opossums, raccoons, grey foxes, ground squirrels, various genera of mice, and pocket gophers.

Black-tailed deer is the big game animal of the foothill area and often moves into the edge of the cultivated areas to feed where it often is considered a nuisance. The publication, "A Plan for the Conservation of Resources - an Element of the General Plan of Santa Clara County," indicates deer areas generally throughout the Diablo Range. A few of these areas have also been identified on the eastern slopes of the Santa Cruz Mountains. The area supporting the highest densities of deer is the Pacheco Pass region of the Diablo Range. The U.S. Fish and Wildlife Service estimated this area supports between 25 and 30 deer per square mile.

Two larger carnivores inhabiting the same general areas as the black-tailed deer are the coyote and the bobcat. Neither is common. The San Joaquin kit fox (Vulpes macrotis mutica) has been sighted in the Pacheco Pass region. Wild pigs and mountain lions, although limited in numbers, also inhabit the area.

Because of the varied natural and cultivated vegetation, birdlife is abundant and includes numerous nongame species in addition to upland game birds such as the California quail, ring-necked pheasant, mourning dove, and band-tailed pigeon.

The U.S. Fish and Wildlife Service estimated that in 1963 about 7,300 hunter-days were expended in the service area for upland game. Over 60 percent of this effort was devoted to doves and 25 percent to band-tailed pigeons and quail.

The intense development of the valley floor has eliminated many acres of the marsh habitat previously used by waterfowl. The river courses still, however, have wood ducks and occasionally mallards. Coots are present wherever permanent water is found. Water birds of all kinds abound in the marshes along the portion of the service area bordering South San Francisco Bay. During wet years, San Felipe Lake may provide a temporary habitat for waterfowl. Some hunting occurs in this area but pressures are light. The percolation beds along Guadalupe River, Coyote Creek, and Alamitos Creek provide waterfowl habitat during periods of heavy recharge activity. However, the Santa Clara Valley Water District does not allow hunting at these ponds.

In May 1970, the Secretary of the Interior directed the Bureau of Outdoor Recreation and the (then) Bureau of Sport Fisheries and Wildlife to complete planning studies related to the San Francisco

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Bay Wildlife Refuge. The studies were completed in 1972 and Congress passed Public Law 92-330 which directed the Secretary of the Interior to establish a National Wildlife Refuge in South San Francisco Bay.

The Refuge contains about 23,000 acres consisting of 11,614 acres of salt ponds, 4,536 acres of salt marsh, 6,372 acres of tidal mudflats, 132 acres of uplands, and 293 acres of freshwater.

Under full development, the refuge will be divided according to degree of habitat sensitivity: open, controlled, conducted, and restricted. It will be designed to preserve the area's biologic systems, allowing for optimum visitor use consistent with preservation policies. The refuge will also ensure the protection of an important open space resource and wildlife-oriented recreation opportunities for the enjoyment of surrounding communities.

Appendix II contains the scientific names of the plants and animals found in the San Felipe service area.

The resource inventory of San Luis Reservoir State Recreation area includes information on area fish and wildlife.

Fish in the San Luis Reservoir include ". . . black bass, striped bass, Sacramento perch, crappie, black fish, carp, hitch, squaw fish, oriental gobies, tule perch, bluegill, white catfish, channel catfish, and brown bullhead.

"All fish in the reservoir and forebay have either come directly from the Delta via the California Aqueduct or from tributary creeks prior to the closure of the dam. There has been no stocking of fish."

The most important fishery appears to be that of striped bass. Preliminary estimates showing the importance of this fishery taken from State Department of Fish and Game data are:

	1973	1974
Total anglers	259,500	394,200
Striped bass catch	337,900	253,600

The birds and animals are described in the following paragraphs:

> "The golden eagle is perhaps the most noteworthy of all the birds and animals that inhabit the San Luis area. The nest of one pair of golden eagles is conspicuously placed on a steel tower of the Pacific Gas & Electric

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Company's 500 KV power line, located between the entrance road to the San Luis Creek area and O'Neill Forebay. The Los Banos area has provided the habitat for the golden eagle for many years. Other birds of prey associated with the area are the red-tailed hawk, Cooper's hawk, the sparrow hawk, the marsh hawk, the barn owl, the burrowing owl, the great horned owl, the prairie falcon, and the white-tailed kite.

"In addition to birds of prey and waterfowl, there are other important birds that frequent the San Luis area. These are the California valley quail, the dove, the pheasant, the belted kingfisher, the white pelican, the red-shafted flicker, the meadow lark, the cliff swallow, the scrub jay, the blackbird, the starling, the sparrow, and the mockingbird.

"Largely because of the water, which furnishes habitat for waterfowl, birds are a major element of the wildlife population in the San Luis State Recreation Area. However, animals also are important here. Black-tailed jackrabbits and cottontails are plentiful. There are also ground squirrels, opossums, racoons, skunks, gray foxes, coyotes, bobcats, pigs (feral), and deer."

11. Rare or Endangered Flora

In or adjacent to the San Felipe service area are three, or possibly four, of the twelve Santa Clara County floral species identified by the California Native Plant Society as rare or endangered.

One of these is a flowering shrub, Ferris Ceanothus (*Ceanothus ferrisae*) found in only one locality in the State. This place is outside of the project area, about 1 mile easterly of the existing Anderson Reservoir.

Three other species are herbaceous plants. The California balsam root (*Balsamorhiza macrolepsis*) has been noted on the rocky hillsides above Coyote Creek about 13 miles downstream of Anderson Dam (along the east boundary of the North Santa Clara subarea). Hamilton thistle (*Cirsium campylon*) may be found in the most sandy areas along the streams below Guadalupe Reservoir, near the central portion of the south boundary of the North Santa Clara subarea. The glabrous popcorn flower (*Plagrobothrys glaber*) has been found in the meadow fringe and marshy area of the baylands of the North Santa Clara subarea. This species has not been reported by botanists or other specialists for some years and may be extinct.

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These plant species mentioned are those found in Santa Clara County only. Information on endangered plant species in San Benito County (Hollister subarea) is not available.

The California Native Plant Society's criteria for classifying plants are as follows:

A plant is rare if:

a. It exists in only one or a very few restricted localities;

b. It occurs in such small numbers that it is seldom seen or collected regardless of its total area;

c. It exists only on a type of habitat that is likely to disappear or change for any reason.

A rare plant is endangered if: It is threatened with extinction and not likely to survive unless some protective measures are taken.

The Society is a private organization which was formed a number of years ago to encourage preservation of California native plantlife. Their work has brought attention to the rare and endangered plants of California.

12. Rare or Endangered Fauna

The proposed Division service area is part of the range of several rare, threatened or endangered species. Mammalian species include the San Joaquin kit fox (*Vulpes macrotis mutica*), which is classed as endangered by the U.S. List of Endangered Fauna, May 1974, and rare by the California Department of Fish and Game. The fox has been sighted in the southeastern corner of Santa Clara County.

Avian species found within the project area are: (1) Southern bald eagle (*Haliaeetus leucocephalus l.*), which is considered endangered by the U.S. Fish and Wildlife Service and the California Department of Fish and Game, and (2) red-shouldered hawk (*Buteo lineatus*), which is classed as status undetermined by the U.S. Fish and Wildlife Service. These two birds will range over nearly all the Division area. The California clapper rail (*Rallus longirostris obsoletus*) and the California least tern (*Sterna albifrons browni*) are also classified as endangered by the U.S. Fish and Wildlife Service and California Department of Fish and Game.

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One reptile, the San Francisco garter snake (Thamnophis sertalis tetrataenia), is classed as endangered by the U.S. Fish and Wildlife Service and California. This very beautifully colored snake has been observed along the northwest edge of Santa Clara County.

The salt-marsh harvest mouse (Reithrodontomys raviventris) is a unique mouse inhabiting San Francisco Bay salt marshes. It is one of the few mammals able to drink salt water. Formerly found throughout the extensive marshes once bordering San Francisco Bay, it is now restricted to scattered colonies within its original range. Continual destruction of salt-marsh habitat by bay fill and diking are major factors contributing to the decline of this mouse. The U.S. Fish and Wildlife Service and the California Department of Fish and Game both class the mouse as endangered.

The thicktail chub (Gila crassicauda) was formerly common in Coyote Creek and is now considered endangered by the California Department of Fish and Game. Coyote Creek flows near the south-eastern boundary of the North Santa Clara subarea. See plate 2.

The California condor (Gymnogyps californianus), classed as endangered, once included the Division area in its range, but it is unlikely that even strays will now be seen. No nesting occurs in this area.

13. Socioeconomic Aspects

The economic development of the service area is highly diverse and covers the entire spectrum from major urban development in North Santa Clara County to major agriculturally supported communities in South Santa Clara and San Benito Counties.

a. Santa Clara County Development - The Santa Clara Valley's first development was the Spanish missions. Mission Santa Clara, from which the valley derived its name, was founded in 1777 at the north edge of the present city of Santa Clara. To make the missions economically stable, a system of pueblos or farming communities was established to support the missions and Spanish presidios in San Francisco, Monterey, and Santa Clara Valley. This brought the first major economic development to the valley and the beginnings of the very important agribusiness which still thrives in the southern part of the valley. During the later mission period when the area was under the control of the Mexican Government and large land grants were made, cattle ranching became the predominant agricultural operation.

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Existing Environment

After annexation of California by the United States in 1848, the large land grants in Santa Clara Valley were gradually subdivided and sold to American settlers. This change and the need for food supplies for the gold seekers was instrumental in transforming the land use of the area from cattle ranching to farming activities with the inclusion of such crops as wheat, fruits, and vegetables.

In the late 1870's and the 1880's, manufacturing, in the form of canning and food processing, began appearing throughout the service area. Government demands for canned goods during World War I greatly increased the production of the canneries and orchards within the service area and created additional demands on the area because imports were cut off during this period. Agriculture continued to develop rapidly after World War I with the improvements of agricultural equipment, pump design, and the availability of electric power. Ground water was readily available in most of the area and it did not take long before farmers were making extensive use of this supply.

The Northern Santa Clara Valley experienced a large influx of military personnel and civilians during and after World War II. Industrial development was greatly accelerated in the vicinities of San Jose, Sunnyvale, Mountain View, and Milpitas. By the end of the 1940's, the agricultural trend was declining, and manufacturing and urban living were increasing. With the educational and cultural climate of the north county where Stanford University, University of Santa Clara, and San Jose State University are located, plus the cultural attractions of San Francisco, the period 1950-1960 produced a spectacular growth in manufacturing and urban population. The educational and cultural advantages of the area attracted professional, managerial and scientific personnel. During this period, total employment increased by more than 100 percent from 109,900 to 228,000; agricultural employment decreased by 30 percent from 16,200 to 11,100; manufacturing increased by more than 200 percent from 22,100 to 70,300; trade employment increased by 80 percent from 22,600 to 40,700. In the 1960's, the economic growth continued at a rapid pace; however, the rate started declining in the latter half of the decade. Much of this growth was attributed to the electronics and aerospace industries. The north county's labor force is highly skilled, with a large proportion of engineers and scientists.

In 1972 there were 1,452 manufacturing firms employing 125,376 persons in Santa Clara County. The total personal income from all sources for the year 1972 was about $5,660,000,000.[18/]

18/ Source data: California Statistical Abstract, 1974.

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The total gross value of agricultural livestock and livestock products was estimated by Santa Clara County Department of Agriculture to be about $71,564,000 for the year 1972.

San Jose, the major metropolitan city in Santa Clara County, is served by Federal Highways 101, 280, and 680 in addition to several State highways. Rail service to the county is provided by the Southern Pacific Transportation Company and Western Pacific Railroad Company. The San Jose Airport is capable of handling large jet transports, but there is some pressure to relocate this facility away from the metropolitan area.

The following tabulation shows the population growth by decades in Santa Clara County:

Date	Population[a/]
1940	174,949
1950	290,547
1960	642,315
1970	1,066,174

a/ Source: California Department of Finanace Population Research Unit

The ethnic distribution of the labor force in Santa Clara County is shown in table B-18. In 1970 there were about 322,600 dwelling units in the county, an increase of 74.5 percent over 1960.[19/] Of these, nearly 73 percent were single-family units and owners occupied nearly 61 percent of the total number of units.

In 1973 there were approximately 50,000 full-time students in universities, colleges, and junior colleges in Santa Clara County. The county is serviced by 41 public school districts with 12 high schools and 29 elementary schools. The total enrollment of students in Santa Clara County has increased yearly over the last two decades, but not uniformly thoroughout all schools.

Some schools have shown increases in enrollment of between 50 and 90 percent, while others have shown decreases of up to 18 percent in the 1969-1973 period. As of March 1973, there were 201,360 elementary and 79,500 high school students enrolled in Santa Clara County.

19/ U.S. Census 1970.

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Table B-18. Ethnic Distribution of the Labor Force by Occupation, Santa Clara County, 1970

Median Income 1969	Occupation Category	Percentage Distribution: Total (Without Negro + Spanish)	Negro	Spanish Heritage	Total	Total No. of Workers	Percent of Total for County
$12,832	Professional, Technical	91.9	1.3	6.8	100.0	97,144	24.0
13,513	Manager, Administrator	91.7	0.6	7.7	100.0	37,636	9.2
9,607	Sales Workers	89.4	0.5	10.1	100.0	31,762	7.8
8,052	Clerical Workers	87.8	1.5	10.7	100.0	74,621	18.2
10,179	Craftsmen	81.6	1.2	17.2	100.0	50,604	12.4
7,725	Operatives (except transport)	68.0	2.8	29.2	100.0	42,337	10.3
8,324	Transport Equipment Operatives	76.3	2.0	21.7	100.0	11,607	2.8
6,713	Laborers (except farm)	66.2	2.1	31.7	100.0	13,972	3.4
6,250	Farm Workers	61.6	1.1	37.3	100.0	4,094	1.0
3,479	Service Workers (except private household)	79.1	2.3	18.6	100.0	40,883	10.0
5,487	Private Household Workers	82.9	4.3	12.8	100.0	3,817	0.9
$ 9,790	Total Workers	84.2	1.5	14.3	100.0		
	Total No. Workers	344,422	6,302	58,353		409,077	100.0

Source: Gruen Gruen + Associates, Based on U. S. Census data, General Social & Economic Characteristics 1970, California; Series PC (1)-C6.

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A large number of the total residential units constructed in Santa Clara County in recent years are located between South San Francisco Bay and Morgan Hill, in a north-south direction, and between the base of the Diablo Range to the westerly edge of the Coyote flood plain. This area has at times been referred to as the San Jose Plain. Two major streams, the Guadalupe River and Coyote Creek, flow across this San Jose Plain into South San Francisco Bay. There is a total of 18 tributaries to the major streams that pose a flood problem to existing and future structures in the area.

It has been estimated that 42 percent of the total dwelling units constructed in the county between 1970 and 1972 are subject to inundation from either the Guadalupe River, Coyote Creek, or their tributaries.

The Santa Clara Valley Water District is considering a bond election to raise funds for the construction of flood control facilities on the 18 streams. An environmental impact report has been prepared on this proposal.20/ Legal action has been initiated on the proposed construction, and at this writing the issue has not been brought to trial.

b. San Benito County Development - Agricultural development in the Hollister subarea of San Benito County began with the founding of the mission at San Juan Bautista in 1797. In the early nineteenth century, extensive acreages were granted to individuals for livestock production. Overstocking of the rangeland subsequently denuded much of the native perennial grasses. Today they cover less than 1 percent of the watershed.

In 1850, American settlers began raising grain on the better valley floorlands. This enterprise reached its peak about 1880. Since 1880 there has been a gradual change from grain to deciduous fruit and field crop production. Deciduous fruit production is also now on a decline, being replaced with grapes and more intensive field cropping. The development of irrigation wells came with the change from grain to field crop production. Ground-water pumping expanded from about 20 wells in 1913 to over 700 wells in 1960 in the Hollister subarea.

The population in the Hollister subarea is divided about equally between urban and rural. The following tabulation shows the population growth in San Benito County for the past four decades:

20/ Environmental Impact Report - East Flood Control Zone Project - SCVWD - Volumes 1 and 2 - URS Research Company.

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Date	Population[a/]
1940	11,392
1950	14,370
1960	15,396
1970	18,226

a/ Source: California Department of Finance Population Research Unit.

When the rate of population growth for the last 32 years for San Benito County is compared with that of the State of California, an interesting fact emerges. For example, between 1940 and 1950 the State population increased by 53.2 percent while the county growth rate was less than 26.1 percent. Between 1950 and 1960, the State rate slowed down slightly to 48.4 percent, while the county rate dropped sharply to 7.1 percent. In the decade between 1960 and 1970, San Benito County's population growth rate began to approach that of the State whose rate had slowed to 27 percent, while the county rate rose to 18 percent.

Of the 18,000-plus persons in San Benito County in 1970, about 8,100 were persons of Spanish surnames. The Census Bureau divides the population into two groups - white and nonwhite. The group designated as nonwhite includes Negro, American Indian, Japanese, Chinese, Filipino, Korean, Asian Indian, and Malayan races. Since Negroes constitute 92 percent of all nonwhites, they are handled as a separate category from the other races mentioned above. The 1970 U.S. Census states that San Benito's population was made up of 96.3 percent white, 0.35 percent Negro, and 3.35 percent other.

The total school enrollment in San Benito County during 1973 was 5,434 in 14 schools. Elementary, from kindergarten through grade 8, accounted for 65.2 percent, high school 26.6 percent, and college 8.2 percent. Two parochial schools have an enrollment of 465 pupils which are not included in the above total.

In 1970, the number of housing units in San Benito County was about 6,300 - an increase of about 1,100 over 1960. About 95 percent of these are single-family units with a median value of about $12,000.

Industrial firms in San Benito County in 1972 included ten canners and processors, and two seed companies. Employment numbered about 1,300 in these industries. According to the 1974 California Statistical Abstract, the average monthly employment covered by the unemployment insurance code, including agricultural

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employment, numbered 6,573 during 1972. From this same publication, personal income from all sources was $80,267,000 during 1972.

The San Benito County Department of Agriculture estimated the gross agricultural income for 1974 was $57,530,000.

Transportation services for passengers and cargo are provided to and from the Hollister subarea by air, rail and highway. The Hollister airport is capable of serving medium-size jet aircraft. Rail transportation is provided daily by the Southern Pacific Transportation Company branch line, which terminates at Hollister. Trucking is the main source of transport for goods, chiefly agricultural products. Road access is provided by State Highways 180, 25, 156, and by U.S. Highway 101.

The Pajaro and San Benito Rivers are the major streams in San Benito County. Although flooding occurs periodically on these rivers, damage is relatively light because the flood plains are primarily agriculture lands. A study made for the Corps of Engineers entitled, "Floodplain Information--San Benito River, Pajaro River to Tres Pinos Creek"--Jordan/Mathis, June 1974, delineated the flood plain of the San Benito River for various intensities of floods.

In June 1975 the Corps of Engineers released a report entitled, "Floodplain Information, San Felipe Lake Unit 2, San Benito County." The area covered by the report included Tequisquita Slough, Santa Ane Creek, and Arroyo de las Vibores Creek. The flood plains of these water courses were delineated for an intermediate flood and their standard project flood. Under a standard project flood, the major damage would occur to farmlands and structures such as bridges and culverts. The city of Hollister experiences local flooding of streets nearly every year, but damage is relatively small.

c. Waste-water Treatment - Waste-water treatment facilities in the San Felipe service area operated by the cities include the Santa Clara-San Jose, Sunnyvale and Palo Alto plants in North Santa Clara County; the Morgan Hill-Gilroy plant in South Santa Clara County and the Hollister and San Juan Bautista plants in San Benito County. The Milpitas sewage plant was closed in November 1974 and its wastes are now treated at the San Jose-Santa Clara plant.

The San Francisco Regional Water Quality Control Board has imposed stringent controls on the quality of effluent discharged into San Francisco Bay. The South Bay Dischargers, which include Palo Alto and its neighboring treatment plants, are required to improve the quality of their effluent which is discharged into San Francisco Bay. Construction of an interceptor drain from the Santa

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Clara County treatment plants is planned to discharge north of Dumbarton Bridge. Palo Alto plans to connect to this drain when it is built, probably some time between 1976 and 1978.

The San Jose-Santa Clara Treatment Plant is planning to upgrade the quality of its waste water by adding nitrification and filtration facilities. The primary treatment plant at Gilroy, which also receives sewage from Morgan Hill and San Martin, only treats domestic wastes and pumps the effluent into oxidation-ground-water recharge ponds. Untreated wastes from the canning industries are discharged directly into ponds. The Gilroy plant is now operating near capacity and officials are planning to construct a new plant which would include facilities to provide secondary treatment. Plans for a 7.5-mg/d plant have been prepared, although Gilroy officials would prefer to construct a 10-mg/d plant. There are, however, fiscal constraints. To qualify proposed treatment plants for a 75 percent Federal grant, the agencies must base the design capacity on the State Department of Finance 10-year E-0 population projection. (This is the lowest projection made by that Department.) This regulation is intended to control growth within critical air basins. Small cities find it difficult to obtain outside financing for treatment facilities which exceed the 10-year E-0 series population projections.

The city of San Juan Bautista operates a secondary treatment facility. The plant discharges into a drainage ditch which is tributary to the San Benito River. The city of Hollister provides a primary plant treating domestic sewage only. Treated effluent is discharged into the San Benito River. Canning wastes are screened and discharged into ponds. The Hollister plant would have to be upgraded to meet Federal standards. Hollister Municipal Airport operates raw sewage lagoons providing primary treatment for the industrial complex located at this site. The County Road Department, the San Benito County School for Boys, two farm labor camps, and the South Side Hospital discharge wastes into raw sewage lagoons. The lagoons have a design capacity of 80,000 gallons per day. The town of Tres Pinos discharges raw sewage into lagoons which have a design capacity of 60,000 gallons per day.

The present capacity of all waste treatment plants in the San Felipe service area would be adequate until year 1985 or 1990, but will require additional treatment facilities to meet Federal and State requirements.

The following tabulation shows some of the basic data for the existing treatment plants in the San Felipe Service area:

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Plant	Type	Design Flow (Mgal/d) Average	Peak
San Jose-Santa Clara	Secondary	160.0	340.0
Sunnyvale	Secondary	22.5	35.0
Palo Alto	Secondary	35.0	70.0
Gilroy	Primary	3.3	3.5
Hollister	Primary	1.0	1.4
San Juan Bautista	Secondary	0.11	0.24

14. Recreation Development

The Santa Clara County Parks and Recreation Department administers 21 parks, including the existing reservoirs of the Santa Clara Valley Water District. Included are four foothill parks, two streamside, three mountain, one valley floor, one arboretum, eight water recreation, and two marine parks. Facilities at these water recreation areas and at other county-administered parks are shown in table B-19 entitled "Present Recreation Facilities--Santa Clara County." A total of over 5 million recreation-days were provided for a wide variety of activities at the park units from June 1, 1971, to May 31, 1972. Several city parks complement county activities.

The following activities are available at the 21 parks: fishing, golfing, hiking, horseback riding, picnicking (family and group), camping, boating, nature study, archery, water skiing, and sightseeing.

The recreation facilities are available for use year-round and visitors have been recorded in every month of the year. However, the most active part of the recreation season is from March to October. High schools and nine college campuses furnish many of the early and late season recreationists.

Water-oriented recreation in San Benito County is practically nonexistent. Hernandez Reservoir, with a maximum water surface area of 620 acres, is in private ownership, although the District owns the dam and has a flood easement. The Paicines Reservoir, a small regulating impoundment, is wholly privately owned land.

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Table B-19. Present Recreation Facilities
Santa Clara County

	Units	Number
Land area	acres	13,695
Water area	acres	5,872
Family picnicking	areas	40
Group picnicking	tables	1,215
Boat launching	ramps	14
Horse trails	miles	30
Foot trails	miles	24
Bike trails	miles	0
Auto parking	spaces	5,167
Auto/trailer parking	spaces	411
Group camping	sites	35
Family camping	sites	266
Archery range	acres	7
Golf courses	acres	303
Ramadas	each	0
Annual attendance	recreation-days	5,002,000

There is also a pistol and rifle range available at one of the foothill parks.
This table covers the period June 1, 1971, to June 1, 1972.

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The major recreation activity in San Benito County centers around the Spanish Mission at San Juan Bautista. This area attracted about 300,000 visitors during 1971. The city of Hollister maintains parks, baseball fields, a golf course, and a swimming pool for its residents.

Thirty-five miles south of Hollister is the Pinnacles National Monument noted for its geological formations and spectacular panoramas. Trails and camping and picnicking areas attract visitors particularly in late winter and spring.

Both Hollister and metropolitan San Jose are situated within an hour's drive of the recreational attractions of Monterey Bay on the Pacific Ocean.

At the present time many of the tributary streams in Santa Clara Valley are used to some degree for picnicking and fishing. Many of the larger tributaries are controlled by dams which release water for percolation in the valley. Recreation use along the streams depends on access and the length of time releases can be maintained. Most of the streams have little or no flow during late summer and fall, but this is dependent on percolation capacity of the ponds and the amount of water in storage. Aquatic fauna disappears with dry streambeds but most of the streamside flora survives. Recreationists who normally visit live streams for picnicking and fishing either abandon this pursuit during late summer and fall or move to other areas such as existing parks and reservoirs.

The State Department of Parks and Recreation operates the water-oriented recreation facilities at San Luis Reservoir, O'Neill Forebay and Los Banos Detention Reservoir. These facilities lie on the east side of the Diablo Range, some 65 road miles from San Jose and 35 miles from Hollister.

San Luis Reservoir has 12,700 surface acres, two boat launching ramps and parking spaces for 400 cars and trailers; camping and picnicking facilities are not available. During 1973, about 39,000 visitors were recorded at this facility. Visitor-day use for 1973 was 89,300, while visitor-day use for 1972 was estimated to be 370,130. The high use in 1972 was explained by the outstanding success striped bass fishermen had that year.

O'Neill Forebay, located immediately below San Luis Dam, contains 2,189 surface acres with two boat launching ramps and parking spaces for 450 cars and trailers. This facility also includes 20 tent spaces, two picnic areas, 185 picnic tables, 55 picnic shelters, two swimming beaches and sanitary facilities. Total visitation was

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193,882 during 1973. Visitor-days were estimated to be about 254,943 in 1973. Over 50 percent of this use was for picnicking and camping.

Los Banos Detention Reservoir is located about 7 miles south of San Luis Reservoir, and was constructed on the foothill line, primarily for flood control. The reservoir has a maximum water surface area of 623 acres. Recreation facilities include one boat launching ramp, 15 tent spaces, two picnic areas, 15 picnic tables and one swimming beach. Parking spaces have been provided for 150 cars. Total visitation during 1973 was 15,200. Visitor-day use for this period was estimated to be 24,386, mostly for picnicking, camping, and fishing.

15. Archeological and Historical Sites

The San Felipe Division is located in an area important to California history. Because of its generally mild climate, the richness of the original fauna and flora, the nearness to San Francisco Bay, and streams which supported anadromous fish runs, the aboriginal population was high. These favorable conditions also attracted the mission builders, and the Division is rich in remains of that phase of California history. Perhaps the earliest irrigation works in this part of the State are those which are located at Mission San Juan Bautista. Archeological and recent historical sites are plentiful in the area, although many have been destroyed by urban and agricultural development.

Information concerning these sites was obtained from an archeological survey of the San Felipe Division requested by and financed through the Bureau of Reclamation and supervised by the Arizona Archeological Center of the National Park Service. Under a contract between the National Park Service and the Frederick Burk Foundation for Education, the San Felipe Archeological Study was a cooperative project by the A. E. Treganza Anthropology Museum at California State University, San Francisco; The Archeological Survey (Team) at West Valley College, Saratoga; and the Santa Clara County Archeological Society.

The study was primarily concerned with the South Santa Clara and Hollister subareas.

The specific responsibilities of the project study, as defined by the National Park Service contract, comprised:

1) An intensive physical reconnaissance of the actual rights-of-way and facility sites, to identify archeological resources subject to direct impact and develop plans for mitigation of such impact.

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2) A systematic sample reconnaissance of the Hollister and South Santa Clara subareas to develop a basis for predictions about the general distribution of archeological resources. On the basis of these predictions, it would be possible to suggest where conflicts might arise between the requirements of archeological resource protection and the changes in land use that will occur as a result of the San Felipe system. These conflicts would be a part of the indirect impact of the system.

3) Discussions with organizations and planning bodies, currently or potentially concerned with archeological preservation, to design means of mitigating the indirect impacts of the system.

4) Interpretation and evaluation of the data resultant from the study terms of Federal and State law and the overall scientific requirements of California archeology. This operation would provide an essential basis for the mitigation recommendations.

A preliminary report on the results of the survey was received by the Bureau of Reclamation during March 1974.[21/] According to the report, this was the first attempt at a regional analysis, not only from an archeological point of view but with the needs and abilities of the various public agencies concerned in mind. Prior to the study, very little was known archeologically about the study area. The stated purpose of the survey was to create:

1) A taxonomy of archeological resources, a map showing where as many types of resources as possible might be expected to occur, and descriptions of resources not mappable at present, with recommendations for further study.

2) Bases for evaluating local archeological resources.

3) Recommendations about ways to manage archeological resources, pursuant to the provisions of Executive Order 11593 and as consistent as possible with existing Federal, State and local policy.

21/ Archeological Impact Evaluation, San Felipe Division CVP. The Southern Santa Clara Valley - A General Plan for Archeology, Part I, Thomas F. King-Patricia P. Hickman. The Direct Impact of San Felipe Division on Archeological Resources, Part II, Thomas F. King.

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A sample area including 4,400 acres in South Santa Clara subarea and 7,400 acres in Hollister subarea was inspected. Archeological sites were recorded on field forms and located on U.S. Geological Survey 7.5' Quadrangel Sheets. A total of 52 prehistoric archeological sites in the South Santa Clara and Hollister subareas were identified during the course of the study.

As a result of this survey, the report indicates that five individual prehistoric sites and five districts containing multiple prehistoric or historic sites are being nominated to the National Register of Historic Places by the writers of the report. However, they have not yet appeared on the Register.

At San Juan Batista, a State historical monument preserves an early example of the Spanish-Mexican goldrush period of California history and is included in the National Register. Two other sites in the San Felipe Division had previously been considered eligible for inclusion in the Register. They are New Almaden, 14 miles south of San Jose, and the Frank Norris Cabin, 10 miles west of Gilroy. None of these, however, would be affected by construction of the project facilities.

A site which is presently on the Register is the San Luis Gonzaga Archeological District. This District is located near the western edge of San Luis Reservoir high-water line, just south of Highway 152. In May of 1975, the Bureau of Reclamation contracted with the Cultural Resources Section of the California Department of Parks and Recreation to provide a phase II site significance evaluation for site CA-Mer-27, which lies within the district. Of the eight sites within the district, the only one that has the potential of disruption or damage because of activities connected with the San Felipe Division is CA-Mer-27. This site was evaluated, and the Department of Parks and Recreation submitted their final report to Reclamation in July 1975.

CA-Mer-27 is a midden deposit broken by a small intermittent stream into two pieces. The smaller part is about 52 square meters in size, and the larger part is about 195 square meters. The site is very near the alinement for Pacheco Tunnel. Negotiations are now underway between the California State Historic Preservation Officer, the Advisory Council on Historic Preservation, and the Bureau of Reclamation to reach an agreement on the action that Reclamation will take in connection with the archeologic resources at this site.

In June 1975, the Bureau of Reclamation arranged an additional contract with Dr. John M. Fritz, archeologist, to conduct a more intensive survey for the area near the proposed outlet of Pacheco

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Tunnel. The survey was performed and the completed report submitted to Reclamation in July 1975. The survey covered the area around the tunnel outlet, the area expected to be used as a staging and work area by the contractor, the area of a proposed access road, the first 2,300 feet of the Pacheco Canal, and the second area for disposal of excavated material (spoil) from the tunnel. Only one small site was discovered, and that site consisted of four bedrock mortars in a bedrock outcrop. "This site probably indicates a limited activity or special use." The site is located on the southern periphery of the proposed spoil disposal area and is labeled PP-1. The spoil disposal was then redesigned so as to avoid the archeology site which will be recorded as to location and covered with a blanket of soil to protect it.

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C. ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

1. General, Including Impacts During the Construction Period

It is not expected that effects on climate or geology will be discernible. Effects on topography would be visible only in the immediate vicinity of the aboveground structures.

Operation of heavy equipment during the actual construction period would temporarily generate noise, dust, and water pollution.

Exhaust emissions from internal combustion engines, the prime movers of most earthmoving equipment, consist of CO, HC, SO_2, NO_X, and particulates. Additional large amounts of particulates are lost due to wind erosion over exposed surfaces. The larger size particulates settle rapidly and form deposits on the surface. Most of the present carbon monoxide, oxides of nitrogen and hydrocarbon emissions in the San Felipe service area are from automobile exhausts. The major portion of the population and vehicles, however, is concentrated outside of the proposed construction areas. Air pollution, therefore, due to construction machinery, would not have a long lasting detrimental effect on the existing environment. A temporary nuisance, primarily from dust and noise, would occur during a few weeks' period along any one reach of pipeline construction, and from 1 through 3 years at structures such as pumping plants or San Justo Dam.

Heavy equipment and construction material would be transported over State and county roads. Large trucks would create traffic hazards and increase air pollution. County roads which are not designed for heavy loads conceivably could be damaged. Conveyance routes, as presently planned, would require three State highway crossings, 23 county road crossings, and 11 farm road crossings. Two of the crossings will require bridges (one State highway and one county road), and the balance would utilize cut-and-cover construction to place the buried concrete pipe. Bypasses would be constructed at the crossings or traffic would be confined to single lanes. In either case, traffic would be disrupted temporarily. The California Department of Transportation has requested changes to preliminary plans for the connection of Pacheco Tunnel access roads to Route 152. These changes are now being incorporated in the construction drawings.

Concentration of heavy machinery at dam construction sites would have a greater local effect than in the more dispersed construction of canals and pipelines.

Environmental Impacts

Both Coyote and San Justo Dams will be designed to withstand seismic activity, and it is considered improbable that the small amount of storage behind either dam would cause any seismic activity.

The Coyote Afterbay Dam could be completed in a relatively short time but would affect more of the population than at the construction site of the larger San Justo Dam. Most of the embankment material for the afterbay dam could be hauled from the Santa Clara Conduit route and the reservoir area. San Justo Dam would be constructed, for the most part, of materials found in the reservoir area. A possible riprap (heavy rock facing) source for the Division is the abondoned limestone quarry at San Juan Bautista.

Three-quarters of a mile below San Justo Dam the creek is a 20- to 50-foot-wide gully entrenched 10 feet into a broad alluvial plain. A mile and a half from the dam the last vestiges of a channel disappear on a cultivated alluvial fan. An instantaneous failure of San Justo Dam could release an estimated maximum of 11,200 acre-feet of water over 2,500 acres of leveled cropland which slopes west at about 15 feet per mile. State Highway 156 between Hollister and San Juan Bautista, running at right angles to the contours, could be affected by water in the event of such a catastrophe. Although there are few dwellings within the 2,500 acres, a large seed company's operation, about 2 miles northwest of the proposed damsite, is located along Highway 156. The town of San Juan Bautista lies about 4-1/2 miles west of the damsite and is over 5 feet higher than the low point on Highway 156. The probability of an instantaneous and complete failure of the dam, occurring when the reservoir storage is at maximum capacity, is, of course, very remote.

Construction of the canals and conduits across natural drainage areas will cause some temporary stream silting as the first flows go over the new construction, not entirely avoidable by use of silting basins or stream bypasses.

As explained in Part A-8, operation of the San Felipe Division integrated with the Central Valley Project will have little, if any, environmental impact except in the San Felipe service area. The San Luis Reservoir is operated primarily on an annual basis with water being transported into that reservoir from the Central Valley Project and State Water Project as the water is available. The water is then released during the summer months when peak demands occur. With two of the possible operational options discussed in Part A-8, San Luis Reservoir is used only

as part of the conveyance to the San Felipe Division with essentially no variance in level or volume of storage. The third operational mode discussed would use some regulatory storage (about 37,000 acre-feet) in the reservoir. This storage is presently being utilized for interim water supply for Central Valley Project customers. If this storage is used for the San Felipe Division, little if any reservoir operational changes will occur between preproject and postproject conditions.

2. Sacramento-San Joaquin Delta

a. Introduction

The planned use of Central Valley Project water as described in Section A-8 will involve diversion of about 200,000 acre-feet of water annually from the Delta under full project conditions. Under the three possible means of delivering water through the Delta to the San Felipe Division, the first option - use of existing Delta-Mendota Canal facilities - would have no additional impact on the Delta as this is an existing condition. That is, 200,000 acre-feet of water is presently being routed through the Delta on an interim basis to serve water to the west side of the San Joaquin Valley. Use of this capacity for the San Felipe Division may require some reregulation in San Luis Reservoir as discussed in the preceding paragraph.

The other two options would have Delta impacts, as a result of conveying an additional 200,000 acre-feet per year across the Delta, as discussed in the following sections.

This regulated water supply would be obtained from Central Valley Project supplies which have been assigned for use in the Santa Clara and Hollister subareas of the San Felipe Division. Approximately two-thirds of the supply will be used for municipal use, and the remainder for agriculture supplies. The water will be delivered on the pattern shown in table A-3, page A-11 where the peak monthly delivery, which occurs in July, is about 13 percent of the annual supply.

b. Climate

Diversion of water from the Delta for the San Felipe Division will have no effect on the climate.

c. Soils and Vegetation

Diversion of water for the San Felipe Division is not expected to have a significant effect on either the soils or vegetation of the Delta. The impact of water quality as it may relate to these items is discussed under Water Quality.

d. Agricultural and Industrial Economy

Diversion of water for the San Felipe Division will not affect the Delta agriculture and industrial economy. A part of the

water supply for Delta uses is currently provided from Delta channel diversions. The water for San Felipe Division will be drawn through the Delta along with other Central Valley Project and State Water Project water supplies. The impact of water quality as it may relate to these items is discussed under Water Quality, Section 2.f.

e. Pumping Influence

The San Felipe Division water supply is provided by Central Valley Project storage and is not a depletion from the Delta. The Division water supply represents about 1.5 percent of the average outflow from the Delta based on 1973 level of development and for the period of record equal to the 1921-53 period. Since the San Felipe Division water supply is minor compared to the average Delta outflow and since the tidal variation is quite large (varies from 3 to 5 feet) within the Delta, the effect of the proposed action will not significantly influence tidal action or water surface elevations within the Delta. The DWR and USBR have conducted pumping tests in the range of 3,000-8,000 ft^3/s. The tests indicated a difference of about 0.1-foot elevation per 1,000 ft^3/s occurred in this range of diversions in the immediate vicinity of the pumps. The maximum monthly pumping rate for the proposed project will therefore affect the stage in the vicinity of the pump about 0.05 foot.

f. Water Quality

The approximate 196,300 acre-foot annual supply to be conveyed to the project service area will make about the same reduction in the average annual outflow from the Delta. In most years the supply would be provided from Central Valley Project storage of high winter flows or from diversions of uncontrolled floodflows arriving at the Delta which are in excess of Delta requirements and if removed would not detract significantly from beneficial uses of water in the Delta. However, in some months of some median runoff years, the supply for the San Felipe Division could reduce Delta outflow and increase Delta salinity from what would occur without the Division. To determine what crop damage this increased salinity might produce requires assuming several interrelationships pertaining to water year conditions: weather, type of crops planted, time of harvest, sensitivity of the crops to salt and farm water management practices. Water Quality Standards cited in Appendix I could allow conditions that would subject about 20,000 acres of cropland in the westernmost Delta to varying degrees of salinity damage. However, under these same conditions, water quality in much of the remainder of the Delta would be improved over that historically because of the need to maintain export water quality. Because of the interrelationship of the factors mentioned, damage could range from nothing with select crop planting and intense water management to slightly lower production from salinity caused plant damage on some Delta lands, and a loss of income because of the more narrow selection of salt-tolerant crops that could be grown.

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The average Delta outflow based on 1973 level of development and for a period of record equal to the 1921-53 period is estimated at about 15.3 million acre-feet per year. The total quantity of the proposed diversions to the San Felipe Division represent less than 1.5 percent of the present average Delta outflow.

The Bureau of Reclamation will operate the Federal Central Valley Project to insure that the federally adopted Delta standards, identified as Sacramento-San Joaquin Delta Policy and State Water Resources Control Board Resolutions 68-17 and 73-16 are maintained, provided that such operation is within the project capability as limited by other purposes and requirements of the project as authorized by Congress. A guarantee that these standards will be met will require either congressional legislation providing specifically that the Central Valley Project will be operated to meet specific criteria in the Delta or contracts with Delta beneficiaries wherein they agree to pay for the benefits received from Central Valley Project water delivered to the Delta.

g. Fish and Wildlife

One of the major concerns associated with the Delta is the impact of diversions on fishery resources, particularly striped bass. Delta diversions may cause a displacement of fish eggs and larvae and young fish to areas where the environment may be more hostile to their survival (e.g., lack of adequate food source, injury from project export facilities, unsuitable water temperature, etc.). However, a popular striped bass fishery has recently developed in San Luis Reservoir, presumably from striped bass transferred into the reservoir by the Delta-Mendota Canal and/or the California Aqueduct. The striped bass harvest at the reservoir peaked in 1971 when the catch was 76 percent as large as the total Bay-Delta harvest. Although the total catch has approached that in the Delta, the mean size of the bass caught in the reservoir has remained considerably smaller than in the Delta.

The reservoir striped bass fishery is probably maintained entirely by export pumping since there is no evidence of successful spawning at the reservoir. Striped bass diverted into San Luis Reservoir cannot return and thus constitute a potential loss to the Delta fishery. However, the total impact on this Bay-Delta resource resulting from pumping bass through the pumping plants into San Luis Reservoir is at present undetermined.

A study was initiated in 1975 to obtain a better understanding of this fishery resource in the San Luis Reservoir. The study is being performed by the California Department of Fish and

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Game with financing by the Bureau of Reclamation and the California Department of Water Resources as part of the "Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary." The fourth agency in this Four-Agency Study Program is the U.S. Fish and Wildlife Service.

Flow reversal occurring within the Delta may displace fish food organisms to areas where they would be inaccessible to the Delta fish population. A reduction in the concentration of fish food organisms in the fishery nursery could result in stress to the fishery.

The intrusion of saline seawater, resulting from increased export pumping, may cause physiological stress to the fish and to fish food organisms resulting in their displacement upriver and/or reduced survival.

California Department of Fish and Game has been studying the effects of flow and salinity on the timing and location of striped bass spawning. Current information (California Department of Fish and Game, et al., 1973) indicates "there appears to be less variation in spawning location with flow than previously thought."; also, the salinity criteria are under review because recent findings "indicate less dependence on salinity than previously thought (for successful striped bass spawning)." However, the recent data which indicated that spawning occurred in regions of higher salinity included no measure of the survival of striped bass eggs spawned. Also, the long-term effects on the population of spawning in regions of higher salinities has not been determined. Since the salinity and flow criteria are still under review, their precise impact on spawning is undetermined.

There appears to be a strong correlation between survival of young bass and adult recruitment but the relationship between survival of eggs and larvae with either young bass or eventual adult bass abundance is not clearly understood at present. Four-Agency studies are currently attempting to define these relationships.

The possibility that water diversions influence survival is supported by the inverse relationship between the abundance of young bass and the percentage of the water entering the Delta that is diverted. Even though that relationship exists, several things suggest that water diversions are not the primary mechanism determining survival.

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Environmental Impacts

During the 2-month period covered by the surveys each summer, the geographical distribution of bass usually remained quite constant. In those instances when the pattern does change, there is no consistent pattern which would suggest that the fish move toward the canal intakes of Central Valley Project and State Water Project.

Influences on the salmon resource which may be attributable to diversions from the Delta are flow, water quality, and cross-Delta transport. Given satisfactory water quality conditions, upstream migrant salmon appear able to successfully negotiate the lower San Joaquin River at flows of 500 ft^3/s at Stockton. Additional water may be required, however, to provide optimum passage. Delta outflow during the spring is likely to be most critical in providing incentive and orientation for outmigrating juveniles. However, no way of determining the amount of outflow required in this regard exists short of observing outmigration under a variety of reduced outflows.

Migrating adult salmon require homestream water to guide them along their migration. Alteration of homestream flows may confuse the salmon, and straying may result. Under present pumping rates, Sacramento River outmigrants apparently are not being drawn into the pumps to any significant degree. However, cross-Delta flows may alter migration routes of both outmigrants and returning adults. The effect of straying by the adults may result in prevention or delay in arrival at the spawning grounds. Under these circumstances, the chances of a successful spawn are reduced.

High water temperatures and low dissolved oxygen content are the two water quality factors which have had an observable adverse effect on salmon in the Delta. In recent years suitable conditions for migration have been achieved by having the Department of Water Resources construct a barrier at the head of Old River to divert more flow past Stockton and sometimes by having the Bureau of Reclamation augment flows in the San Joaquin River by releases from the Delta-Mendota Canal. The diversion of water for the San Felipe Division Canal would not be critical to water quality conditions for migrating salmon.

Under conditions of low San Joaquin outflow and high pumping rates, essentially all of the San Joaquin flow is delivered to the pumps; little gets past the crossflow of Sacramento River water and into the western Delta. Juvenile salmon migrating down the San Joaquin are drawn to the pumps. Existing screens at

the Tracy and State Pumping Plants are efficient at saving small salmon when operated within their design criteria. A draft report by California Department of Fish and Game (an office evaluation of the Tracy Fish Collecting Facility, September 1973) indicated the Tracy Fish Collecting Facility is 90-98 percent efficient at screening salmon fingerlings in excess of 50 millimeters when the approach velocities are in the range of 1.0-3.5 ft^3/s. Furthermore, the report indicated that "reasonable approach water velocities above 3.0 ft^3/s will not adversely affect salmon efficiency." A further perspective of the effects of the San Felipe Diversion on the Delta fishery is afforded by a comparison of the Pacheco Tunnel capacity (480 ft^3/s maximum) with that of the Federal Tracy Pumping Plant (4,600 ft^3/s) and the State Delta Pumping Plant (10,300 ft^3/s ultimate with present diversions up to 6,300 ft^3/s). The capacity used for the San Felipe Division would be about 3 to 4 percent of the combined diversion capacity of these two facilities. The added effects from the San Felipe Division would probably be impossible to discern within the limits of error of measurement of existing conditions.

h. Recreation

The diversion of water for San Felipe Division Canal operation is not expected to have an impact on recreation in the Delta. Conveyance from the Delta of the diverted water is also described in part A-8. Two of the possible operational options would have no impact along the existing conveyance route's Delta-Mendota Canal or State Aqueduct as they would involve use of existing capacity. The third option (enlargement of the Delta-Mendota Canal) would create minor temporary construction impacts like those described in this section for the San Felipe Division features. However, it is assumed that existing right-of-way would be utilized with only the requirement for raising the lining being necessary to convey the additional flow. This should require only limited excavation and minor disturbance of the existing topography. Additional pumping capacity at the Tracy Pumping Plant would probably be required for operation flexibility and reliability.

3. Water Resources

The environmental impacts of the proposal on the existing water resource environment are discussed under the following headings:

a. Santa Clara County (Santa Clara subarea)

(1) Ground Water

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The ground-water basin will be managed to produce the effects of improved water quality, added water yield, and increased system reliability with the additional project supply.

The added quantity will obviate ground-water "mining" and the attendant subsidence, a mechanism described in the section on the existing environment. The ground-water basin in Santa Clara County was in a state of overdraft, but water levels have risen about 43 feet since 1965 through utilization of import supplies. The projected demand is expected to equal the safe yield of the ground-water basin, storage reservoirs and available import water supplies by about 1978. Without additional water supplies after that demand is reached, it will be necessary to exceed the safe yield (mine water from the ground-water basin) or regulate the demand so that it would not exceed the available yield. The proposal will allow additional percolation of import supplies to increase ground-water yield and insure that water will be available during the dry periods where natural recharge will be less.

(2) Surface Water

Import water from the proposal will increase surface water flow in subarea streams by allowing additional reservoir releases and creating additional drainage accretions in some areas. It will be possible to maintain higher minimum pools in the subarea's existing reservoirs because of the availability of the additional water.

(3) Imported Water

The reliability of the existing water supplies will be enhanced by a third alternative import source. Possible damage to one source would become less critical with the additional supply.

(4) Water Quality

Table C-1 gives an indication of the quality of water that can be expected to be delivered to the San Felipe Project with and without a Peripheral Canal. The data were collected by the Bureau of Reclamation from 1969 to 1974. The data, measured on the Sacramento River at Greens Landing, would be representative of the quality of water diverted to the Peripheral Canal near Hood. The data from Old River at Clifton Court Ferry and the Delta-Mendota Canal represent the quality of water presently pumped from the Delta. This quality would be delivered to the San Felipe Project without a Peripheral Canal. The quality with a Peripheral Canal may be

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Table C-1. Project Water Quality With and Without Peripheral Canal

		With Peripheral Canal				Without Peripheral Canal							
		Sacramento River at Greens Landing				Old River at Clifton Court Ferry				Delta-Mendota Canal (Several sites along Canal)			
		Max.	Mean	Min.	No. Samples	Max.	Mean	Min.	No. Samples	Max.	Mean	Min.	No. Samples
Hydrogen ion	pH	8.0	7.5	6.7	61	8.7	7.8	7.3	16	8.9	7.6	6.5	181
Total Dissolved Solids	mg/1	150.0	100.0	72.0	27	646.0	326.0	137.0	7	449.0	265.0	178.0	35
Electrical Conductivity	MMHOS @ 25°C	495.0	147.0	64.0	80	974.0	505.0	47.0	24	1180.0	490.0	150.0	329
Sodium	mg/1	16.0	8.8	4.4	27	105.0	49.0	4.0	7	120.0	54.0	30.0	51
Chloride	mg/1	69.0	7.2	1.0	68	175.0	76.0	19.0	23	236.0	78.0	14.0	76
Total Alkalinity	mg/1 as $CACO_3$	75.0	50.0	19.0	20	134.0	73.0	29.0	14	147.0	81.0	44.0	165
Boron	mg/1	.20	.08	.0	6	Not Available				.55	.26	.10	28
Total Hardness	mg/1 as $CACO_3$	59.0	51.0	32.0	6	Not Available				254.0	128.0	79.0	29
Ammonia	mg/1 as N	.17	.08	.02	29	.28	.08	.01	18	.26	.06	.01	184
Nitrite + Nitrate	mg/1 as N	8.60	.51	.08	23	1.14	.57	.09	18	1.66	.67	.12	184
Suspended Organic N	mg/1 as N	.24	.07	.04	18	.68	.27	.04	17	1.17	.21	.04	183
Total Phosphorus	mg/1 as P	.34	.13	.07	25	.31	.18	.12	18	.38	.18	.11	184

Data from USBR (1969-1974)

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slightly poorer than Sacramento River quality if some additional water is pumped from the Delta and mixed with Peripheral Canal water. This additional water would probably be a very small percentage of the Sacramento River water, however. The table indicates that water delivered without a Peripheral Canal would have about three times the total dissolved solids, six times the sodium, ten times the chloride, three times the boron, twice the hardness, and one to two times the nutrient content of water delivered with a Peripheral Canal. There may be a slight degradation in some water quality parameters between the Delta Pumping Plants and Pacheco Tunnel due to algal growth and evaporation in the canal system, and San Luis Reservoir. This degradation has not been quantitatively evaluated but is not expected to be significant.

Return flows from irrigation with an expected maximum concentration of 2,000 to 3,000 milligrams per liter (mg/l) of total dissolved solids (TDS) is expected to flow into the Pajaro River and thence to the Pacific Ocean during the summer. Median[1] summer flows in the river which now average about 300 acre-feet per month (at times the surface flow in the river disappears) are expected to increase about nine times (estimated mean 2,600 acre-feet per month with project conditions June to September) and the TDS load will double to about 2,000 mg/l. As the stream is already relatively high in nutrients, additional stimulation of algae growth would not be expected. Winter flows of the stream will not be affected by irrigation return flows because of their small magnitude in relation to normal flow. The increased TDS load will have little effect on the summer fishery in the Pajaro River although the increased summer flows will tend to benefit it. No detectable effects on the ocean are anticipated.

A Department of Water Resources memorandum report, entitled, "Estimated Future Water Quality Conditions in the California Aqueduct" dated April 1969, estimated San Luis Reservoir average TDS levels to be 308 mg/l in 1975 (without Peripheral Canal), 125 mg/l in 1980 (with Peripheral Canal), and 120 mg/l in 1985 (with Peripheral Canal).

A comparison of Table C-1, with Tables B-10, B-11, and B-12 shows that San Felipe water quality with a Peripheral Canal will be substantially better than the existing surface- and ground-water quality of the San Felipe service area. San Felipe water quality without a Peripheral Canal will be about the same as present surface- and ground-water quality in Santa

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1 Pajaro River flow measured at Crittenden during the period 1940 to 1970, June to September median flows.

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C-038712

Clara County. Nutrient levels of imported San Felipe water generally will be less than local surface- and ground-water nutrient levels. The boron levels of the drainage water are not expected to exceed current summer levels in the Pajaro River and should improve with the additional volume of drain water.

(5) Drainage

The summarized impact of additional imported water is quoted from San Felipe Water Distribution System December 1974 Draft Environmental Impact Report of the Santa Clara Valley Water District:

> "It is unlikely that the introduction of additional water through import projects will directly result in additional flood control and drainage problems in the County. Most new water will go either to groundwater recharge, or into the water distribution system and eventually out to the Bay. Both can be beneficial effects. Increased surface runoff from residential and commercial outdoor use will be insignificant.
>
> "An additional water supply can remove water from constraints to urban growth; subsequent development within a watershed may change existing drainage patterns, with consequent effects on flood control.* Policies adopted by the Local Agency Formation Commission (LAFCO) in Santa Clara County indicate that detrimental changes in drainage related to development will be avoided in the future (Santa Clara County Planning Department, 1973). In particular, LAFCO guidelines state that future development should be allowed only in those areas within cities which are designated as "Urban Service Areas". If the intent of these policies is followed, the location and timing of future development will be controlled so that adequate drainage can be maintained."

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*For more detailed discussion of these relationships see Knott (1973), ESA (1973), Rantz (1971), and URS (1974), among others. Refer to the quoted document for these references.

The Bureau generally agrees with the quotation except that it is felt that urban growth would not be unduly limited by lack of an additional water supply. The water supply contract will require the Santa Clara Valley Water District to develop and maintain a ground-water monitoring program.

C—038713

C-038713

(6) Flooding

Maintaining ground-water levels by utilization of import supplies for ground-water recharge will result in a favorable impact from the standpoint of flood control by eliminating or reducing subsidence and thereby helping to maintain existing gradients in the area's stream course floodways.

b. San Benito County (Hollister subarea)

(1) Ground Water

The ground-water basin in the Hollister subarea is presently in a state of overdraft. The city of Hollister pumps its municipal and industrial water supplies from the ground-water basin. A cone of depression has developed beneath the city resulting in poor quality water and pumping lifts of up to 200 feet. The San Felipe Division would provide the entire M&I supply to this community, thus assuring a reliable supply of water for municipal purposes.

Under project conditions, the cone of depression will fill, and the ground-water slopes will return to their former condition, with prevailing slopes to the north.

(2) Surface Water

The project is expected to have little effect on the surface water in this subarea with the exception of the Pajaro River. Summer flows of this stream will be significantly increased by drainage inflow and accretions indirectly resulting from additional irrigation water applied in the service area.

(3) Imported Water

Water imported through the San Felipe Division facilities will supplement existing service area supplies allowing management flexibility and providing a greater reliability of yield.

The reliability of the area water supply systems under seismic conditions is improved by adding facilities. Such an addition increases the chances that more facilities will survive undamaged to lessen community disruption from water supply failure. Imported water will also cause adverse impacts on wildlife because of the additional acreage under irrigation and a

C—038714

C-038714

minimal loss attributed to 10.25 miles of fenced open canal. (This is covered in more detail in the section on Fish and Wildlife Impacts.)

(4) Water Quality

For project conditions in the Hollister subarea, it is assumed that with irrigation the cone of depression will fill, and the ground-water slopes will return to their former condition; i.e., with prevailing slopes to the north. Filling the cone of depression will allow a ground-water movement pattern along these historic slopes with a quality approximately equal to that presently existing except in the subareas containing boron. Project water will be applied in these subareas leaching boron from the root zone. The resulting ground water, diluted by the project irrigation water, will cause the water table to rise and supress the existing boron containing water which seems to come from deep sources. This area, under ultimate project conditions, may require pumping of about 4,000 acre-feet of ground water to maintain the quality of water described in the following paragraph. The pumped water is expected to be satisfactory for irrigation. The imported San Felipe supply will leach the boron out of the upper soils to lower strata and allow the land to return to its previous productivity.

The project water will be a mixture of water having passed through the Delta; however, it will come mostly from the Sacramento Valley. A typical analysis is shown by Table C-1. It is of a sodium chloride bicarbonate type. The total dissolved solids are about 260 p/m while the electrical conductivity is around 500 micromhos/cm, and there are no constituents present in amounts that are phytotoxic. The Sodium Absorption Ratio is less than 2 and the pH around 7.6. These waters meet the standards for drinking water and are satisfactory for irrigation as they have a low salinity and sodium hazard.

In calculating the salt balance and the leaching requirements it was assumed that import water and ground water would be blended, resulting in applied water of about 500 p/m. Using the average amount of applied water as 26 inches and the rainfall as 13 inches, the blending of these waters would yield a resulting average annual water quality of about 300 p/m. Since most of the future irrigated crops will be fruit, nuts, and vines, a salt concentration in the bottom of the root zone of 4,000 micromhos or about 2,500 p/m is considered safe.

For project conditions then, using water (including rainfall) received by the soil of 300 p/m and a root zone water concentration of 2,500 p/m, the leaching requirement would be 12 percent of the applied water or about 5 inches. Using an average applied water efficiency of 70 percent, the leaching requirement would be accomplished even if only one-half the loss (30 percent) passes through the root zone.

(5) Drainage

With import water, the water table can be managed through pumping in such a way as to eliminate the cone of depression, allowing the return to the original direction of ground-water movement (toward the north). If pumping is continued in the northern area between the Pajaro River and the project service area boundary (Bolsa area) and the drainage water from that area removed by the existing tile systems and open drains as outflow to the Pajaro River, then salt balance can be maintained without the need of project drainage. The necessary monitoring of ground-water levels and pump usage is assumed to be accomplished by the local contracting agency.

The anticipated use of sprinkler irrigation systems, which allow for good water control, should provide the means of preventing overirrigation and the creation of future drainage problems. With the combination of good water control for all land and the flatter land already developed to provide surface runoff, there should not be a need for project drainage; however, it is possible that ground-water export may be needed for a small area that has poor quality water if time proves the outflow is insufficient to maintain water tables and quality at the desired levels.

Drainage water entering the Pajaro River or the San Benito River is not expected to cause any additional problems to fish and wildlife, but may provide some enhancement with the increased summer flows. The contracting agency in this subarea will be required to develop and maintain a ground-water monitoring program.

(6) Flooding

The Bureau does not see any direct impact on the flooding problems in the Hollister area. Indirect impacts will include agriculture development on some flood-prone lands, minor siltation load increase from additionally cultivated lands, and a slight increase in flood peaks because of a more rapid runoff from lands added to cultivation.

C—038716

C-038716

4. Future Land Use Patterns

Past changes in land use patterns have been major within the San Felipe Division's service area. Where a scant 20 years ago orchards and truck gardens occupied North Santa Clara County, acres of homes now predominate. The growth trends and opportunities of the region, and its location near the San Francisco Bay metropolitan area, indicate large increases in population can be expected in the San Felipe Division area. To accommodate this population growth, urban areas are expected to eventually occupy nearly all of North Santa Clara County and some portions of South Santa Clara County. Expansion of the urban area is also expected in the Hollister subarea.

The following tabulation shows the projected population for the San Felipe service area upon which the supplemental municipal and industrial import water supplies were based:

Year	Santa Clara County	San Benito County[a/]
1970	1,066,000	15,600
1980	1,279,000	18,900
1990	1,471,600	23,800
2000	1,652,500	29,600
2010	1,796,100	31,900
2020	1,884,600	35,100

a/ Based on data from San Benito County Employer Survey, February 1972, and San Benito County "Overall Economic Development Program of 1972."

Table C-2 includes population projections prepared by various agencies. It may be noted that there is only about 10 percent difference projected by the Santa Clara County Planning Department and the California Department of Finance. However, the county projections are based on an inmigration of 10,000 persons per year, which is considered a low rate. The county also has a "median" projection based on higher inmigation (15,000), which is quite close to that projected by the Department of Finance.

As indicated in the discussion of land use patterns (part B), urban growth is expected to continue even without an additional water supply. About a 75 percent increase in population is projected for the Santa Clara subareas in the period 1970-2020. Employment is projected to increase with the population increase.

C—038717

C-038717

Table C-2. Comparison of population projections for Santa Clara County (1,000)

Projection Series:	California Department of Finance[a]			ABAG/MTC[f]			Calif. Regional Water Quality Control Board[j]		County of Santa Clara Cohort Survival Model[l] Annual Migration		
	E-0[b]	D-100[c]	D-150[d]	Losouth[g]	Gronorth[h]	Grosouth[i]	E-0 Baseline	D-150	Zero	10,000	15,000
1970	1075[e]	1075	1075	1065	1065	1065	1042[k]	1042	1065	1065	1065
1980	1309	1343	1345	1240	1255	1308	1271	1349	1161	1269	1323
1990	1482	1614	1632	1408	1464	1594	1508	1762	1254	1479	1591
2000	1590	1805	1859	1523	1638	1852	1636	1910	1299	1646	1820

a/ California Department of Finance, Population Projections for California Counties, 1975-2020; Report 74, P-2, June 1974.

b/ E-0 Series: Fertility rate = 2.1 births per woman; net state in-migration = zero.

c/ D-100 Series: Fertility rate = 2.5 births per woman; net state in-migration = 100,000 per year.

d/ D-150 Series: Fertility rate = 2.5 births per woman; net state in-migration = 150,000 per year.

e/ The 1970 population figure was based upon 1970 Census data. Due to data collection errors in Santa Clara County, however, the actual 1970 County population was 1,065,000.

f/ ABAG/MTC, Population, Employment and Land Use Projections, San Francisco Bay Region: 1970-2000, Summary of Series 2 Projections; August 1973.

g/ Losouth: Low population increase and economic growth (State Department of Finance E-0 Series population projections). Southern counties continue 1960-1970 trends of experiencing highest proportion of total Bay Area growth.

h/ Gronorth: High population increase and economic growth (State Department of Finance D-150 Series population projections). Northern counties experiencing a higher proportion of total Bay Area growth than in 1960-1970 period.

i/ Grosouth: High population increase and economic growth (State Department of Finance D-150 Series population projections). Southern counties continue 1960-1970 trend of experiencing highest proportion of total Bay Area growth.

j/ California Regional Water Quality Control Board, San Francisco Bay Basin and Adjacent Basins for the Comprehensive Water Quality Control Plan, February 1973.

k/ The 1970 population figure reflects projections made before publication of the 1970 Census data. Refer to footnote 5 for further amplification.

l/ County of Santa Clara Planning Department, Projected Population for Santa Clara County, Santa Clara County Series V, 1973.

C-038718

C-038718

Environmental Impacts

The following statement generally reflects the feeling of this agency:

> "Since the water is but one of a set of factors which limit the ultimate size of the economy, restrictions of water availability may not be the operative constraint on the ultimate size of the economy. The economy could run out of land and labor force before it 'runs out' of water."19/

Loss of substantial agricultural areas in Santa Clara County is inevitable and is foreseen in the county general plan. Loss of agricultural lands in South Santa Clara County will be due to urban development in the Morgan Hill, San Martin and Gilroy areas.

The Santa Clara Valley Water District projects a reduction in irrigated acreages from 56,400 acres in year 1980 to 38,300 acres in year 2020. This is shown on the following tabulation:

Year	North Santa Clara Subarea (acres)	South Santa Clara Subarea (acres)	Total Subarea
1980	12,400	44,000	56,400
1990	6,600	41,900	48,500
2000	5,600	39,200	45,800
2010	5,000	36,500	41,500
2020	5,000	33,300	38,300

During this same period, a population increase of 594,000 is projected by the Santa Clara County Planning Department. It is expected that much of the agricultural area lost in North Santa Clara County will eventually be converted to an urban-suburban type use. Cropland will then be replaced with single family homes, apartments, schools, recreation complexes, roads, parks and greenbelts. In addition to actual construction of housing, utilities consisting of water, gas, electric and sewerlines will be required. Noise and dust during construction will increase appreciably. Air pollution from automobile exhaust may increase and exceed standards set by State Air Implementation Plan.

19/ The paragraph is from the December 1974 Draft Environmental Impact Report for Santa Clara Valley Water District San Felipe Water Distribution System - Environmental Science Associates.

Environmental Impacts

The impacts associated with the increase in population will be minimized if construction is confined to the "Urban Limit Lines" set by the County Planning Department.

The Santa Clara County cropping pattern is expected to change from predominantly orchard crops to specialty crops such as cut flowers, nursery stock, strawberries, grapes and row crops. Specialty crops could utilize land units as little as 5 acres. There are no plans to construct an irrigation distribution system in the Santa Clara subarea.

The anticipated increase of less than 20,000 in the population for San Benito County by year 2020 will have little direct impact on the future land use. Most of the increase is expected to occur in and around the town of Hollister with small increases at San Juan Bautista and Tres Pinos. The projected increase in population could be adequately contained within the "Urban Limit Lines" set forth by the San Benito County Planning Department and LAFCO's guidelines.

Local governments will be expected to provide services such as water, means of sewage disposal, fire and police protection in addition to schools and hospitals. Construction of houses, roads and utilities will cause temporary noise and dust problems. Urbanization will result in a permanent increase in noise levels. Existing or new industrial plants associated with processing agricultural products could affect waste-water quality if not properly controlled. An increase in air pollution from additional automobile traffic could be expected.

The ability of local government to provide services such as utilities, schools, roads, and police and fire protection depends on many factors. Foremost is probably the location of new urban developments in relation to existing developments. Constructing subdivisions that are not contiguous to existing developments might require extending utilities and roads that involve costs not recoverable by the tax base. Another factor involves the number and types of industry located in an area whose taxes might subsidize community development. Certainly the state of local and national economy at any given time could affect the ability, or even the willingness, of local government to provide services for urban development.

In the Hollister subarea about 75 percent of the arable land is Class 1 and 2 and highly suitable for all climatically

adapted crops. Of the 39,600 irrigable acres in the subarea 24,000 acres, or 60 percent, are presently being irrigated or partially irrigated. With the San Felipe Project and a firm supply of good quality water it is anticipated that all productive lands (38,300 acres), including about 13,000 arable acres of presently nonirrigated land (over 7,000 acres of which had been previously irrigated), in the subarea will be irrigated. This will displace about 1,000 head of cattle or other livestock to areas less adapted to intensive agriculture. This livestock production will be replaced by production of about 200,000 tons of vegetables, fruits, nuts and grapes.

A closed pipe, high-pressure distribution system will be constructed by the San Benito Water Conservation and Flood Control District in the Hollister subarea to provide supplemental water to about 18,000 arable acres. The adverse environmental impacts of this construction will be temporary in nature and include the usual nuisances of dust, noise, and machinery exhaust emissions. This, however, will be spread over about 18,000 acres and over a 3-year construction period. There is an added possibility that archeological sites may be encountered during excavation of approximately 94 miles of ditches for the buried pipelines. The distribution pipe sizes are expected to vary from 6 inches to 21 inches. Final designs of the distribution system are being prepared by an engineering consultant for the District and have not yet been completed. This will be the subject of an Environmental Impact Report to be prepared by the District.

A comparison of present and predicted future agricultural use expressed as a percentage of the irrigated lands in the Hollister subarea is as follows:

	Field	Forage	Truck	Fruit and nuts	Vineyards
Present[a/]	4.4	3.3	38.7	52.5	1.1
Future	5.0	2.1	42.5	40.3	10.1

a/ 1967 data.

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Thus, in some areas the environmental effects of irrigated agriculture would decline, to be replaced by the effects of urbanization, and in others they would increase. Secondary effects accompanying irrigation include air and noise pollution during the planting and harvesting season including that from truck traffic on primary and secondary roads. Fertilizers and insecticides are employed and their production requires electrical and other energy sources. Mosquitoes or other disease vectors will require control. Migrant or permanent farm workers will require housing and medical and recreational facilities.

Five small pumping plants would be constructed in the distribution system and power would be provided by the local utility. The pumping plants would require about 4 million kilowatt-hours annually at ultimate development.

5. Air Quality Changes Related to the Project

Existing conditions relate to two major sources of pollution: stationary (building heating systems, industrial processes, etc.), and mobile (automobiles, trucks, trains, aircraft, etc.). The distribution and type emissions during 1972 were shown in table B-2. It can be seen from this table that emissions, particularly from cars and light trucks, cause a significant portion of the air pollutants. Plate C-1 represents Bay Area Air Pollution Control District's (BAAPCD) calculations of past and future trends in daily emission levels for five pollutants in the District, without differentiating between counties within the District. The December 1974 Draft EIR for the San Felipe Water Distribution System, Santa Clara Valley Water District, analyzes this under the heading "Transportation." This document states:

> "The private passenger automobile and public transit are the dominant travel modes in Santa Clara County. With the exception of Southern Pacific Company's passenger rail link extending from San Francisco and San Mateo Counties, both modes use an extensive road network. By 1965, for instance, Santa Clara County contained approximately 3,300 miles of roadway (state highways, city streets, county roads), exceeding each of the other eight counties comprising the Bay Area (BATSC, 1965). BATSC data indicate approximately 3,000,000 person trips daily in the county in 1965.
>
> "On a countywide level, a recent bus transit study (Smith, 1969, using BATSC data) identified several significant characteristics within the county's transportation system. For example, in 1965, approximately 98 percent of intracounty travel utilized

private auto, with the remaining 2 percent, or about 42,000 passenger trips daily, representing the extent of transit travel in the county. The 42,000 figure excludes schoolbus and rail transit which, respectively, represent 100,000 and 9,200 passenger trips daily. In this respect, 57 percent of public transit trips were intracounty trips, with the balance extending beyond county boundaries. Significant also is a contrast in travel patterns of private-auto and public-transit trips, where travel between home and work represents only 20 percent of total auto trips, while approximately 60 percent of public-transit trips were for home-to-work purposes."

In the same report, utilizing a household employment forecast and the concept that water supply would become a constraint on the population growth, a series of tables[20/] were developed to show estimated vehicle trips (VT) and vehicle miles traveled (VMT) for 1975, 1980, 1985, and 2000. These tables are summarized and shown as table C-3. The total vehicle trips increased from about 3 million to about 5 million and total mileage from about 24 million to 49 million in the 1975 to 2000 time frame. The percent of change (VT and VMT) ascribed by the report to the Santa Clara Valley Water District Project was 71 percent. Considering that the San Felipe Division will not supply water until after 1980, it will have a lesser effect than that described for the Santa Clara Valley Water District project. The total vehicle trips increase (table C-3) from about 4.3 million in 1980 to about 5 million in 2000 and vehicle miles traveled increase from about 36 million to about 49 million indicating that over half of the growth would take place prior to San Felipe supplies being available. As the growth in VT and VTM are associated with population increase, the Bureau believes that San Felipe Division will cause only a minor increase in VT and VTM.

In the San Benito County portion of the service area, particulate matter concentration may increase as the primary source is from agricultural practices. Emissions from automobiles are expected to remain about constant with the total number of vehicles increasing, but emissions per vehicle decreasing, due to new vehicle emission standards.

20/ EIR, San Felipe Water Distribution System SCVWD Environmental Science Associates, December 1974

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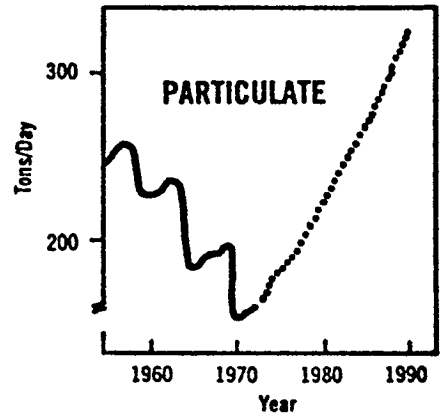
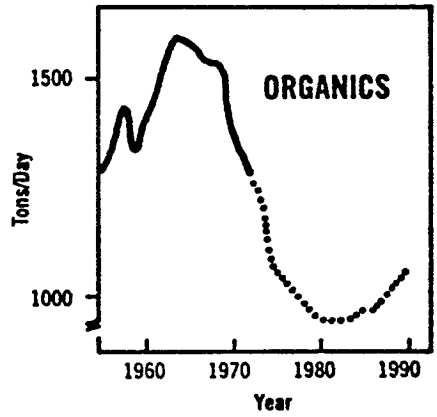
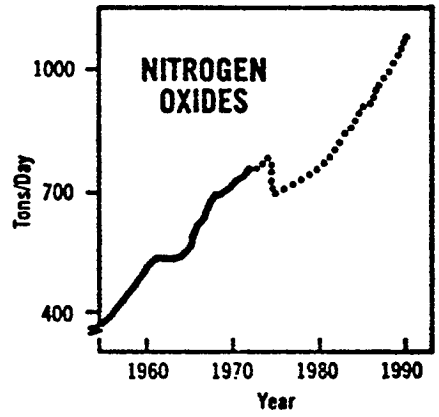
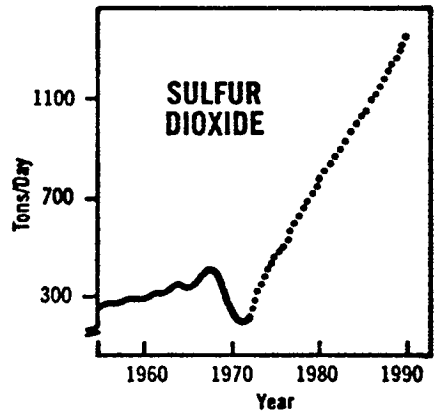
TRENDS
In Air Pollutant Emissions

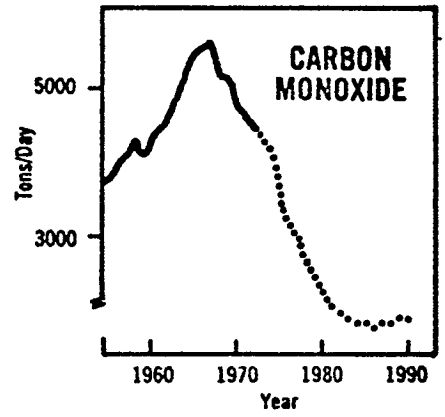
The graphs below show for each of the five main air contaminants the variation in Tons/Day emissions through the years. Solid portions of the curves represent historical emissions which have been adjusted so as to be consistent with the 1972 Source Inventory and the latest computation techniques. Dotted portions of the curves indicate estimated emissions for the future.











TRENDS IN AIR POLLUTANT EMISSIONS
1955-1990

Source: BAAPCD, 1973

Table C-3. Weekday trip distributions
Santa Clara County (1,000)

Year	Person Trips Auto	Person Trips Transit	Total Person Trips	Vehicle Trips	Vehicle Miles Travelled
1975					
No. S.C. Co.	4,239.5	34.0	4,273.5	2,943.8	23,554.2
So. S.C. Co.	120.4	0.9	121.3	83.4	668.5
Total	4,359.9	34.9	4,394.8	3,027.2	24,227.7
1980					
No. S.C. Co.	5,893.0	90.5	5,983.5	4,091.6	34,783.8
So. S.C. Co.	267.3	4.4	271.7	185.5	1,577.6
Total	6,160.3	94.9	6,255.2	4,277.1	36,361.4
1985					
No. S.C. Co.	6,547.7	228.5	6,786.2	4,546.1	40,922.2
So. S.C. Co.	369.5	13.7	383.2	256.3	2,309.1
Total	6,917.2	242.2	7,169.4	4,802.4	43,231.3
2000					
No. S.C. Co.	6,838.6	594.9	7,433.5	4,766.4	45,115.0
So. S.C. Co.	589.4	51.4	640.8	409.2	3,888.2
Total	7,428.0	646.3	8,074.3	5,175.6	49,003.2

Source: Gruen Gruen & Associates, Population and Housing Projections (Santa Clara Valley Water District EIR); BATSC Study (1969); Rand Corporation (1974); Wilbur Smith (1969); Santa Clara County (1969a).

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6. Native Vegetation

Direct impacts on native vegetation due to the construction of San Felipe Division project facilities include the removal of trees, shrubs and grasses from approximately 775 acres. An additional 210 acres would be inundated by the San Justo Reservoir and Coyote Afterbay. The loss of native vegetation will be permanent at all facilities except for the 425 acres associated with the Santa Clara and Hollister conduits and possibly the fringe areas of San Justo Reservoir. Earth material will be replaced over the buried conduits and native grasses should eliminate the construction scars within two or three seasons. The total native vegetation lost due to construction of project facilities would be about 560 acres.

In the Hollister subarea the principal changes will be those resulting from the conversion of lands not presently irrigated or only partially irrigated to full irrigation. About 13,000 acres of native vegetation, primarily grazing land, will be converted to irrigated cropland with the San Felipe Project.

The original native vegetation has been much altered by past urban and agricultural development and the accompanying introduction of various exotic species either by accident or for range improvement or other cultural purposes.

7. Scenic Impacts

Disposal of waste material from tunnel and conduit excavation not otherwise used will alter natural contours and vegetation at the disposal sites. As mentioned in part A - Proposal, Pacheco Tunnel spoil material from the inlet portal will be placed in a small arm of San Luis Reservoir. This material will be spread over an area of about 2 acres (San Luis Reservoir has a surface area of over 12,700 acres when full) and shaped to provide vehicle parking. The area will not be visible from Highway 152. Pictures following this page show the area in relation to San Luis Reservoir. Additional discussion is found in Section D-1. Spoil material from the outlet portal will be placed against a hill south of Pacheco Creek and will be visible from Highway 152. The contractor may place a concrete batching plant near each tunnel entrance. These plants will be dismantled when construction of the tunnel is completed. All construction activity at the inlet portal will be shielded by hills and not be visible from Highway 152. The construction site at the outlet portal will be visible. The spoil area at the outlet portal will be visible from the highway, but should not be discernible after native grasses are established

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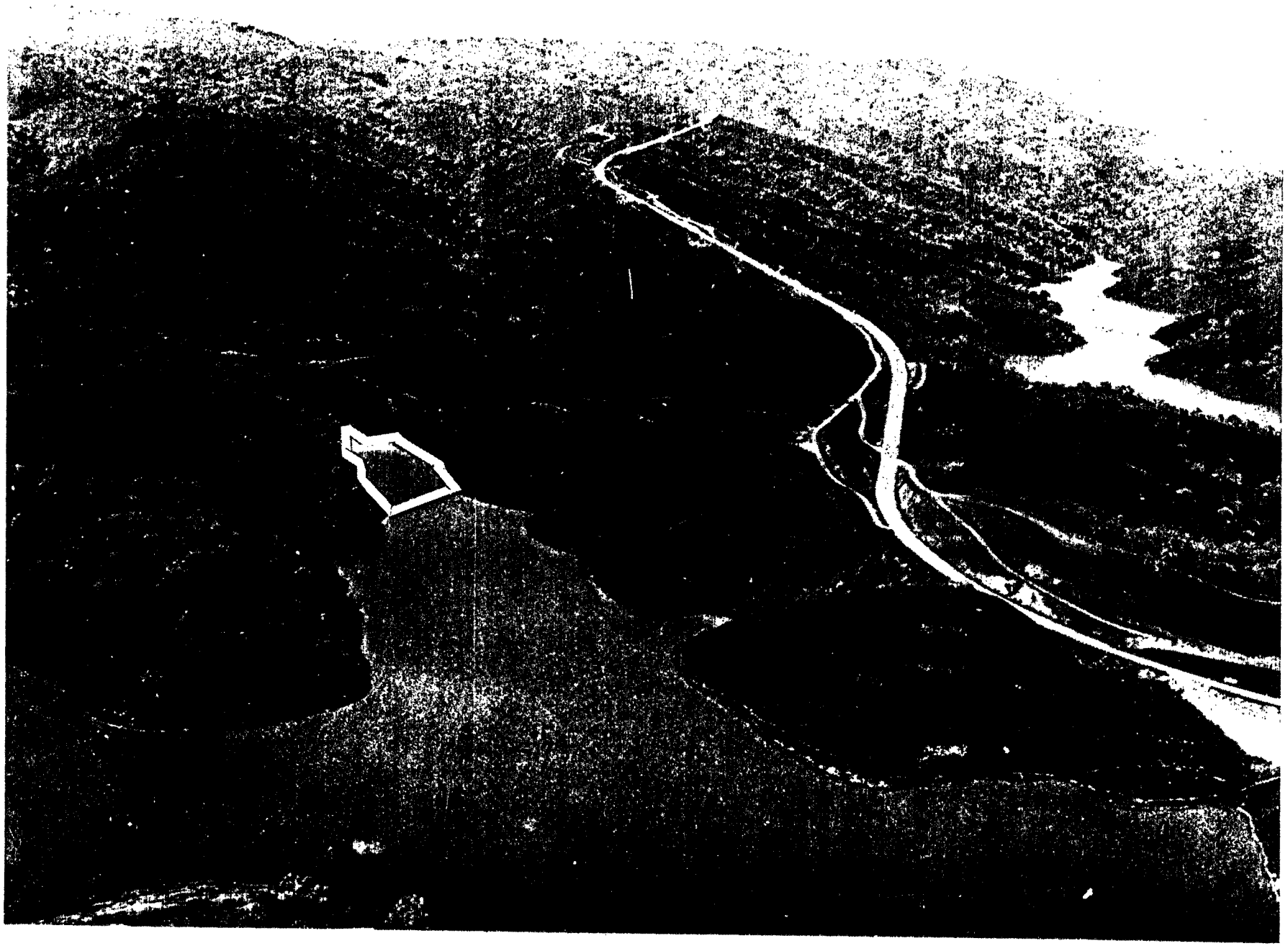

Inlet tunnel spoil site is outlined in left center. Old Highway 152 and boat launching parking area are shown in the lower right of picture.

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Inlet tunnel spoil site is outlined in right center of the picture.
San Luis Dam is barely visible in the top center background.

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C—038728

on the fill. Plate C-2 shows the location of the two spoil areas selected from Pacheco Tunnel. The spoil material from the Santa Clara Tunnel, 52,700 yd^3, will be placed in one of several draws in the area, shaped and seeded and should not be discernible a few years after construction is completed. Exact location of this site has not been determined.

Canal construction will permanently eliminate native vegetation in the waterway and along the adjacent operating roads. Permanent visual scarring will occur from the 10 miles of concrete lined canal. Pumping plant buildings, switchyards and discharge lines will be visible as will the single-pole power transmission lines from existing powerlines to the pumping plants.

San Justo Reservoir will permanently eliminate most of the vegetation consisting of native grasses in the 200-acre reservoir area. Temporary marsh-type vegetation or native grass growth could develop along the upper fringe areas when the reservoir is being drawn down in early summer. Up to 150 acres of mudflats could develop during low stages of the reservoir, similar to those observed in reservoirs in Santa Clara County.

Coyote Afterbay will be located on an existing recreation development, and all of the existing recreation facilities will be removed and relocated around the new afterbay. The water surface in the afterbay will remain fairly constant and fringe vegetation should develop.

A survey of the reservoir area of the Coyote Afterbay was made to determine species and number of trees and bushes which would be affected by construction of this facility. About 143 trees and 18 bushes will have to be removed. Several buildings are also within the reservoir area. It may be possible to transplant some of the smaller trees in the new recreation area to be constructed below the dam. The following is a list of the vegetation and structures which lie in the proposed reservoir area:

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Item	Number	Height
California sycamore	6	To 15'
	10	To 40'
	3	To 60'
Live oak or valley oak	8	To 20'
	11	To 40'
	6	To 60'
California buckeye	1	To 20'
Unbellularia	1	To 20'
	3	To 40'
Big leaf maple	70	To 20'
Digger pine	1	To 70'
Freemont cottonwood	1	To 75'
Eucalyptus	2	To 60'
Coyote or Toyon bush	18	To 10'
Walnut - black and English	20	To 20'
Total	161	

Item	Number
Two-story dwelling	1
One-story dwelling	1
Mobile home	1
Garage and machine shop	1
Shed	1
Total	5

Placement of pipelines will temporarily disrupt native grasses, but these will soon grow back and eliminate construction scars in a few years. This is evident where the Pacific Gas and Electric Company has buried their pipelines (30-inch-diameter gas main Topock-Milpitas and a 20-inch gas main) near the proposed Santa Clara Conduit alinement. No visual effects of the buried segments of pipe, which was constructed in the mid-1950's, are apparent.

8. Fish and Wildlife

A detailed analysis of the San Felipe Division effects on fish and wildlife in the San Felipe service area was made by the Bureau of Sport Fisheries and Wildlife in 1963. While the basic concept of the Division has not changed, import quantities and the method of distributing water have been revised. The Division is

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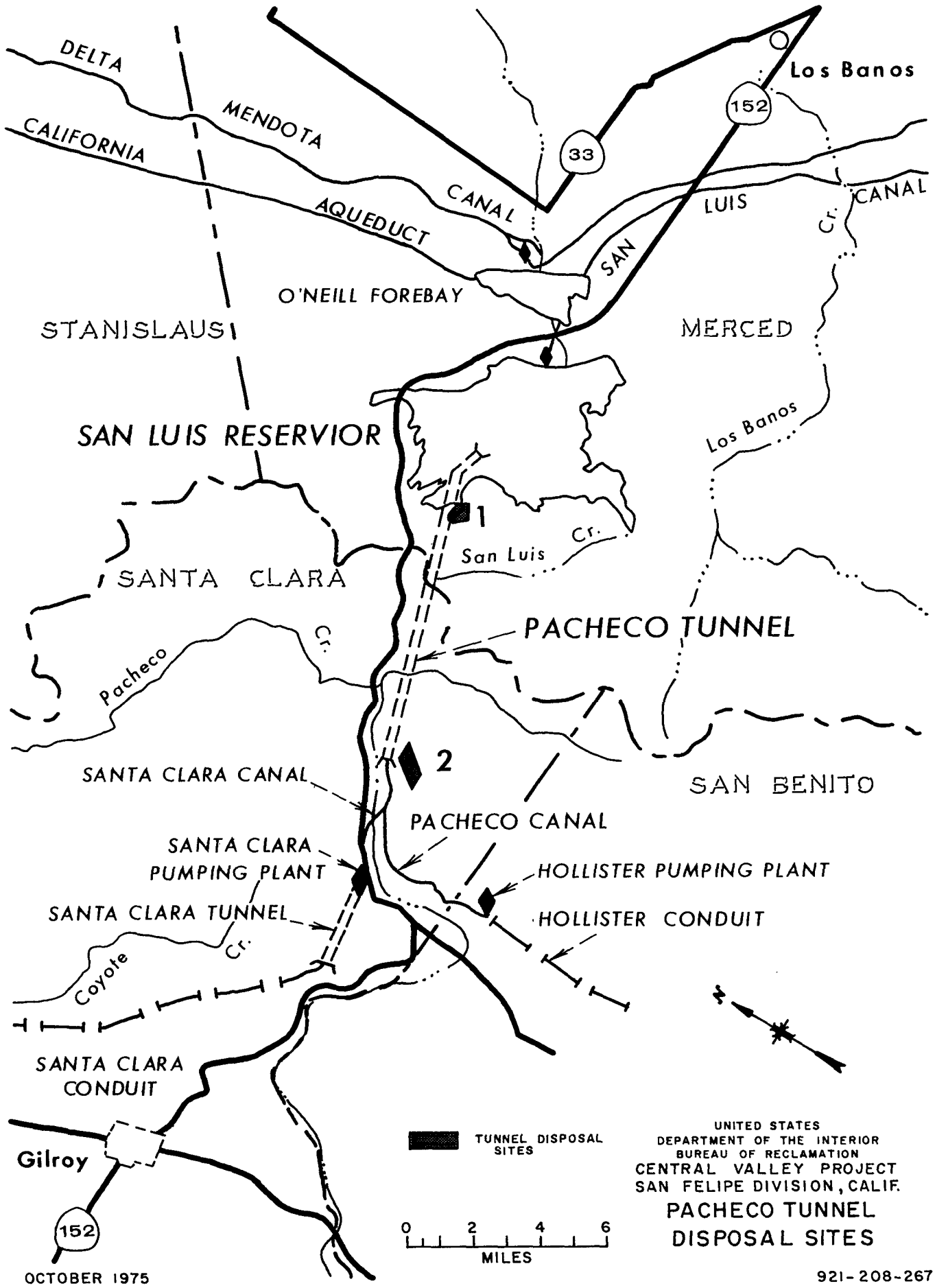
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CALIFORNIA
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LUIS
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SAN
O'NEILL FOREBAY
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1
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SANTA CLARA CANAL
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MILES
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
SAN FELIPE DIVISION, CALIF.
PACHECO TUNNEL
DISPOSAL SITES
OCTOBER 1975
921-208-267

now scaled down to provide about 200,000 acre-feet of import water, essentially through a closed pipe system in Santa Clara and San Benito Counties. The plan analyzed by the U.S. Fish and Wildlife Service included an import of 293,000 acre-feet and 116 miles of open canal construction serving Santa Clara, San Benito, Santa Cruz and Monterey Counties.

Stated again for emphasis, the concept has not changed. Santa Clara Valley Water District will still operate its existing reservoirs and percolation ponds as previously analyzed. However, reservoir releases to the streams tributary to the percolation ponds will depend on factors such as percolation capacity of the ponds at any given time, and the amount of import water reaching the percolation ponds. Although the streamflow is expected to improve with the project, the Santa Clara Valley Water District cannot guarantee that all 61 miles of stream channels will be "live" at all times, as previously assumed in the U.S. Fish and Wildlife Service evaluation. Further, reservoir release quantities will vary during the year. It may be possible, after some years of operating experience with import and local supplies to schedule releases to maintain live streams in some of the channels. In any event, the stream channels will be kept "live" under conditions of surplus water. The U.S. Fish and Wildlife Service estimates the fishing use along the 61 miles of streams will remain at about the current annual use of 6,000 angler-days throughout the study period. Increased fishing use is estimated when the Santa Clara Valley Water District constructs the additional percolation ponds required to utilize San Felipe Division supplies. This additional fishing use is estimated at 84,000 angler-days when the ponds are completed increasing to 252,000 angler-days annually through the 2020 to 2080 period.

The imported San Felipe Division water will allow the Santa Clara Valley Water District to maintain conservation pools in their reservoirs which now are periodically dry. A relatively stable summer pool area maintained in the reservoirs from April 1 through October 15 will provide water conditions for the development of significant fishery as well as other recreation uses.

The following tabulation is a summary of the pool capacities and surface areas for the Santa Clara Valley Water District's reservoirs when reservoir and San Felipe import supplies are coordinated.22/

22/ According to Santa Clara Valley Water District Resolution No. 605.

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April 1 to October 15

Reservoir	Summer Pool		Minimum Fishery
	Capacity (acre-feet)	Surface area (acres)	Pool capacity (acre-feet)
Almaden	1,000	42	400
Anderson	20,000	400	4,000
Coyote	10,000	415	2,500
Guadalupe	1,300	42	500
Lexington	5,000	165	2,000
Stevens Creek	1,000	45	400
Calero	4,000	170	1,000

The percolation ponds, with a total of about 600 surface acres, are expected to provide good fish habitat with additional imported water. These ponds, however, do need rehabilitation every 1 to 5 years. This process will require draining the ponds, drying and removing the silt and scarifying. During this period, the California Fish and Game and District personnel should make a concerted effort to collect excess fish and transfer them to operating ponds.

The U.S. Fish and Wildlife Service indicated that initial eradication of undesirable fishes in the District's reservoirs would be desirable and subsequent control might be necessary at 8- to 10-year intervals.

This procedure usually uses Rotenone or one of its derivatives at concentration ranging from .025 to .2 parts per million of active ingredient, depending on the species involved. The material is a plant derivative and is biodegradable. The time it takes for the lake or reservoir to become detoxified is from 30 days for warm-water bodies of water to as much as 6 months for cold trout lakes. In the San Felipe service area, the lower time range would be applicable. All fish life is killed and much of the aquatic insect life. The latter usually repopulates in one season, although this rate also varies according to temperatures. Microcrustacea such as Cladocera are also killed, but repopulate from resistant stages. Many crayfish are also killed. The waters in this area are usually restocked with sport fish, such as largemouth bass, several possible kinds of sunfishes, channel catfish and a forage fish, such as threadfin shad. The management of the fishery resources in California is a prerogative of the California Department of Fish and Game. It may be possible to control undesirable species merely by periodic rehabilitation of the ponds.

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Anderson and Coyote Reservoirs, two existing reservoirs of Santa Clara Water District, are now managed by the State for fisheries. The State, however, cannot treat any water district reservoir without the district's concurrence and, in addition, all public health regulations must be followed.

Rotenone is nontoxic to most mammals, although workers applying the material sometimes develop temporary but irritating skin and eye irritations.

The impact on recreation would apply only to fishing, and no fishing would be possible for 3 months to a year, depending upon the restocking policy followed by the State. If the reservoirs were purposely drawn down to accomplish the treatment, water contact sports would also be adversely affected until the reservoir was again full or at a surface level and size where such activity was again attractive. Dead fish would also detract esthetically, if not picked up, although cleanup of carcasses is usually part of the normal procedure.

Chemical eradication of nongame fishes is a standard tool of fishery management agencies. The fishes now in these reservoirs are non-native or introduced species such as largemouth bass, carp, catfish, and sunfish. The carp is the usual target for eradication. No rare or threatened species occur in these waters.

The fishery potential of San Justo Reservoir has not been evaluated, but it is anticipated benefits would be minimal because of the annual fluctuation. However, a minimum pool of about 800 acre-feet will be maintained in the reservoir. If Uvas and Chesbro Reservoirs were operated to maintain minimum summer pool capacities, they could also support sizable fishery activity. There is no indication at this time that the South Santa Clara Valley Water Conservation District will change its operation of these two reservoirs to accommodate this function.

As occurred at San Luis Reservoir, striped bass might be imported into San Justo Reservoir in the form of very small fish. If the San Luis experience is repeated this should lead to an enhancement of a fishery at this reservoir and the recreational opportunities afforded by that resource.

Environmental Impacts

If the connection is made to Anderson Lake and Calero Reservoir from Coyote Pumping Plant, the same possibility for transporting San Luis Reservoir fish exists. However, Calero Reservoir is presently closed to fishing because of mercury contamination. Transporting striped bass to Anderson Lake would alter present fishery and a diversification of the recreational opportunities afforded by that resource. No adverse effect on the existing fisheries in the reserviors is foreseen as a consequence of this potential importation. However, if an unforeseen adverse effect should develop, the water delivery system is such that control measures, e.g., rotenone, screening, etc., would be relatively easy to install and operate.

Insofar as stream fisheries are concerned, the flows are all too small at their lowest flow periods to support a striped bass fishery which might be competitive with the existing steelhead fishery. Striped bass, like steelhead, are anadromous and have access to all the streams that empty into the ocean or San Francisco Bay. The fact that no striped bass move into the streams (except for some estuarine reports), and spawn or exist as steelhead do is prima facie evidence that striped bass would not establish populations in the streams if they were to be inadvertently introduced via the San Felipe Project.

Big game does not inhabit the service area permanently. Resident deer of the adjacent foothills will continue to be attracted to the irrigated land in the service area. Depredation problems may increase on areas converted from dryland to irrigated crops.

Conversion of about 13,000 acres of native pasture and other dry-farmed areas to irrigated cropland will reduce quail and dove populations. The U. S. Fish and Wildlife Service estimates these losses at 4,000 hunter-days annually by year 2020.

Waterfowl use of the area reservoirs will increase with the coordinated operations of the Santa Clara Valley Water District. District reservoirs will be utilized as resting areas. Food will be provided by the plants and invertebrates produced in the reservoirs. Hunter-days will not be increased because the District does not allow hunting on any of their reservoirs or percolation ponds.

Pacheco, Santa Clara and Hollister Canals are located along Pacheco Creek and total 10.25 miles in length. The Pacheco Pass region supports between 25 and 30 deer per square mile and no doubt some of these deer water and browse along Pacheco Creek.

These canals will be constructed with deer-proof fencing on each side. Deer crossings will be provided as cooperatively determined by the U.S. Fish and Wildlife Service, California Department of Fish and Game, and the Bureau of Reclamation. Substitution of buried conduits for the open canals previously planned will substantially reduce wildlife losses estimated by the U.S. Fish and Wildlife Service in their original analysis of the project.

The Bureau does not expect any environmental impacts on the fish or wildlife of the San Luis Reservoir caused by the San Felipe Division since operations of the reservoir will not change. Water which will be stored in San Luis Reservoir and withdrawn for San Felipe use is presently being stored and utilized elsewhere on an interim basis. In the absence of a San Felipe Division, it is anticipated that this water would continue to be used in the San Joaquin Valley. Therefore, no significant change in programmed reservoir water surface elevation variations is expected.

The intake structures for the Pacheco Tunnel are located at elevation 313 and 370 feet. Under most operating conditions this should provide sufficient water cover to minimize the possibility of fish entering the intakes. However, at lower operational levels selective operation of the intakes or other fish protective facilities may be required. The Bureau has recently contracted with the Department of Water Resources and the California Department of Fish and Game to study the movement of fish and the relationship of fish population to thermoclines in San Luis Reservoir. These studies will determine the necessity for a fish screening device at the Pacheco Tunnel intakes, the type of devices if required, and the advantage of selective withdrawals from the two intake elevations.

9. Socioeconomic Aspects

The Santa Clara County population is expected to increase between 45 and 52 percent between year 1980 and year 2020 (see table C-2 following page C-17). The San Benito County population projection shows a 90 percent increase during this same period (see page C-16). Thus, with an anticipated increase in population of over 610,000 in the two counties, it is obvious that city and county services will have to be greatly expanded. These services will include police and fire protection, domestic and industrial water supplies, sanitary facilities, schools, hospitals, roads, recreation facilities, and many others. If these population estimates are accurate, or reasonably so, construction of the San Felipe Division would, by 1980 or shortly after, provide needed municipal and industrial water to the counties in addition to providing irrigation supplies.

It would be desirable, from a social and economic view, to preserve as much of the open space land in the service area as possible. The scattering of subdivisions with their attendant requirements such as utilities, roads, schools, stores, and possibly

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shopping centers, in agricultural areas would have a greater adverse environmental effect than if they were located contiguous to similar developments. Providing water at a reasonable price to agricultural lands would, in effect, relieve some of the pressures on these lands to convert to urban uses.

Overall, irrigated acreage in the Division service area will decline. The projected increase in the Hollister area is only about half of the projected decrease in the Santa Clara County subareas. San Benito County will have a projected increase of about 14,300 newly irrigated acres in the Hollister subarea. That county lost 7,300 irrigated acres between 1965 and 1973, partially in and partially outside of the Hollister subarea.

Thus, in some areas the environmental effects of irrigated agriculture will decline, to be replaced by the effects of urbanization, and in other areas these effects will increase. Secondary effects accompanying irrigation include air and noise pollution during the planting and harvesting season including that from truck traffic on primary and secondary roads. Fertilizers and insecticides are employed, and their production requires electrical and other energy sources. Mosquitoes or other disease vectors will require control. Migrant or permanent farm workers will require housing and medical and recreational facilities.

Providing full irrigation to presently nonirrigated or partially irrigated lands will increase the tax base and will more than offset the loss of taxes on land required for project facilities. Land values vary considerably throughout the service area and depend upon size of parcel, location and quality of land. Generally, developed agricultural land is assessed from 25 to 100 percent more than undeveloped land.

The countywide Santa Clara Valley Water District has a primary function of managing the water supplies (surface, ground water and imports) in the most efficient manner possible. The District also plans, constructs and operates physical facilities necessary to provide water for existing and future needs.

Federal Government personnel requirements have been estimated for the 7-year construction period, and are shown in the following tabulation:

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Construction Year	Government Personnel
1	4 to 18
2	32 to 42
3	44 to 61
4	69 to 112
5	127 to 135
6	115 to 79
7	62 to 28

Most of the Federal Government personnel will be stationed in the Gilroy-Hollister area during the construction period. If satisfactory arrangements can be made, existing trailer courts will be enlarged to house the additional workers. The number of trailers required would depend on the availability of other housing in the area at the time of construction. If local housing is not available and existing trailer courts could not handle the additional workers, a temporary Government camp may be constructed. Government camps would provide their own security and fire protection and provide for their sewage disposal. Other services, such as utilities, would be provided from local sources.

During the peak period of construction, it is conceivable that between 350 and 400 individuals, including the Government employees and their families, will be housed in the area. Medical services will be available locally and in the San Jose area, but local schools and recreation facilities might be temporarily overtaxed.

The number of construction workers onsite at any particular time depends on many factors such as number of contracts let on a specific facility, number of shifts per day worked, type of construction equipment used, and many other unknowns. Based on experience on other construction projects, an estimate was made of contractor personnel required over a 7-year period. This is shown in the following tabulation:

Construction Year	Contractor Personnel
1	50 to 100
2	50 to 100
3	175 to 200
4	300 to 350
5	475 to 500
6	350 to 400
7	50 to 100

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The local labor market in Santa Clara, San Benito, and Merced Counties is expected to provide about 50 percent of the contractor's workforce. The balance of the workers will find housing in the cities and towns in the surrounding counties. It is not anticipated that a contractor's camp will be required. However, several staging yards will be needed to store, repair and service construction equipment. These areas will be a source of noise and dust during working hours.

The personnel requirements during the construction periods are based on the assumption of a specific Congressional appropriation each year over the 7-year period. If the construction period is extended, the personnel requirements would be less during any given year.

Power to operate project facilities, including pumping from the Delta, will require 49 million kWh in 1980 and will increase to 206 million kWh by year 2020. This energy will be furnished from Central Valley Project and will reduce the amount of power available for sale to the project's commercial power customers. The use of this power for pumping San Felipe Division water will necessitate the purchase of an alternative power supply to meet the future needs of the project's commercial power customers. This alternative power supply will likely be furnished by a local utility from a fossil fuel or nuclear thermal plant. Furnishing this alternative power supply will not, in itself, require the construction of a new powerplant, but could cause some speedup in the construction schedule of a powerplant already planned to meet future needs.

As has been demonstrated previously in this statement, water supply facilities interrelate in many ways to the natural environment and the human activities which are undertaken within it. To predict and control these interrelationships is one function of the County General Plans developed by Santa Clara and San Benito Counties. Thus, the adoption of the San Felipe Division as a planned facility strengthens general county planning and supplies one of the elements needed to achieve a desirable urban and rural environment.

10. Recreational Development

The National Park Service evaluated the effect of a San Felipe import on the project service area in 1963 for the Division feasibility report. It was their conclusion that the recreation

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aspects of the San Felipe Division would not be of national significance. Further, none of its components would affect, directly or indirectly, any area administered by the National Park Service, wilderness areas or wildlife refuges.

Recreational demands have outgrown the present facilities and space available at parks in Santa Clara County, and the county now desires to expand its park system. Of the 7,950 acres recommended for purchase and development within a 10-year period by the Santa Clara County Planning Department in its 1972 report, "A Plan for Regional Parks for Santa Clara County," 3,158 acres would be benefited directly or indirectly by the San Felipe Division by stabilizing water levels in six existing reservoirs of the Santa Clara Valley Water District and by enhancing streamflow.

The 1972 report contemplates the construction of access roads, parking spaces, riding and hiking trails, bicycle paths, and as facilities for camping and picnicking as well as for waterborne recreation in the forms of fishing, swimming, sailing, powerboating, and water skiing, but does not list off-road vehicle operation as an activity to be accommodated.

Many areas now used only by the hardy or the unauthorized trespasser would be opened to a greater number of people as the county plan becomes operational. In these areas, as throughout the county park system, the usual problems of park administration and environmental impact would ensue. Prospective problems include increased erosion, cutting of trees and brush by campers, fire, litter, human waste, and vandalism.

Current standards of park practice are extremely stringent in regard to locating transport routes and parking places to preserve scenic amenities and minimize erosion. Similarly, the special organization of compatible uses and the preservation of open spaces for sightseeing and scenic contemplation provide essential criteria for park planning.

The proposed San Justo Regulating Reservoir in San Benito County will probably provide some incidental recreation benefits. It is believed the benefits will be derived primarily from warmwater fishery. An evaluation of this facility has not been made by either California Fish and Game or the National Park Service and, therefore, no benefits were claimed. Drawdown of the reservoir, from full to dead storage each year, would no doubt preclude sizable recreation benefits at this facility.

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11. Archeological and Historical Sites

The complete impact on archeological sites from construction of the San Felipe Division facilities cannot be determined precisely at this time; however, zones of high, moderate, and low sensitivity in the Santa Clara and Hollister subareas have been identified.

Construction of the Pacheco, Santa Clara, and Hollister Canals in the Pacheco Creek area will pass through an area identified as having high sensitivity. These open concrete-lined canals will involve about 9.7 miles of cut and fill construction on either side of the creek. Because they are gravity flow conduits, there will be little opportunity to relocate them to avoid disturbing any artifacts that might be encountered during excavation.

From the end of the Santa Clara Canal, water will be pumped to the Santa Clara Tunnel and thence flow through a buried concrete pipe to Coyote Afterbay. Location of the conduit will follow closely the Pacific Gas and Electirc Company's existing buried pipeline. The conduit route will pass through high and moderate zones of archeologically sensitive areas. This is shown on plate C-3.

A pumping plant located at the end of the Hollister Canal will discharge into the buried high-pressure conduit which terminates at San Justo Reservoir. This conduit alinement follows existing county roads for the most part, passing through high and moderate zones of archeologically sensitive areas. San Justo Reservoir is located in an area of moderate archeological sensitivity according to the archeological field survey team.

Much of the conduit routes would be located in areas which have already been distrubed by either farming activity or road construction. Based on information supplied by the Bureau of Reclamation, the archeological survey team on canal location determined that construction would have a direct impact on 21 of the 52 sites. The Bureau of Reclamation has since decided to change most of the open canal systems previously planned to closed pipe systems. Substituting closed pipe for open canal should reduce archeological impacts because alinements for the pipeline can be more easily changed to avoid an area or site than is possible with an open canal. It may be possible to virtually eliminate the need for data recovery operations (excavations).

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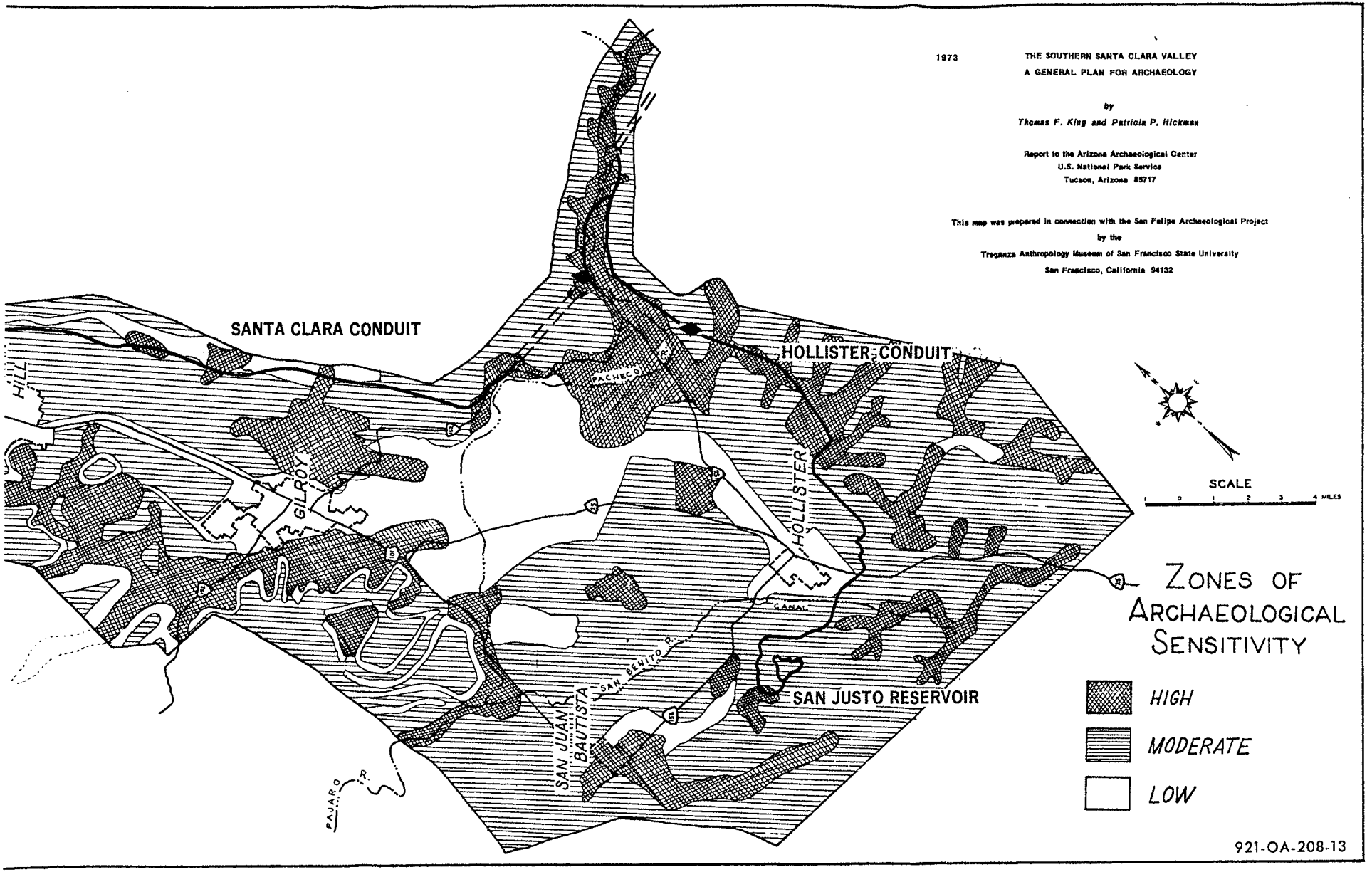

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The most serious impact of constructing the project as presently proposed appears to be associated with the open canal from the end of the tunnel to the pumping plants. If data recovery operations are determined to be required, they will be accomplished before construction of these reaches begins. The survey team did not have the opportunity to investigate the San Justo Reservoir area. This, of course, will also be investigated prior to construction and mitigation actions taken if archeological resources are discovered.

Of the five sites and five districts that the survey team indicated would be nominated to the National Register, only one site would be affected by the division facilities as now proposed. That site (T 5-9, Wild Pig) lies on the proposed alinement for the Hollister Canal. If the canal cannot be realined, extensive disturbance to the site will occur.

With the exception of the San Luis Gonzaga Archeological District, the staff of the State Historical Preservation Office has determined that the Division facilities do not pass through any sites included in the National Register of Historic Places established pursuant to the National Historical Preservation Act of 1966 (80 Stat. 916, 16 USC 470), nor through any State Landmarks or State Points of Historical Interest. A copy of the staff letter is attached as Appendix IV.

The location of archeological site CA-Mer-27 is such that the excavation of Pacheco Tunnel and spreading of the excavated material will adversely impact the site. The July 1975 report by the Department of Parks and Recreation recommended that in the absence of the ability to avoid the site, it should be excavated and studied.

The July 1975 report by Dr. John Fritz indicated only site PP-1 would be adversely impacted by the project in the area of the outlet to the Pacheco Tunnel. The disposal area has been reshaped to avoid damage to the site. It will be carefully logged for future relocation, and a 5-foot-deep cover of topsoil will be placed over the site to protect it. This procedure is in conformance with the recommendations of the July 1975 report by Dr. John M. Fritz. No adverse impacts on the site will be experienced.

Indirect impacts on presently unknown archeological resources in the agricultural areas may occur as a result of the availability of additional water from the San Felipe Division. However, it is not possible at this time to pinpoint specific sites or resources since surveys of non-Federal lands have not been carried out in details sufficient to do so. Cities, counties, and individuals are encouraged to use the map "Zones of Archeological Sensitivity", shown on plate C-3, in planning and executing land use changes that may adversely impact archeological resources.

12. Rare or Endangered Fauna and Flora

The San Joaquin kit fox, southern bald eagle, and red-shouldered hawk are not expected to be impacted by the project. None of these are inhabitants of the service area. The southern bald eagle and red-shouldered hawk may overfly the service area and have been observed near the less inhabited portions. The San Joaquin kit fox was recently observed in a remote, small portion of southeastern Santa Clara County outside of, but near, the edge of the service area. In the portions of San Benito and Santa Clara Counties where these species may have originally occurred, human population pressures from urban and agricultural development have already proceeded to a point where these species could not now be considered resident or in danger of being impacted by the project. Further development into the fringes of the service area for whatever purpose would have the potential for causing adverse impact regarding the distribution and well-being of these species.

The San Francisco garter snake would be affected by further restriction of its range by increased urbanization of bay lands northeast of Palo Alto. The California Department of Fish and Game has recommended a number of measures to protect the snake, including the prohibition of taking, possession, or sale of it.

Those endangered plant species which occur at the periphery of the service areas (Ferris Ceanothus, California balsam root, and Hamilton thistle) will in all probability not be affected by the proposed action. The glabrous popcorn flower which has occurred in the marshy areas at the north end of Santa Clara County could be severely impacted if filling and urbanization in the marsh areas is permitted. Since the plant has not been collected for many years, it may now be extinct.

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D. MITIGATION AND PROTECTIVE MEASURES

1. During the Construction Period

Construction specifications will include provisions to minimize water, noise, and air pollution and public safety hazards during construction activities. A draft of language now being prepared for inclusion in the construction specifications can be seen in Appendix V. The contractor will be required to comply with all Federal, State, and county laws and regulations concerning the control and abatement of pollution. All waste and salvage material resulting from this operation will be disposed of in a manner and at locations approved by Federal and State health agencies.

Construction contractors will be required to control dust created during excavation and embankment work. To the extent possible, contractors will be required to use equipment with low noise levels, and working hours controlled so that construction noises will not disturb evenings and nights, particularly near urban areas. To the maximum practicable extent, construction equipment will be kept off streets and roads used by the general public in order to avoid interference and possible accidents.

Turbid water accumulated from construction activities will be ponded to trap sediments before they reach natural stream channels. Construction specifications will require that permanent maintenance roads will be graveled and oiled to prevent dust from vehicle operation. Borrow areas will be contoured to be self-draining to minimize mosquito breeding places.

Canals will have a low profile and the sections in cut will have slopes seeded to native grasses. The three main pumping plants will have landscaped grounds. Concrete structures will house pumps and electrical equipment.

A total of seven disposal sites for Pacheco Tunnel were investigated prior to final selections. Coordination with California Department of Parks and Recreation led to the selection of the final site at the inlet of Pacheco Tunnel (see Plate C-2). About 180,000 yd^3 of spoil material will be placed in a small arm of San Luis Reservoir and will be shaped and paved to form a vehicle parking area for visitors to this recreation area. A contractor's road leading to the construction area will provide access to the parking area after construction is complete.

Spoil from the outlet portal, about 180,000 yd^3 will be placed on the south side of Pacheco Creek, as discussed previously. Prior to placing spoil material, the topsoil will be removed from the area and stockpiled. After the spoil material is in place, the

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topsoil will be spread over the embankment. Areas such as these usually reseed themselves naturally in a short period of time. The Bureau would reseed the area if this doesn't occur.

Turbid water will result from tunnel contruction. During construction at the parking area, a water quality dike would be constructed in the arm of San Luis Reservoir approximately 200 feet from the edge of the reservoir to trap sediments. The second dike, some 1,100 feet in the reservoir arm, also will trap sediments which might pass the first dike. Outlet pipes would be installed in both dikes at such an elevation to allow only clear water to pass onto the reservoir.

There are several approved methods to handle turbid water which meet National Pollutant Discharge Elimination System (NPDES), P.L. 92-500. These methods are discussed in detail in Appendix V. One of the several methods available will be used at the outlet portal of Paceco Tunnel to control turbid water and meet the National Standards.

Similar procedure will be followed in constructing the 2.9-mile-long Santa Clara Tunnel. Spoil material consisting of some 52,700 yd^3 will be placed in a draw and recovered with topsoil, similar to the embankmnet at the outlet portal of Pacheco Tunnel. Turbid water will be treated by one of several approved methods discussed in Appendix V.

About 460,000 yd^3 of material will be produced by the pipe excavation on the Santa Clara and Hollister Conduits. About 15 percent of the 380,000 yd^3 of material from the Santa Clara Conduit will be placed in the Coyote Afterbay Dam embankment.

Future plans envision upgrading U.S. Highway 101 in Santa Clara and San Benito Counties. The Santa Clara Valley Water District has recently completed studies related to the flood control aspects of the east side drainage streams. These studies considered channelization and levee construction as one means of controlling high water.

Excess material from pipeline excavation in the Santa Clara subarea could be used as embankment for highway overpasses or for building levees if the construction schedules coincide. If the scheules do not coincide, a suitable disposal area to stockpile about 323,000 yd^3 will have to be obtained.

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About 80,000 yd^3 of material from Hollister Conduit could be used in the San Justo Dam embankment, or in highway construction.

If spoil material is not needed for the uses described, it will be graded and contoured along the conduit route or removed to disposal sites.

Pacheco Creek and the San Benito River are the only two major streams crossed by the conveyance conduits. Both streams are wide enough to permit working one side while streamflow is directed to the opposite side. Dikes would be constructed on the downstream side to trap sediments from the ground water pumped from the trench excavation. Other small drainageways crossed by the conduits will be diverted around the construction site or diked on the downstream side to trap sediments if the streams are flowing.

Drainage from the reservoir area at the San Justo site normally dissipates in a cultivated field some three-quarters of a mile below the damsite. A small dike, located immediately below the damsite, will contain sediments caused by construction activities in this area.

Coyote Afterbay Dam will be constructed on Coyote Creek immediately below Anderson Dam. Releases from Anderson Dam are diverted to percolation ponds and must be fee of sediments so as not to cause silting problems in the ponds. A bypass conduit, located outside of the stream channel, will be constructed before the dam cutoff trench is excavated. This will allow the operating district to maintain high quality water in their system during dam construction. Settling ponds or other measures may still be required to handle turbid water pumped from the trench excavation. The contractor will be required to meet NDPES standards for Coyote Creek. The contractor may use other methods to meet the standards as detailed in Appendix V.

In compliance with the requirements of the Federal Water Pollution Control Act Amendments of 1972, the Bureau of Reclamation has applied for a Construction Discharge Permit from the Environmental Protection Agency. The application covers the discharges which would result from the construction of Pacheco Tunnel.

2. Seismicity

The Bureau of Reclamation has contributed research funds and manpower to the intensive seismological studies of the San Andreas Fault system which are being conducted by the National

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Oceanic and Atmospheric Administration, Earthquake Mechanism Laboratory, and the U.S. Geological Survey, National Center for Earthquake Research. An ultimate objective of this research is earthquake prediction in time, location and intensity. Information from the studies and that obtained from Reclamation's alinement arrays across the Calaveras Fault zone will furnish design and location data for Division facilities. In particular, the Santa Clara and Hollister Conduits, mentioned in part C, Environmental Impacts, as crossing the Calaveras Fault, will be designed to withstand seismic strains. Design considerations at this site will include seismic motion-activated shutoff devices on both sides of the fault crossing and location of structures to minimize damage when a strong earthquake occurs. Further protection will be afforded by provisions for the immediate shutdown of the Santa Clara and Hollister Pumping Plants to minimize water loss and to reduce flooding from conduit rupture.

The proposed San Justo Dam and Reservoir will be located approximately 9,000 feet east of the San Andreas Fault. Reservoir stability and the dam design take into consideration the possibility of an intensity IX (Modified Mercalli intensity) earthquake during the life of the structure. The Coyote Afterbay Dam will also be designed to resist a like seismic shock.

3. Air and Water Quality Aspects

Executive Orders 11507 (2-4-70) and 11752 (12-17-53) direct all Federal agencies to cooperate in the prevention, control and abatement of air and water pollution. Water contractors from the San Felipe Project will be required to comply fully, within their legal authorities, with all applicable Federal laws, orders and regulations, and the laws of the State of California concerning protection of the environment and pollution of air, streams, reservoirs, ground water, or watercourses with respect to thermal pollution or the discharge of refuse, garbage, sewerage effluent, industrial waste, oil, mine tailings, mineral salts, or other pollutants.

In the North Santa Clara subarea, water quality is regulated by the San Francisco Bay Regional Water Quality Control Board, and in the South Santa Clara and Hollister subareas, by the Central Coast Regional Water Quality Control Board, under the overall direction of the California State Water Resources Control Board.

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Mitigation and Protective Measures

Local authorities are aware of and concerned with the implications of urban growth, possibly encouraged by increased municipal services, such as water supply and sewerage connections and by improved transportation and energy supplies. Uncontrolled urban growth would probably be incompatible with the State Air Implementation Plan to attain and maintain National Ambient Air Quality Standards and the objectives of the Clean Air Act.

The Bay Area Pollution Control District deals with stationary sources of air pollution on a regional basis. The State Air Resources Board regulates automobile manufacture to control automobile emissions, a major source of air pollution.

One important tool in controlling air quality is the Environmental Protection Agency regulations designed to prevent significant air quality deterioration. Three air quality condition classes are identified based on sulfur dioxide and particulate matter concentrations in a specific area:

Class I - Areas where very little change from present quality is permitted. National parks and wilderness areas could be examples of such areas.

Class II - Areas where moderate changes are allowed, under definite constraints.

Class III - Areas where substantial growth may be permitted, so long as pollution levels remain within the national standards.

The regulations were fully implemented on June 1, 1975, and require a preconstruction review of major new stationary sources that would add particulate matter or sulfur dioxide.

The U.S. Bureau of Reclamation has little direct control over the end source of air quality degradation. If the assumption is made that by curtailing water, growth can also be limited, then control of the water supply could have some effect. However, the key to control rests with local entities as water used for agriculture can easily be converted to municipal and industrial use.

Environmental Air Quality measures to be instituted during construction are discussed in Appendix V.

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4. Wildlife Habitat

There is no practical method for completely mitigating the loss of wildlife habitat resulting from change of land use on lands permanently taken for project facilities. However, to keep these losses to a minimum, efforts will be made to protect or restore areas temporarily disturbed during construction, and to enhance wildlife conditions in areas adjacent to the permanent taking. This will include restricting temporary construction right-of-way to the absolute minimum required to accomplish construction, confining construction equipment and personnel to the permanent and temporary right-of-way and protecting living trees near the right-of-way by marking, staking, or fencing. To the extent practicable, working periods will be restricted to daylight hours in order to avoid interfering with twilight and nocturnal activities of native fauna. Dust will be controlled. If borrow areas are needed, the sites will be selected to minimize loss of native vegetation and after project completion, native vegetation will be replanted or allowed to reestablish itself.

Following completion of construction, temporary rights-of-way, access roads, and other disturbed areas outside the permanent right-of-way will be cultivated, planted, and irrigated to reestablish native vegetation and restore wildlife habitat. Plans for wildlife habitat will be developed with the U.S. Fish and Wildlife Service and the California Department of Fish and Game when right-of-way locations are established.

As mentioned previously, both sides of canal rights-of-way will be fenced with 8-foot-high wire mesh to exclude entry by both animals and unauthorized humans. This will reduce the opportunity for large animals to fall into the canal. Escape facilities and deer crossings will be provided at points where deer and other animals normally move across the right-of-way to permanent water. The crossing locations will be established cooperatively with the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

5. Scenic Changes

The visual impact of San Felipe structures will be partially mitigated by landscaping around buildings and pumping plants, revegetation of cut slopes above the canal in those reaches of the canal where the water surface is below existing ground level, and planting of native grass species on the outside of embankments and on unused areas inside the right-of-way fencing. Architecturally pleasing buildings will be designed for the pumping plant.

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The height and shape of spoil banks will be contoured to minimize adverse visual impact. Typically, spoil disposal areas will be selected to be out of sight.

Original project designs have been modified to substitute buried pipelines for open canals as far as practicable in order to avoid both scenic impacts and interference with wildlife and archeological resources.

6. Archeological and Historical Sites

Further archeological and historical site evaluations will precede construction. If the sites cannot be avoided or an "effect" is determined to result from the project, the procedures of the Advisory Council on Historic Preservation (36 CFR 800) will be followed. The report on the evaluations will include recommendations for appropriate measures at specific localities.

Provisions of Federal laws and orders governing cultural resources, including the Antiquities Act of 1906, the Historic Sites Act of 1935, Public Law 93-291 which amended the Reservoir Salvage Act of 1960, the National Historic Preservation Act of 1966, Executive Order No. 11593, 1971, and the Procedures for the Protection of Historic and Cultural Properties (36 CFR 800), with their subsequent amendments, will be followed in the construction and operation of the Division works.

In pursuing Reclamation's obligations in this area, funds will be made available for additional detailed surveys to more clearly define the cultural resources that appear to have the potential of being adversely impacted by the San Felipe Division. For instance, the Phase II report on archeological site CA-Mer-27 near the inlet tunnel portal recommended an excavation and study program as mitigation action. The Bureau of Reclamation has recently prepared and submitted a "Case Report" to the State Historic Preservation Officer. This report contained Reclamation's recommendations for mitigation actions at this site. With the concurrence of the State and the Advisory Council on Historic Preservation, Reclamation will fund and arrange for the mitigation actions to be performed.

At Site PP-1 near the outlet of the Pacheco Tunnel, the disposal area has been reshaped to avoid damage to the site. It will be carefully logged for future relocation, and a 5-foot-deep cover of topsoil will be placed over the site to protect it. This procedure is in conformance with the recommendations of the July 1975 report by Dr. John M. Fritz.

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In final alinement studies, consideration will be given to moving the Hollister Canal to avoid site T 5-9, Wild Pig. If it cannot be avoided, appropriate mitigation will be formulated and carried out in consultation with the California State Historic Preservation Officer.

The Bureau of Reclamation proposes to mitigate the impact of the undertaking on any archeological or historical property found during construction. The property will be evaluated by an archeologist or other appropriate professional who will make a determination in consultation with the State Historic Preservation Officer regarding the property's eligibility for inclusion in the National Register of Historic Places. Should the property be determined eligible for inclusion in the National Register of Historic Places, the Bureau of Reclamation will follow the procedure outlined in 36 CFR 800.

Secondary or indirect impacts occurring to the resources on private or non-Federal lands would result from undertakings initiated by other agencies or the private sector. When it is determined that such impacts will occur, the Bureau will undertake to inform, encourage compliance by, and offer to advise the entities involved in the undertakings pursuant to the provisions of sections 3(a), 3(d), and 3(f) of Executive Order No. 11593.

7. Endangered Species of Flora and Fauna

The resource conservation plans for Santa Clara County suggest the establishment of ecological preserves, as well as transplanting threatened plant species. To assure survival of the threatened species, the sites would need to meet a number of conditions, such as suitable microclimates, soils, topography and isolation from human disturbance. After final right-of-ways have been determined, the Bureau will contact Federal, State and local agencies with the view to identifying possible sites on project lands that might be utilized for these purposes where compatible with other project uses.

8. Fisheries

Short of eliminating Delta diversion, there are no means of completely eliminating fish loss through the pumping plants. Existing fish screening devices at the pumps provide a high degree of protection of some species at specific flows. However, it is obvious that striped bass fry are "lost" to the Delta by their appearance in the Delta-Mendota Canal, the California Aqueduct, and San Luis Reservoir. There is little information on the survival rate of fry through the pumps. It does appear, however, that fish smaller than 1 inch in length have a better chance of survival than those over 1 inch.

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Mitigation and Protective Measures

The Department of Water Resources has recently proposed a perforated plate screening system for the proposed Peripheral Canal in conjunction with limited diversions during periods of peak downstream striped bass egg and larvae movement. The system would involve a 4,000-foot-long, low velocity intake scheme which would be expected to prevent tidal abrasion and impingement of small fish on the plates. The fish would be retained in the Sacramento River.

The intake structures for the Pacheco Tunnel include two trashracks; one at elevation 313 and the other at elevation 370. As previously discussed, the Bureau has recently contracted with the California Department of Fish and Game to study the fish populations in San Luis Reservoir and their relationships to the intakes to Pacheco Tunnel. These studies will help determine if structural modifications will be required to prevent adverse impacts on the San Luis Reservoir fishery.

Coyote Afterbay Dam and Reservoir will replace an existing small impoundment and a streamside picnic area which are part of a public park. As construction of the afterbay will require clearing of the area, the picnic facilities will be relocated on the south shore of the afterbay reservoir. The existing road will be raised and relocated to retain existing traffic circulation.

The feasibility plan for this division envisioned open canals for most of the conveyance system. Subsequently, the plan evolved to substitute buried conduits for most of the canals previously planned. The expected reduction in wildlife habitat losses was a primary factor in determining this change.

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E. UNAVOIDABLE ADVERSE IMPACTS

Concern has been expressed by some groups about urban problems stemming from the continued growth of population in California and the increasing concentrations of populations in the southern California and San Francisco Bay areas, particularly the urban expansion in the San Jose, Santa Clara County area. Their view holds that imported supplemental water supplies should not be brought into metropolitan areas which are presently subject to pollution and other urban problems. The extent of "People Pollution" problems -- urban sprawl, air, noise, and visual pollution -- which may develop will be determined by the actions of local governing bodies. The steps being taken by the affected counties to resolve these problems are discussed in the section on Existing Environment.

Traffic and other noises may increase with expanded urbanization. As the Santa Clara area is already heavily urbanized, the ambient noise levels have a probable range of 40 to 80 decibels. In the more rural Hollister area, the levels may approximate 35 to 50 decibels. A change to more intensive agriculture in the Hollister area should tend to raise the noise levels toward those of the Santa Clara area.

Southern Santa Clara County is already a transportation corridor but noise levels here might increase toward the upper end of the urban range.

Increasing population and paving of streets and roads will increase the need which already exists for additional flood control and drainage works in the San Felipe area. Intensive local discussions over these works, which frequently involve stream channelization, are now taking place as the local governments endeavor to reach a balance between environmental and economic concerns.

Sewage flows will increase proportionally with the population and will require additions and upgrading of the existing treatment plants. Current plans call for abandonment of all present Santa Clara County discharges to South San Francisco Bay by 1976. If those plans are implemented, the Palo Alto, Sunnyvale, and San Jose-Santa Clara treatment plants will be connected to a major interceptor which will discharge north of Dumbarton Bridge. The Gilroy and Hollister treatment plants will be upgraded to provide secondary treatment.

Air quality in the San Felipe area is affected not only by local point sources of pollutants, such as smoke and chemicals, but also by automobile emissions and by pollutants produced in the eastern and northern portions of the San Francisco Bay Area which have been driven south by the prevailing winds. Thus, future conditions for air quality, dependent as they are upon the nature of the controls exercised by Federal Government, the State Air Resources Board, and the Bay Area

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Pollution Control District are difficult to predict. However, it is to be expected that urbanization will increase the magnitude of the control problems.

Adding 9.7 miles of open canals and additional reservoir surface areas to those already existing will increase the risk of drownings despite safety measures.

The conversion of 13,000 acres of native pasture to irrigated agriculture where intense farming activity replaces cattle grazing will reduce birdlife such as quail and dove populations. The U.S. Fish and Wildlife Service estimates that an annual 4,000 hunter-day loss of quail and dove hunting opportunity will occur by year 2020 because of this change in land use patterns. Loss of hunter-days with the project will be 20 percent greater than without the project.

Construction activities will, despite contractual restrictions, result in some adverse impacts from noise, movement of heavy equipment, and air pollution. These will occur over various portions of the project during a 7-year construction period. Equipment and staging areas will be required by the contractors during construction. The extent of air pollution and noise experienced at these sites will depend on size and activity in the area. The sites will probably be located near existing roads to insure adequate access, and they will be visible to vehicle users. Safety hazards will be increased during construction although contractual specifications will meet existing State and Federal standards.

Excavation of the Pacheco, Hollister, and Santa Clara Canals in the Pacheco Creek area has been identified as occurring in an archeologically sensitive area. It may not be possible to avoid disturbing buried artifacts if they are found and lie within the canal alinements. Protection and mitigation of these resources is discussed in the sections on Existing Environment, Environmental Impacts, and Mitigation and Protection.

The influx of up to 135 Government and up to 500 contractor workers and their families during construction will have a measurable impact on local communities. Schools, recreation facilities, sanitary, safety, and security services will experience a temporary but rather rapid increase in use. The additional taxes collected by the local area from these temporary workers will probably not offset the cost of increased services. There will be a temporary rise in the economic activity, but it will then decline to about that of the preconstruction era. New establishments which may develop during construction, such

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as restaurants, grocery, clothing, and other stores, may experience temporary economic difficulties after construction activities cease.

The 9.7 miles of fenced canals will somewhat disrupt existing patterns of widlife movement. This impact applies primarily to the movement of black-tailed deer, which number between 25 and 30 per square mile, from the generally undeveloped slopes above the canals into Pacheco Creek below the canals. Losses of deer by drowning might range from 1 to 4 per year on the basis of experience with canals elsewhere. Losses might be larger initially, but should decrease with time as preventive measures become effective and the deer become adjusted to the changed environment.

Loss of human life by drowning has a possible frequency of one in a 5- to 10-year period based on operating experience with other Central Valley Project canals.

Contour changes of the landscape adjacent to 9.7 miles of open canals and pumping plants will be permanent, but raw excavation and construction scars will become covered with vegetation except where operation procedures require vegetation control such as about 20 miles of unlined berms along the open canals. The placement of buried concrete pipeline will cause only temporary changes in the landscape along 35 miles of conveyance routes.

About 10 years after the initial water deliveries from the San Felipe Division, San Justo Reservoir will be operated from full to empty each year. Throughout the fall and winter months a large portion of the reservoir, an area of about 150 acres, will be devoid of either water or vegetation. Even so, any open water area has a tendency to draw people, and San Justo Reservoir would probably not be an exception. Although safety and minimum sanitary facilities will be provided, unforeseen accidents and an accumulation of litter at this type of facility are always possibilities.

In discussing environmental impacts of water supply in Part C of this report, the effects of irrigation return flows upon the quality of the receiving waters were described. As noted there, the effects of flows may be marginally adverse.

As mentioned in Part C, Environmental Impacts--Future Land Use Patterns, about 1,000 head of cattle (12,000 animal unit months) would be displaced. These cattle could readily be accommodated on the 500,000 acres of rangeland elsewhere in San Benito County with slight range improvements.

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Unavoidable Adverse Impacts

Diversion of additional water for the San Felipe Division could cause an increased loss to the striped bass and salmon fishery in the Sacramento-San Joaquin Delta on the order of 3 to 4 percent. The loss would be less with the construction of the proposed Peripheral Canal and its associated screening facilities.

Although the additional amount diverted for the San Felipe Division appears small in relation to existing Delta water diversions, it is an amount superimposed upon a system which is already suspected to be under stress due to water diversions. Net reverse flows and salinity intrusion (only to be experienced in critically dry years) resulting from export pumping have been documented, and the effects of these conditions are presently under investigation. Presently it appears that the fishery is deleteriously affected by reverse flows and salinity intrusion. Diversion of about 200,000 acre-feet annual supply for the San Felipe Division will result in some reduction in Delta outflow at times when such outflow would improve water quality (salinity) for benefits to the Delta.

The State of California has recently released their August 1974 Draft Environmental Impact Report on the Peripheral Canal for review and comment. The Bureau of Reclamation is presently preparing a Draft Environmental Impact Statement on the project. Initial construction on the Peripheral Canal was scheduled for 1975 and would have been in operation by 1980. It now appears initial construction may be delayed until 1977 or later. Federal participation in this project has not yet been authorized.

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F. THE RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Construction is a short-term activity that commits numerous resources to project features. Operation of the San Felipe Division will result in both short- and long-term gains and losses in productivity and resource availability. These are relative to the life of the Division and in some cases beyond. The consumptive use of nonrenewable resources forecloses any alternative use of such resources. The Division has made such a resource commitment in order to enhance the long-term availability of water, a renewable resource, primarily for municipal and industrial and agricultural uses.

1. Short-Term Commitments

Short-term uses are, for the most part, associated with the construction phase of the project. Manpower and the contractor's equipment are committed for the duration of the contract. Energy in the form of electrical power and fuels will be required during the construction period. During this period, there will be a degradation of local air quality due to exhaust emissions and dust raised by construction equipment and materials processing. There will also be consumptive and nonconsumptive uses of water. Water used in dust suppression falls into both categories, since any that evaporates is no longer available while any that runs off or seeps into the ground will return to the stream and be available for downstream use.

Where discharge to streams occurs, there will be a localized degradation of water quality. Discharge permits will be required in these areas. This degradation will occur even though the quality of the discharge is within established limits.

Clearing commits the vegetative cover for the duration of the construction activity, at least where revegetation with an association similar to that removed can be accomplished. There are a number of secondary commitments associated with clearing. These include: displacement of the preexisting fauna, erosion, and consequent loss of soil. In addition to the direct loss of habitat through clearing, there is loss of habitat on the periphery of the worksites and construction camps. However, this applies only to those species that are intolerant of the noise and activity associated with these operations. This displacement will lead to an increase in intraspecific competition, especially for territorial species, which will most likely result in a reduction of the number of individuals of those species. In some areas the loss is more applicable as a decrease in the carrying capacity for livestock, than for wildlife.

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Short and Long Term

Construction will bring an influx of people into municipalities near the construction sites. This will result in an increased demand for publicly and privately provided goods and services, often in small towns without the available resources. Once the construction personnel have left these towns, there is a resulting period of adjustment while the economy returns to its former level.

2. Short-Term Gains in Productivity

In towns near construction sites, such as Gilroy and Hollister, there will be short-term economic stimulation, which results from the influx of construction personnel. This will affect not only those supplying the goods and services, but the entire town. There will be more money available in these towns as well as an increase in tax revenues. Project construction also leads to a short-term stimulation for the construction industry. Contractors will be both locally based and from areas outside of the project vicinity.

3. Long-Term Resource Commitments

The San Felipe Division is one of several major developments in the Central Valley Project. The average annual diversion of about 200,000 acre-feet is an incremental increase in the commitment of waters from the Sacramento-San Joaquin Delta for at least the 100-year life of the San Felipe Division. Project pumping plants will require an average of 162 million kWh per year during the first 50 years of project operation and 206 million kWh per year during project years 50 through 100. Envergy will also be required to accomplish project maintenance and other operational needs. These represent long-term commitments of energy resources.

The areas disturbed by extraction of borrow and aggregate, disposal of tunnel and trench spoil, excavation for pumping plant sites, and dam embankments represent long-term commitments for vegetative changes.

The loss of habitat in Pacheco Creek due to the construction of 9.7 miles of open canals and the conversion of about 13,000 acres of native land to irrigated crops will incrementally reduce the carrying capacity to support avian and terrestrial wildlife species for the life of the project. For some wildlife species which are sensitive to human activities, the San Felipe Project and its spinoff effects may jeopardize their continued existence within the project construction and service areas.

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Some fish will undoubtedly be carried from the Sacramento-San Joaquin Delta through Pacheco Tunnel to the streams in the service area. Insofar as stream fisheries are concerned, the flows are all too small at their lowest flow periods to support a striped bass fishery which might be competitive with the existing steelhead fishery. Striped bass, like steelhead, are anadromous and have access to all the streams that empty into the ocean or San Francisco Bay. The fact that no striped bass move into the streams (except for some estuarine reports) and spawn or exist as steelhead do is prima facie evidence that striped bass would not establish populations in the streams if they were to be inadvertently introduced via the San Felipe Project.

4. Long-Term Gain in Productivity

The San Felipe Division will continue the shift in the productivity of the area; a shift from exploiting the simpler products of the soil to the creation of the products of more intensive agriculture and of industry. One aspect of this shift in types of production will be a change in land use in the Hollister subarea from pasturage to irrigated agriculture. This will increase food and fiber supplies for domestic consumption and possible export.

Another aspect is the shift from suburban and rural status to urban status in the already highly urbanized North Santa Clara County. Intellectual and technological productivity will increase with the multiplication and cross-fertilization of human activity, a phenomenon which has accompanied the rise of civilization from the crowded cities of ancient Greece and Rome to the golden, but still crowded, era of late nineteenth century Paris and London. The darker side of urbanization, as this statement has repeatedly pointed out, is the increase of traffic noise, air and water pollution, loss of open space, and the replacement of native flora and fauna with the more contrived vistas of parks and urban architecture.

Ground-water overdraft which would otherwise occur in the Santa Clara subarea can be prevented through the supply of water for direct municipal and industrial use and for percolation with subsequent withdrawal for these and agricultural uses as well. Thus, land subsidence will be arrested and the environmental degradation which would accompany "ground-water mining" can be halted.

Similarly, the water and the maintenance of agricultural economy associated with the Division works can play a small but important part in Santa Clara County's efforts to maintain the amenities of open space and recreational opportunity in the midst of an expanding urban complex.

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Short and Long Term

Supplemental project water will provide irrigating farmers a means to increase and diversify their agricultural productivity. They will have greater capability to endure drought periods and have the means to continue meeting the nation's food and fiber needs for at least the duration of the San Felipe Division's life expectancy. The supplemental water will also contribute to the service area's economic stability for an indefinite period of time.

5. The Extent of Foreclosure of Future Options

Once construction is complete, future fuels, power, construction materials and manpower will have been committed to project facilities and their operation. Thereafter, these commitments are difficult to redirect to other uses.

The inundation of lands in the reservoir areas, construction of open canals and pumping plants, and to some extent the right-of-way for buried pipelines forego alternative uses of these areas. These alternative uses include wildlife habitat, pasture, cropland, and recreation.

Monies committed to the project cannot be put to other uses. The inundation of archeological sites may severely restrict, but does not preclude, future investigation of archeological sites. Further, any sites destroyed by project construction are irreparably lost.

If mineral resources are located beneath project features their recovery would be foregone for the life of the project unless such features could be relocated.

Water supplies committed to the project will not be available to other areas.

The option of other alternative water supply development is not foreclosed, but may be postponed. In the case of waste-water reuse, the San Felipe Division, will allow time to study and test safe methods and conditions of use of reclaimed waste water.

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G. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction of Pacheco and Santa Clara Tunnels would be an irreversible commitment. For all practical purposes, the construction of all other structures such as canals, conduits, pumping plants and dams would approach an irreversible commitment. While it is conceivable that land developed with a sophisticated distribution system could be returned to its original state, it is highly unlikely. Generally, land dedicated to rights-of-way for the authorized project facilities no longer would be available for other uses.

The use of fuel for construction machinery and construction material such as steel, sand, gravel, lime, and water, as well as the human labor required, would all be an irreversible commitment of these resources.

The commitment of the power and water resources for the proposed purpose will border on irreversibility; however, the allocation of these resources could be modified between various functions if required to meet more critical human or natural resource needs.

The destruction of archeological sites during construction, even though the artifacts are recovered, is considered an irretrievable commitment of resources by many archeologists.

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H. ALTERNATIVES TO PROPOSED ACTION

These alternatives include: (1) waste-water reclamation; (2) local conservation plans for Santa Clara County; (3) various import routes; and (4) no action.

1. Waste-Water Reclamation Studies

Within the past few years, studies pertaining to the uses of reclaimed waste water have become increasingly important, partly due to a local scarcity of water but primarily due to conservation concerns. Both the California State Health Department and the Environmental Protection Agency have issued position papers regarding the use of reclaimed waste water. The position of these two agencies is discussed in more detail later in the text.

The Bureau of Reclamation is currently operating a waste-water reclamation and reuse pilot demonstration program in the Suisun Marsh near Fairfield. This is a cooperative study with the California Departments of Fish and Game and Water Resources and the U.S. Fish and Wildlife Service. Other agencies taking an active role in the study are the Suisun Resource Conservation Agency, California State Department of Health, and the Suisun Research Soil Conservation District. The overall objective of the Waste-Water Reclamation and Reuse Pilot Demonstration Program is to demonstrate the compatibility of beneficial treatment and reuse of municipal and industrial waste water with marsh management.

At the present time the Santa Clara Valley Water District representatives and Stanford University Research are finalizing a contract proposal which calls for studying the nature, movement, and fate of trace organics and mineral constituents in the ground-water basin. Central to the research proposal is the use of a 2-million-gallon-per-day tertiary waste-water treatment plant to be constructed by the District in the Palo Alto-Mountain View Bayfront area. The plant effluent would then be recharged into the ground-water basin and its quality monitored by Stanford researchers. A long-term objective of the study, which will be funded in part by the District, Stanford University and possibly EPA, is to determine the optimum waste-water treatment process and injection system required to achieve the most economical system of water supply using reclaimed waste water.

Within the last 3 years the Santa Clara Valley Water District and the San Felipe Committee retained the services of various consulting engineering firms to study and report on the quality, quantity, and economics of reusing reclaimed waste water as a substitute for all or part of the San Felipe import supply. The following

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paragraphs relate to the studies conducted through the District and the San Felipe Committee:

a. Waste-Water Reclamation and Reuse, Phase I, Consoer-Bechtel, 1973 - The Santa Clara Valley Water District requested this study be made to determine the relative merits of using reclaimed waste water as an alternative to the San Felipe Project.

The study was undertaken with the premise that reclaimed waste water could be used to supplement municipal, industrial and agricultural water requirements by ground-water recharge or direct use. Following is a partial list of the report findings:

(1) Clear technical or economic reasons for a choice between the San Felipe Project or reclamation and reuse were not indicated.

(2) Depending on the price of San Felipe Project water, reclamation and reuse would be 15 to 20 percent more expensive than project water.

(3) The cost to the Santa Clara Valley Water District for water supply, including reclamation and reuse, would be 10 to 25 percent more than San Felipe Project water.

(4) Without grant funds, in terms of near-term capital cost to the San Felipe service area and the District, reclamation and reuse would be 50 to 100 percent more expensive than the San Felipe Project.

(5) The effect of a 25 percent grant for capital expenditures for reclamation and reuse would have very little effect on the cost to the San Felipe service area. An 80 percent grant would mean that the costs to the San Felipe service area for reclamation and reuse would be 9 to 12 percent higher than for the San Felipe Project water.

(6) There will be a critical need for additional water in Santa Clara County beginning in about 1978. The projected deficit increases rapidly from zero in 1978 to about 70 Mgal/d (78,000 acre-feet per year) in 1990. Without additional supplies this deficit would be met by mining the ground-water basin.

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(7) All waste water in Santa Clara County (with the exception of Gilroy-Morgan Hill) has a mineral content considerably higher than expected. This is largely due to the high mineral pickup in the municipal-industrial cycle.

(8) It is very doubtful that, during the time span considered in the study, Santa Clara County would need both a large-scale reclamation and reuse project and the San Felipe project as presently planned. The construction of one virtually eliminates the need for the other.

The Bureau of Reclamation did not participate in this study but was given the opportunity to review the draft report. The Bureau does not agree with the report findings listed under (a), (b), (c), (d), and (e) because the consultants' economics were based on a waste-water treatment plant developing 145,000 acre-feet compared with a San Felipe Project which would deliver 273,000 acre-feet. Therefore, there would be a greater spread between the cost of developing waste water and the San Felipe Project import if supplies were compared on an equal basis. Further, the Bureau of Reclamation does not agree with the cost for San Felipe water arrived at by the consultant. The Bureau does not agreee with the report finding (h). The consultants' study was based on the premise that reclaimed waste water could replace the San Felipe import on a one-to-one basis. This is not logical because: (a) The monthly occurrence of the waste-water supply and the irrigation demand do not coincide. Thus, either a large waste-water reservoir or a supplementary San Felipe supply would be required, (b) health considerations as described in the following paragraphs are not considered, and (c) the time span for the two alternatives is not the same. The consultant's report uses the year 2000 as a demand reference versus the San Felipe 2020 demand. Additional water will be required after 2000 and probably after the 2020 demand is met by the San Felipe Division.

The California Department of Health and the Environmenal Protection Agency have taken the position that health risks from the use of renovated waste water may arise from pathogenic organisms and toxic chemicals. The Department of Health has established criteria to control those health risks, but such is not the case with regard to some organic constituents of waste water. The Department of Health has concluded that the ingestion of water reclaimed from sewage may produce long-term health effects associated with stable organics. The effects would not be dramatic, would be difficult to demonstrate, and would be exerted only with years of ingestion. See also Appendix III.

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Alternatives to Proposed Action

The following is quoted from a Department of Health Position Paper dated September 18, 1973:

> "The urgent need for knowledge in this area has generated increased calls for answers by health authorities, the water industry, resource managers, and the scientific community. It now appears that the need for research is recognized, and there should be action in the near future. As a suggestion of the time frame needed for research activity, it has been estimated that the interval needed before information can be generated through animal feeding experiments (one possible method of study) could range from six to ten years or longer depending on the results that are obtained. The health effects of concern are not immediate or acute. They are related to ingestion over an extended period, measured in years or decades, and may be serious but quite subtle. In summary, stable organics pose a health question when reclaimed water is used to augment a domestic water supply. This question will not be answered for years, and years of exposure may be involved for the occurrence of adverse effects."

The Environmental Protection Agency (EPA) generally assigns the task of enforcing water quality standards to the states. However, EPA has set forth water quality criteria which set specific limits of constituents in drinking water. The following is the EPA policy statement on water reuse:

(1) EPA supports and encourages the development and practices of successive waste-water reclamation, reuse, recycling, and recharge as a major element in water quality management, providing the reclamation systems are designed and operated so as to avoid health hazards to the people or damage to the environment.

(2) EPA recognizes and supports the potential for waste-water reuse in agriculture, industrial, municipal, recreational, and ground-water recharge applications.

(3) EPA does not support the direct interconnection of waste-water reclamation plants with municipal water treatment plants.

(4) EPA will continue to support reuse research and demonstration projects.

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b. Water Reclamation and Reuse - Report on Public Health Aspects, Phase II, Consoer-Bechtel, October 1973 - The object of the study was to determine if health standards would permit use of reclaimed water for domestic use, and if permitted, under what conditions and to determine the technological dependability. The consultants reported that there is insufficient scientific information about acute and long-term effects on man's health resulting from the use of reclaimed waste water. Direct reuse of reclaimed waste water would not be permitted unless it is distilled into pure water under fail-safe methods which is extremely expensive. The consultants estimated that it would take at least 5 years from the beginning of a study (at a cost of a million dollars or more) to develop the scientific-technical information necessary to answer the public health questions. More recent estimates (May 1975), indicate it may take 10 to 15 years at a cost of one million dollars per year to answer the public health questions. There is, of course, no guarantee that the results of such a study would be conclusive or would or would not support the reuse of reclaimed waste water for domestic purposes.

There are four major water quality factors which must be considered for any major project of ground-water recharge with reclaimed waste water. They are: the microbiological, the total minerals, the mineral toxicants of heavy metals, and the stable organics. The first three items can be satisfactorily controlled by providing fail-safe protection against disease transmission with sufficient time travel in the ground-water basin, demineralization and upsewer control of the discharges. Stable organics are the most troublesome problem facing those concerned with public health. Sewage treatment and passage through the ground apparently do not alter the character of some of the stable organics. The residual microchemical pollutants, both organic and inorganic, vary widely and their characteristics depend on the nature of the wastes which enter the sewerage system. Technology will continue to create new synthetic compounds which will add to the continuing problem of how to deal with obstacles in the area of stable organics. There is no doubt that a research program is needed in this area.

c. Use of Reclaimed Water for Agricultural Irrigation and Conceptual Design, Phase I and Phase II, Consoer-Bechtel, February 1974, May 1974 - In light of the above discussion, the San Felipe Committee, an official body representing four counties in the service area, concluded that reclaimed waste water is not a viable alternative for future minicipal water supplies. However, it did appear that renovated waste water might be a competitive alternative for their supplemental agricultural water requirements.

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The committee retained the services of the same consulting firm which made the previous waste-water studies for the Santa Clara Valley Water District. Scope of the studies was to include a determination of the availability of waste water and to develop feasibilty cost estimates for the reclaimed waste-water facilities to serve the agricultural lands in Santa Clara and Hollister subareas.

The Bureau of Reclamation maintained close liaison with the committee and the consulting firm during the course of this study. Reclamation provided data on minimum water quality requirements, crop irrigation water requirements, pattern of delivery demands, and specifications and cost estimating data for conveyance facilities. The consultants provided costs of the treatment facilities, main conveyance and pumping plants, and annual operating, maintenance, replacement, and energy requirements.

This alternative, as a substitute for the authorized San Felipe Division irrigation supply, would require two systems, one a waste-water system for irrigated agriculture, the other an import system for municipal water. The municipal and industrial import system tunnels, canals, and conduits would follow routes similar to those of the San Felipe Division but deliver about one-half the San Felipe supply. The waste-water system would start at the opposite end of the service area from the San Felipe system. In-basin storage would not be required.

Sewage treatment plants produce effluent on nearly a constant pattern during a month, although there is a diurnal low at about 8:00 a.m. and a high at about 2:00 p.m. The monthly pattern throughout the year is also nearly constant and the consulting engineers assumed the quantities of waste water that would be produced in the area would be constant for any given year. The irrigation water requirements in the service area normally begin in March, peak in July, and end about October. However, depending on the antecedent rainfall, some preirrigation in the service area may take place as early as February and as late as December. Only small amounts of irrigation water would be required outside the March-October period.

The following tabulation shows the monthly quantities of waste water produced at the San Jose-Santa Clara treatment plant and a typical monthly demand pattern of agricultural water requirements in the Hollister and Santa Clara subareas. This tabulation is expressed in percent of the total.

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Alternatives to Proposed Action

	Effluent Produced %	Agricultural Requirement %
January	8.3	0
February	8.3	1.0
March	8.3	3.0
April	8.3	5.0
May	8.3	11.0
June	8.3	20.0
July	8.4	23.0
August	8.4	16.0
September	8.4	14.0
October	8.4	6.0
November	8.3	1.0
December	8.3	0
TOTAL	100.0%	100.0%

Table H-1 was prepared by the Bureau of Reclamation to show the comparison of waste-water production in the time frames of 2000 and 2020 and the agricultural requirements that could not be met by use of the existing ground-water supplies and existing imports. It was assumed here that municipal demands would have first call on existing supplies. Therefore, the total irrigation requirement shown on the table is the difference between the existing supply and the projected M&I demands met from this source. The M&I shortages are not shown on this table.

As shown on the table H-1 it would be impossible to meet the total irrigation requirements from May through September in year 2000 and from June through September in year 2020. The table also shows that over two times more waste water would have to be produced in July by year 2000 in order to meet the peak irrigation requirement. An inspection of the surplus/shortage column shows that during the year the shortfall amounts to 47,500 acre-feet, but the total production exceeds this amount. This shortfall is the quantity of waste water which would have to be stored and released on pattern in order to meet peak irrigation requirements. A reservoir to provide these releases would be the second largest storage project in the Santa Clara Valley and equivalent in storage capacity to the existing Guadalupe plus Lexington Reservoirs. By year 2020, however, the waste-water production increases and the irrigation requirements decrease, resulting in a shortfall of 24,200 acre-feet.

There are obvious problems with constructing a facility to store some 47,500 acre-feet of waste water. In addition to the

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Table H-1. Waste-water Production from San Jose-Santa Clara Treatment Plants
Santa Clara and Hollister Subareas Irrigation Water Requirements

	Year 2000			Year 2020		
Month	Wastewater Production[a]	Total Irrig. Requirement[b]	Surplus/ Shortage	Wastewater Production	Total Irrig. Requirement[b]	Surplus/ Shortage
Jan	13,100	0	13,100	16,100	0	16,100
Feb	11,900	1,400	10,500	14,500	1,200	13,300
Mar	13,100	4,100	9,000	16,100	3,700	12,400
Apr	12,700	6,900	5,800	15,700	6,100	9,600
May	13,100	15,100	- 2,000	16,200	13,500	2,700
Jun	12,700	27,400	-14,700	15,700	24,500	- 8,800
Jul	14,000	31,500	-17,500	16,600	28,200	-11,600
Aug	14,100	21,900	- 7,800	16,800	19,600	- 2,800
Sep	13,700	19,200	- 5,500	16,200	17,200	- 1,000
Oct	14,200	8,200	6,000	16,800	7,400	9,400
Nov	12,900	1,400	11,500	15,900	1,200	14,700
Dec	13,200	0	13,200	16,200	0	16,200
Total	158,700	137,100	69,100 -47,500	192,000	122,600	94,400 -24,200

a/ From Consoer-Bechtel Consulting Engineers--Wastewater Reclamation Studies 2/74
b/ Quanties do not include conveyance losses or leaching requirements.

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cost of a dam and reservoir, a large amount of energy would be required to pump the reclaimed water into the reservoir. While a reservoir site was not investigated for this purpose it was reasoned that there would be many adverse environmental effects associated with such a facility.

In order to eliminate the need for a storage reservoir, a plan was studied which would reduce the use of reclaimed waste water to more nearly fit the irrigation pattern. Therefore, the consultants prepared designs and costs estimates for a treatment plant and conveyance system which would be capable of delivering 87,700 acre-feet annually, by year 2020, for the Santa Clara and Hollister subareas. The following tabulation shows the amount of waste water which could be provided by decades to the service area from the system designed by the consultants.

Year	Waste-Water System Design acre-feet
1980	39,200
1990	77,700
2000	80,300
2010	83,900
2020	87,000

Plate H-1 is a plot of the waste-water supply superimposed on the irrigation pattern for the years 2000 and 2020. Both plots show a deficiency of waste water in the peak months. This was assumed to be made up by import supplies from the San Felipe Project as it would be designed for year 2020, and until that time there would be excess system capacity during the peak months.

The following tabulation shows the import required from the San Felipe Division for the Santa Clara and Hollister subareas if reclaimed waste water were used without a storage reservoir as previously discussed:

Year	San Felipe Import With Reclaimed Waste Water (acre-feet)
1980	9,800
1990	52,900
2000	76,900
2010	97,500
2020	108,600

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Under the San Felipe Division plan of development, the Santa Clara subarea does not require additional distribution systems as the irrigators would rely on ground-water pumping and existing surface diversions. If reclaimed waste water were used, it would be necessary to construct a closed pipe distribution to about 23,000 arable acres in this subarea.

The California State Department of Health has set requirements for the treatment of waste waters to be used for agricultural irrigation. The requirements are covered in "State-wide Reclamation Criteria for Use of Reclaimed Water for Irrigation and Recreational Impoundments," California Administrative Code, Title 17, Chapter 5, Subchapter 1, Group 12. Briefly the requirements state that reclaimed waste water used for spray irrigation of food crops shall at all time be adequately disinfected, oxidized, coagulated, and filtered. The medium number of coliform organisms shall not exceed two and two-tenths (2.2) per one hundred (100) milliliters.

One of the most troublesome problems facing public health officials today is the stable organics found in the most highly treated sewage effluents. There is great uncertainty about the potential for some of these organics to cause chronic effects in man if ingested even in microgram-per-liter concentrations over a period of many years. The problem is one that has come to man's attention recently, and there are no criteria in the State or Federal drinking water standards covering the subject. Irrigating nonprocessed food crops with reclaimed waste water over a long period of time could conceivably be harmful to man's health.

Using large quantities of reclaimed waste water would require a high degree of operational efficiency to prevent contaminating the underground aquifer. Reclaimed waste water developed at the Santa Clara-San Jose treatment plants will have a total dissolved solids (TDS) concentration of about 900 parts per million (p/m). At some point in time, equilibrium in the soil profile would be reached at which time the concentration of the salts would range between three and five times that of the applied waste water. Assuming a relative high irrigation efficiency of 75 percent, the return flow would have a TDS of about 3,600 p/m. This return flow could not be used again for irrigation purposes and must be disposed of by an efficient drainage system.

Even with efficient irrigation methods, there is the danger of salt (sodium and chloride) buildup in the soil profile. Depending on the soil structure this may be overcome by winter leaching to maintain soil conductivity, thus increasing water deliveries about 15 percent, over those which would be required

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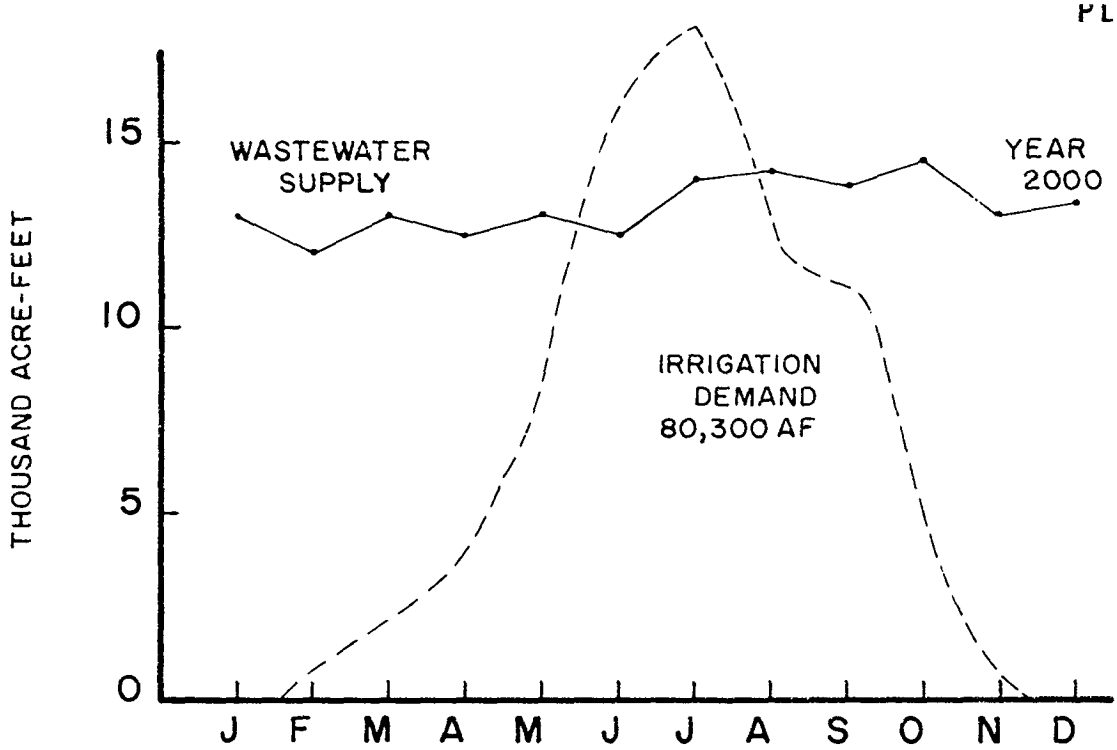

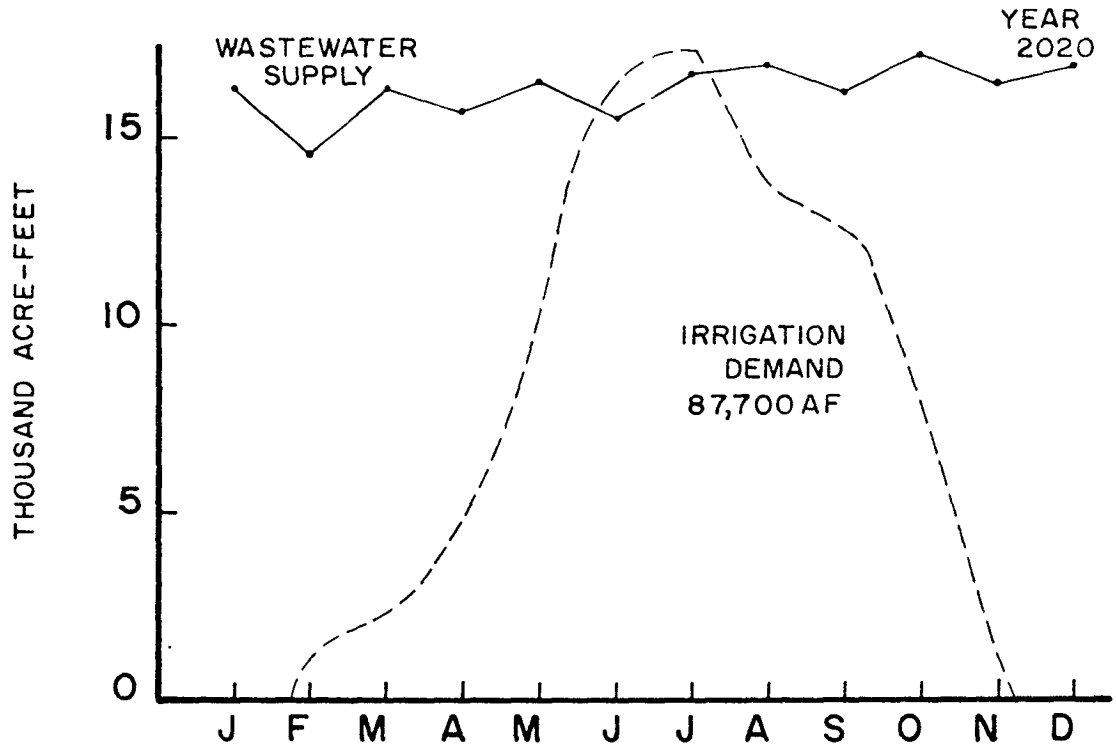

NOTE:
Wastewater-Supply from Consoer-Bechtel 1974
Irrigation Demand & Pattern USBR

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
SAN FELIPE DIVISION – CALIFORNIA

SUPPLY–DEMAND CURVE

JUNE 25,1975

with a San Felipe supply. Table H-2 lists the chemical constituents of major disposal stations in Santa Clara County. The following tabulation shows the average TDS concentrations expected in the year 2020 at the various sources of water:

Source	TDS (milligrams per liter)
Local ground water	
Santa Clara Valley	388
Hollister and San Juan Valley	635
Delta water a/	
Without Peripheral Canal	280
With Peripheral Canal	120
Hetch-Hetchy Aqueduct	54
Local surface supplies	240
Sewage effluent	895

a/ From DWR-DEIR Peripheral Canal Project Table XI-2.

Reclaimed waste water for the agricultural areas in Santa Clara and San Benito Counties would be obtained from the Santa Clara-San Jose treatment plant supplemented by the Gilroy treatment plant by about 1990.

Establishing a conveyance route from Santa Clara-San Jose treatment plant through the city of San Jose was done with difficulty because most of the obvious routes have been used by the city utilities or are already dedicated for future use. From Morgan Hill south to San Benito County, the conveyance would follow an existing Pacific Gas and Electric buried pipeline. The conveyance line serving the Hollister subarea in San Benito County follows the alinement of the Hollister Conduit proposed for San Felipe Dvision project.

The 68-mile-long high-pressure conveyance conduit from the San Jose-Santa Clara treatment plant to the Pajaro River includes 31 miles of 78-inch-diameter concrete pipe, 18 miles of concrete pipe varying from 75 inches to 63 inches in diameter, and 19 miles of concrete pipe varying from 57 inches to 24 inches in diameter. The first 18 miles of the conveyance line would be constructed through the business section and suburban areas of San Jose. The balance of the line could probably be located so as to avoid

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Table H-2. Sewage Quality Santa Clara County

Constituent	Sewage Disposal Station		
	Sunnyvale Mg/l	San Jose - Santa Clara Mg/l	Gilroy Mg/l
Ca	79	65	53
Mg	37	15	19
Na	330	174	102
K	16	17	9
NH_4	41	46	44
CO_3	0	0	0
CHO_3	296	393	375
SO_4	148	116	60
Cl	541	189	95
NO_3	0	0.1	0
PO_4	30	29	36
SiO_2	25	25	25
TDS	1401	880	636
B	0.5	0.7	0.6
COD	90	65	225

Data from Water Reclamation and Reuse
Consoer-Bechtel, July 1973

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existing structures. Three pumping plants would be required; one located at the existing treatment plant, a booster pump located at the intersection on Monterey Road and Highway 101, and one located at the proposed location of the Hollister Pumping Plant. The respective pumping lifts would be 320, 310, and 335 feet. Substations would be required at each pumping plant. Other features include a 15-acre forebay at the San Jose-Santa Clara treatment plant, standby chlorination facilities, and instrumentation to monitor water quality at all times.

Waste-water treatment required for this alternative is any treatment in addition to that required to meet regional discharge requirements. This additional treatment constitutes that portion of the treatment plant costs that are considered as being related to the irrigation project.

Constructing the facilities to provide reclaimed waste water to the agricultural lands in the Santa Clara and Hollister subarea would have the usual adverse environmental effects caused by heavy construction equipment. Noise, dust, and machinery exhaust emissions would be present as the equipment moves along the conveyance route. Constructing the conveyance conduit through the first 18 miles would be disruptive to traffic, businesses and homes in this reach. An archeological survey along the conveyance route would be required. Approximately 385,000 cubic yards of excess excavated material from trench construction would have to be hauled to a suitable disposal site.

As stated previously, providing reclaimed waste water to part of the agricultural lands in the service area does not eliminate the need for an additional import supply. The need for dual facilities would greatly increase the adverse enviornmental effects due to construction activities in the area.

No attempt was made to evaluate the energy required to manufacture the chemicals such as chlorine that would be needed to treat waste water for irrigation. The power requirements associated with the pumping plants, however, have been computed for both the San Felipe Project and the waste-water plan. This is shown in the following tabulation:

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Electric Energy - million kilowatt-hours

Year	San Felipe Import[a/]	Waste Water[b/]	Total
1980	3	39	42
1990	49	79	128
2000	72	81	153
2010	97	83	180
2020	111	86	197

a/ USBR energy at Load Center (Tracy, California).
b/ Commercial energy. The tabulation does not include energy requirements for in-plant service.

The Environmental Protection Agency and the California State Water Resources Control Board (SWRCB) provide funding up to 87.5 percent of the construction costs of waste-water treatment and disposal facilities and for funding of waste-water reclamation facilities. However, the eligibility of the recommended plan for grant funding for reclamation facilities is questionable. Although grants are theoretically available for the funding of reclamation projects, few have been made available. The SWRCB has said in the past that only reclamation plants which operate year-round will be considered for funding. Even with the leaching requirements, little or no agricultural water would be required during the winter months. If grants were not available, the cost of providing the agricultural water to the subareas from reclaimed waste water would probably be 100 to 150 percent higher than providing agricultural water from the San Felipe Project.

Effects on public health of irrigating with substantial quantities of reclaimed waste water which then percolates to ground water and is repumped for human use cannot be accurately assessed at this time. One of the problems foreseen by engineers and scientists is the unkown effect on human population of progressive accumulations of total dissolved solids, viruses, bacteria, and new exotic chemicals. Related to this is the difficulty in the present state of knowledge of monitoring low concentrations of exotic and toxic chemicals.

In addition to the scientific and environmental issues in waste-water reclamation, there is the added difficulty of securing public acceptance for a more expensive alternative providing lesser quality water. During the eight public hearings on the San Felipe Draft Environmental Impact Statement, proponents and opponents testified on the use of reclaimed waste water. The proponents primarily represented the environmental groups while the opponents, for the most part, represented the agriculturalists.

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d. Waste-Water Availability and Quality, Phase I - Yoder, Trotter and Orlob (YTO), January 1974 - The San Felipe Committe retained the services of YTO Consulting Engineers to investigate the agricultural reuse potential of waste water from Hollister and Watsonville areas. The consultants found that the future agricultural water demands in the Hollister subarea far exceed the available waste water from the Hollister treatment plant. In addition, due to high TDS concentration, agricultural reuse may not be feasible. It was found the agricultural demands in the Watsonville subarea could be met from the Watsonville treatment plant with storage or without storage by combining Wastonville's flows with those obtained from the Santa Cruz treatment plant.

e. Waste-Water Reclamation and Conveyance Facilities, Phase II - YTO, May 1974 - This study was made for the San Felipe Committee to determine the facilities and costs of providing the supplemental irrigation water requirements for the Watsonville subarea from local treatment plants.

f. Feasibility of Using Reclaimed Water from the Santa Cruz-Watsonville Area for the Hollisiter and South Santa Clara Subareas, Phase III - YTO, November 1974 - This study was undertaken for the San Felipe Committee as a followup to previous studies described above. The consultants found that the avilability of reclaimed waste water from the Santa Cruz, Watsonville, and Gilroy treatment plants is not sufficient to meet the annual supplemental irrigation demand from 1980 through 2000. In addition, the supplemental demand during peak irrigation months exceeds the available reclaimed water in all years through 2020.

Eight alternatives were investigated which included service area storage reservoirs, reclaimed waste water from the San Jose-Santa Clara treatment plant and a supply from the San Felipe Division, all in various combinations to make up the shortfall from the Santa Cruz, Watsonville, and Gilroy treatment plants.

The least expensive alternative, if 87.5 percent grants were available, included treatment plants at Santa Cruz, Watsonville, and Gilroy which operated the year round, a 32,000 acre-foot-capacity reservoir in the service area, and a San Felipe water supply transported to storage during peak flows. No San Felipe water would be required after the year 2010.

The least expensive alternative without grants provides for reclamation water at the Gilroy treatment plant only, a 38,000 acre-foot-capacity reservoir in the service area, and a San Felipe import supply through year 2020.

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All of the eight alternatives studied were more costly than providing reclaimed waste water to the Santa Clara and Hollister subareas from the San Jose-Santa Clara treatment plant.

g. Summary

(1) The Bureau of Reclamation and the Santa Clara Valley Water District are both involved in waste-water reclamation studies to explore the potentialities and limitations of the process.

(2) The Santa Clara Valley Water District and the San Felipe Committee have recently funded several studies to determine the feasibility of using waste water in the San Felipe service areas.

(3) Use of reclaimed waste water is not presently a viable alternative for domestic supplies because of the expressed concern of those involved in public health.

(4) The agriculturalists in the San Felipe service areas do not support plans to use reclaimed waste water for crop irrigation. Their concern is not only the health aspects, but the possible adverse effect on soils and productivity.

(5) Public health officials estimate that a waste-water research program, running 10 to 15 years and costing about 1 million dollars a year, might be required before answers to the public health questions are available.

(6) Waste-water treatment plants are entitled to an 87.5 percent grant, under certain conditions, from State and Federal agencies. Under P.L. 92-500, the Clean Water Act, precedents would indicate reclamation facilities are also grant fundable. The question of the funding of distribution systems for reclaimed waste water, a major factor in the use of reclaimed water in the San Felipe service areas, is not addressed either by the act or by precedent at this time.

(7) The water demands in Santa Clara County are based on zero population growth and inmigration of 5,000 per year, considered a low projection. A medium growth projection results in a water demand of 88,500 acre-feet over that used for low projections.

(8) A major effort should be put forth to study all phases of reclaimed waste water. Reclaimed waste water could probably be used now on golf courses and parks. The San Francisco

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National Wildlife Refuge appears to be an excellent area to use reclaimed waste water. This would be similar to the Suisun Marsh Project.

(9) This alternative was not selected for implementation partially because of the presently unresolved biological and chemical problems associated with using large quantities of reclaimed waste water. There is no assurance that a research program, which may run 10 to 15 years, would result in favorable decisions to use reclaimed waste water without restriction. A limited use of reclaimed waste water in the service area would not eliminate the need for an import supply from a project such as the San Felipe Division.

2. Local Conservation Plans for Santa Clara County

a. Reservoir Storage Plans - The remaining opportunities for local water development are limited. Reservoir storage at several sites might develop slightly less than 30 percent of the total ultimate water requirements.

In the interest of providing additional water supplies, flood control and recreation facilities, the Santa Clara Valley Water District, various consulting engineers, the Corps of Engineers, California State Department of Water Resources, and university students have investigated numerous dam and reservoir sites in Santa Clara County. Several of these studies were very preliminary, and no attempt was made to adequately define the hydrology, reservoir yields, topography and geology of the site, construction details, project costs, or the allocation of costs to various functions. Some of the studies were, however, quite comprehensive single-purpose and multipurpose evaluations of potential dam and reservoir projects.

The Santa Clara Valley Water District published a report in 1972 entitled, "Summary of Dam and Reservoir Investigations in Santa Clara County." This report contains information on dam and reservoir sites in over 20 drainage basins. In addition, information on seven coastal streams which would provide a municipal water supply to the city of Palo Alto is included in the report. Many of the storage sites have a low yield-to-storage relationship and others have a yield-to-cost relationship which would preclude their construction in the foreseeable future. A list of the storage sites considered by the District is included in table H-3.

Disregarding costs and adverse environmental effects, it appears that there is a possibility of developing about 44,150

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acre-feet of additional yield[24/] by constructing eleven reservoirs in Santa Clara County. Additional hydrologic, geologic, and economic studies would be required to determine the feasibility of this construction. This alternative could provide about 30 percent of Santa Clara subarea's ultimate water requirement. It would not provide any water for San Benito County.

The environmental effects of constructing the reservoirs have not been fully assessed. Several of the sites would inundate valuable wildlife habitats. The Santa Clara Valley Water District has furnished the following comments on the sites listed in table H-3:

Reservoir	Comments
Uvas	The project would inundate some marginal grazing areas.
Upper Coyote	The project would inundate a semi-wilderness area on one reach and working ranches on another reach.
Upper Llagas	The project site is prime productive orchard land. The creek is a valuable wildlife habitat. Significant environmental impacts could be expected.
Second Guadalupe	Watershed terrain repair of the abandoned Guadalupe strip- and shaft-mined area would be required. Impact to local environment would be heavy.
Upper Penitencia Creek	The project would inundate a deep inaccessible gorge.
Enlarged Stevens Creek	Road and picnic area relocations required.
Enlarged Calero	Modification and raising to multipurpose facility. Existing reservoir contains mercury contaminants.

24/ Average annual yield. Not to be interpreted as firm annual yield.

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Table H-3. Dam and Reservoir Investigations in Santa Clara County

Reservoir Site	Storage (acre-feet)	Annual Yield[a/] (acre-feet)
Uvas	65,000	20,300
Upper Coyote	74,350	4,000
Upper Llagas	14,000	2,200
Second Guadalupe	5,500	2,500
Upper Penitencia Creek	4,500	2,600
Enlarge Stevens Creek	7,200	2,400
Enlarged Calero	24,000	2,000
Silver Creek	2,500	940
Enlarged Lexington	40,600	5,500
Permanente Creek	1,400	660
Calabazas	5,000	1,050
Total		44,150

a/ Average supply based on several years of record.

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Alternatives to Proposed Action

Reservoir	Comments
Silver Creek	Minimal Yield and high land costs make this project infeasible.
Enlarged Lexington	Multipurpose. Requires protection of San Jose Water Works treatment plant and relocating Highway 17.
Permanente Creek	Multipurpose. Provides some flood control.
Calabazas	Located in developing residential area. Involves high land acquisition costs.

b. Water Conservation Measures - The Santa Clara Valley Water District estimated that possible water conservation measures could conserve 41,000 acre-feet annually by year 2020. The following tabulation was furnished by the District:

Item	Percent Savings	Savings in AF/yr. in 2020
Water-saver toilets	15% of total in-house	11,000
Water-saving appliances and showers	14% of total in-house	10,000
Meters for agricultural uses in South Santa Clara County	25% of present agricultural use	20,000
Total theoretical savings		41,000

The District concluded that if water savings are to be insured the following steps would be necessary: (1) the use of water-saving appliances should be required in all new construction; (2) complete water metering should be adopted; (3) water-saving yard and garden practices should be utilized; and (4) a continuing program of public education on ways to save water should be initiated.

Because of the uncertainties involved in making quantitative estimates on water-saving measures, it would not be prudent to assume they would be more than 50 percent effective. However,

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a reduction of 20,000 acre-feet annually (about 13 percent) of supplemental water requirements could probably be realized in Santa Clara County.

If projections of future water requirements are adjusted downward due to the above anticipated savings, positive measures of assuring their implementation are mandatory. These would involve ordinance changes, building code changes, regulation of the type of plant material sold in the area, programs to install and read meters, and continuous educational programs. It would involove the cooperative efforts of many entities such as the cities, the county, and private and municipal water companies and districts.

c. Summary

(1) The Santa Clara Valley Water District estimates that eleven new reservoirs in Santa Clara County would produce an average annual yield of about 44,000 acre-feet annually. The firm annual yield of these reservoirs is not available.

(2) Many of the reservoirs have a poor storage-yield relationship.

(3) Many of the reservoirs have a poor cost-yield relationship.

(4) Construction of all eleven reservoirs would provide about 30 percent of the ultimate water requirement of Santa Clara subarea but no water for the Hollister subarea.

(5) The environmental effects of constructing eleven reservoirs in Santa Clara County have not been assessed.

(6) The Santa Clara Valley Water District estimates that 41,000 acre-feet annually by year 2020 could theoretically be saved by water conservation measures. A more realistic value would probably be closer to 20,000 acre-feet by year 2020.

(7) This represents about 13 percent of the area's ultimate water requirement.

(8) Mandatory measures such as ordinances and building code changes would be necessary to accomplish these objectives.

(9) Selection of this alternative would merely delay the need, for a few years, of a supplemental water supply in Santa Clara County. San Benito County (the Hollister subarea) does not have these options.

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3. Alternative Canal and Tunnel Routes

The alternatives of importing San Felipe water via the existing South Bay Aqueduct route was studied. The South Bay Aqueduct is a 42.9-mile-long conveyance system from the Delta to a treatment plant in Santa Clara County. (See plate 2.) It consists of 8.4 miles of concrete-lined canals, a 1.6-mile-long tunnel, and 32.9 miles of concrete and steel pipe. The initial capacity is 363 ft^3/s and the terminal capacity in Santa Clara County is 184 ft^3/s. This alternative would require enlarging the South Bay Aqueduct open canal sections or constructing new parallel canals and constructing a parallel pipe and tunnel along the existing conduit to the terminus at Penitencia Creek. A new conduit would be required from Penitencia Creek to the terminus at Coyote Afterbay. The conduit from Coyote Afterbay would then follow the route of the Santa Clara and Hollister conduits of the selected plan for San Felipe Division to convey both South Santa Clara and Hollister subarea water supplies with similar environmental effects. This alternative would involve about 10 miles of construction through a heavily urbanized area and increase the potential of man-caused accidents. Pedestrian and vehicle traffic would be disrupted and the temporary noise and air pollution would affect a larger number of people than the selected plan of development. Additional impacts of this alternative are a 20 percent increase in electrical energy requirements, higher construction and operating costs, and increased water costs. An additional 300 acres of rights-of-way between the Delta and Coyote Afterbay would also be required.

The reliability of the area's water supply would be lessened under seismic conditions if both State and Federal imports followed the same route.

Another alternative considered a 480 ft^3/s-capacity pumping plant from O'Neill Forebay to a reregulating reservoir on the south side of San Luis Reservoir and at a higher elevation. The water would be conveyed by canal around the southern rim of San Luis Reservoir to a 5.3-mile tunnel and thence to a high elevation canal on the west side of Pacheco Pass. The canal would transport the water to the proposed Santa Clara and Hollister conduits. The effect of this plan on the environment would be: (a) permanent scarring of the hills around San Luis Reservoir by construction of the canal; (b) possible interference with recreational use of San Luis Reservoir; (c) increase the potential of man-caused accidents; (d) additional hazard to wildlife posed by the canal; and (e) a pumping energy requirement greater than that required in the authorized plan.

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These alternatives were eliminated because they were considered more disruptive to the environment, as well as being more costly, and otherwise less desirable.

4. No-Action Alternative

Santa Clara and San Benito Counties have been very active in planning for future population growth as evidenced by their extensive urban studies, their present and future plans pertaining to sewage disposal plants, and their recreation developments.

Santa Clara County, in particular, is experiencing inmigration in addition to natural increases due to birth rate. The population is increasing, although not as dramatically as during the 1960 decade. City and county officials do not anticipate the population will decline or level out in the absence of a San Felipe import water supply.

History has shown an inadequate water supply has not been a limiting factor to urban population growth. Between the decades of 1950 and 1960, the population of Santa Clara County increased about 120 percent. During this period, it was necessary to withdraw domestic water supplies from an already overdrafted ground-water basin. Land subsidence continued throughout this period and up until the California South Bay Aqueduct provided additional water to Santa Clara County.

The no-action alternative would require mining ground-water supplies and, if possible, further development of local supplies in Santa Clara County. Santa Clara County has, in the past, spent millions of dollars correcting and replacing facilities caused by subsidence that was a result of withdrawing more water from the ground-water basin than could be replenished with existing supplies. Continued depletion of the ground-water basin will also encourage intrusion of saline water from San Francisco Bay. Without additional water supplies, the Santa Clara Valley Water District would operate its existing storage reservoirs to obtain the maximum conservation yield at the expense of the recreationist and fisheries.

The Hollister subarea in San Benito County has lost about 3,000 acres of orchards because of boron-rich ground water. It is estimated that another 1,000 acres of trees will be lost without an import supply. The conversion of orchards to dry-farm operations not only affects land values but also affects farm and cannery employment as well. In the absence of an improved water supply

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San Benito County will incur economic losses affecting the farm laborer, transportation and equipment operators and dealers, wholesale and retail operators, and food processing plants.

At the present time, the city of Hollister pumps its water supplies from the underground. A cone of depression has developed beneath Hollister resulting in high pump lifts and poor quality water. This situation is expected to worsen without a supplemental import water supply.

The need for additional water in the San Felipe Division is well recognized and acknowledged by Federal, State, and local representatives and by most environmental groups. Opinions differ among the groups as to the quantities of water required, time frames, and logical sources of supply.

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I. CONSULTATION AND COORDINATION

1. Consultation and Coordination During Development of the Proposal and During Preparation of the Environmental Impact Statement

Federal, State, local entities and agencies contributed in various ways during the plan formulation process for the San Felipe Division. This contribution ranged from active participation to reviewing and commenting on the plan of development.

Reports and comments of State and Federal agencies are appended to House Document 500, 89th Congress, 2d Session (1966). The Federal agencies were:

Bureau of Sport Fisheries and Wildlife
National Park Service
Public Health Service
Department of Army
Department of Agriculture
Federal Power Commission
Department of Health, Education and Welfare
Department of Commerce
Department of Labor

The State agencies which provided comments were:

Department of Water Resourses
Department of Fish and Game
Department of Conservation
Department of Parks and Recreation
Reclamation Board
Division of Highways

During the past several years close liaison was maintained with local entities and agencies and their consulting engineers. The local entities and agencies are listed below:

Santa Clara Valley Water District (formerly Santa Clara Flood Control and Water District)
San Benito Water Conservation and Flood Control District
Pacheco Pass Water District
Santa Cruz Flood Control and Water Conservation District
Boards of Supervisors (Four Counties)
San Felipe Committee

The staff of the State Historic Preservation Office has been consulted regarding archeological and historical sites. A copy of the response is appended as Appendix IV.

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2. References

Threatened Wildlife of the United States: Resource Publication 114, March 1973 - Bureau of Sport Fisheries and Wildlife.

Rare and Endangered Fish and Wildlife: 1973 - Bureau of Reclamation, Mid-Pacific Region.

At the Crossroads: January 1974 - California Department of Fish and Game.

A Plan for the Conservation of Resources, an Element of the General Plan of Santa Clara County: June 1973 - Santa Clara County Planning Department.

A Conservation/Development Plan for the Santa Cruz Mountains, Santa Clara County: June 1972 - Santa Clara County Planning Committee.

An Urban Development, Open Space for Santa Clara County; April 1973, Santa Clara County Planning Committee.

A Plan of Regional Parks for Santa Clara County: March 1972 - Santa Clara County Planning Department.

Urban Development Policies: April 1972 - City of San Jose, California - San Jose City Planning Department.

Flood Control in South County, South Santa Clara County Planning Program: November 1972 - Santa Clara Valley Water District and Santa Clara County Public Works Department.

Ground-Water Conditions - Annual Reports, Santa Clara Valley Water District.

Summary of Dam and Reservoir Investigations in Santa Clara County: 1972 - Santa Clara Valley Water District.

Water Reclamation and Reuse, Phase I Final Report: July 1973 - Consoer-Bechtel, Consultants.

Conceptual Development of a Waste Water Reclamation Alternative for the San Felipe Committee: May 1974 - Consoer-Bechtel, Consultants.

C—038789

C-038789

References (continued)

Environmental Impact Report (Draft) on the Santa Clara County Flood Control and Water Conservation District (now Santa Clara Valley Water District), East Flood Control Zone Project: Volume 1, 1973 - U.R.S. Research Company.

Regional Master Plan for South Santa Clara Valley Waste-Water Treatment Facilities: May 1972 - Consoer-Townsend and Associates, Consulting Engineers.

Draft Environmental Impact Report for San Jose-Santa Clara Water Pollution Central Plant, Advanced Waste Treatment Facilities: January 1974 - Consoer-Townsend and Associates, Consulting Engineers.

Overview Facilities Management Plan, Water Pollution Control Facilities in South San Francisco Bay: For the South Bay Dischargers Authority, March 1974, by Bechtel Incorporated.

Resource Inventory, San Luis Reservoir State Recreation Area: January 1973 - State of California, Resources Agency, Department of Parks and Recreation.

San Luis State Recreation Area 73-74 Major Construction Project Requests: State of California, Resources Agency, Department of Navigation and Ocean Development.

County of San Benito, California Open Space Land Use-Housing and Scenic Element of the General Plan: 1972 - Nestor Barrett, Planning Consultant.

Land Use, Housing and Scenic Highways, Elements of the General Plan: 1973 - Nestor Barrett, Planning Consultant.

Archeological Impact Evaluation, San Felipe Division, Central Valley Project Draft Reports Parts 1 and 2 and Appendix: March 1974, Dr. Thomas F. King (unpublished).

Evaluation Testing Program Report for Delta Fish Protective Facilities, California Aqueduct, North San Joaquin Division: Memorandum Report, 1973 - State of California, Resources Agency, Department of Water Resources, Department of Fish and Game.

Master Plan - Expansion of In-County Water Distribution System (Preliminary), Santa Clara Valley Water District, December 1974.

C—038790

C-038790

References (continued)

San Felipe Division, Central Valley Project, A Report on The Feasibility of Water Supply Development: March 1964, United States Department of the Interior, Mid-Pacific Region (H. D. 500, 89th Congress, 2d Session).

Appendix, Part I, Land Classification, Part II, Agricultural Land Use and Water Requirement, Hollister Subarea, San Felipe Divison, revised March 1973 - United States Department of the Interior, Mid-Pacific Region.

Subsidence and its Control: J. F. Poland, Reprint from Underground Waste Management and Environmental Implications, 1972.

California Statistical Abstract: 1972.

Annual Report, San Benito County, Department of Agriculture, 1972.

Annual Report, Santa Clara County, Department of Agriculture, 1972.

Water Resources Council, OBERS Projections, 1972, Regional Economic Activitiy in the U. S., Series E, Vol. 5, Standard Metropolitan Statistical Areas.

U. S. Bureau of the Census, Current Population Reports, Series P-25, Nos. 329, 448.

Department of Transportation, State of California, Draft Environmental Statement for Route 5 in Sacramento County, Department of Transportation, March 1974.

Inland Fisheries Management
Alex Calhoun, Editor
California Department of Fish and Game, 1966

Flood Plain Information, San Benito River - Pajaro River to Tres Pinos Creek, U.S. Corps of Engineers: San Francisco District, June 1974.

C—038791

C-038791

References (continued)

Flood Plain Information, San Felipe Lake Unit 2, U.S. Corps of Engineers: San Francisco District, June 1975.

Draft Review Report for Flood Control and Allied Purposes, Pajaro River Basin, U.S. Corps of Engineers: San Francisco District, April 1965.

Seawater Intrusion, Ground-Water Pumpage, Ground-Water Yield, and Artificial Recharge of the Pajaro Valley Area, Santa Cruz and Monterey Counties, California. U.S. Geological Survey Water Resources Investigations, 9-74, October 1974.

Archeological Reconnaissance at Pacheco Tunnel Portal, Dr. John M. Fritz and others, July 1975.

Anderson and Pack, 1915
Anderson, Robert, and Pack, R. W.: Geology and Oil Resources of The West Border of the San Joaquin Valley North of Coalinga, California, U.S.G.S. Bull. 603, 1915.

Atwater, 1970
Atwater, Tanya: Implications of Plate Tectonics for the Cenozoic Tectonic Evolution of Western North America. Geol. Soc. Amer. Bull., Vol. 81, No. 12, pp 3513-3536, 1970.

Bailey, Blake, and Jones, 1970
Bailey, Edgar H., Blake, M. C., Jr., and Jones, David L.: On-land Mesozoic Oceanic Crust in California Coast Ranges. U.S.G.S. Prof. Paper 700-C, pp c70-c81, 1970.

Bailey, Irwin, and Jones, 1964
Bailey, Edgar H., Irwin, William P., and Jones, David L.: Franciscan and Related Rocks, and Their Significance in the Geology of Western California. Bull. 183, Calif. Div. Mines and Geol., San Francisco, California, 1964.

Blake, Irwin, and Coleman, 1967
Blake, M. C., Jr., Irwin, W. P., and Coleman, R. G.: Upside-Down Metamorphic Zonation, Blueschist Facies, Along a Regional Thrust in California and Oregon. U.S.G.S. Prof. Paper 575-C, 1967.

Briggs, 1953,
Briggs, Louis I., Jr.: Geology of the Ortigalita Peak Quadrangle, California. State of California, Division of Mines, Bull. 167, 1953.

C—038792

C-038792

References (continued)

Compton, 1966
Compton, Robert R.: Granitic and Metamorphic Rocks of the Salinian Block, California Coast Ranges, Bull. 190, California Div. of Mines and Geology, 1966.

Cotton, 1972
Cotton, William R., MF 343--Preliminary Geologic Map of the Central Part of the Diablo Range, Santa Clara and Alamenda Counties, U.S.G.S. 1972.

Cowan, 1974
Cowan, D. S.: Deformation and Metamorphism of the Franciscan Subduction Zone Complex Northwest of Pacheco Pass, California, Geol. Soc. Amer. Bull., Vol. 85, No. 10, pp 1623-1634.

Ernst, 1965
Ernst, W. G.: Mineral Paragenesis of the Franciscan Metamorphic Rocks, Panoche Pass, California. Geol. Soc. Amer. Bull., Vol. 76, pp 879-914.

Ernst, 1970
Ernst, W. G.: Tectonic Contact Between the Franciscan Melange and the Great Valley Sequence, Crustal Expression of a Late Mesozoic Benioff Zone. Jour. Geophysical Research, Vol. 75, pp 886-902.

Gilluly, 1949
Gilluly, James: Distribution of Mountain Building in Geologic Time. Geol. Soc. Amer., Vol. 60, pp 561-590.

Greenly, 1919
Greenly, E.: The Geology of Angelsey, Great Britian Geol. Survey Mem., 1919.

Hill and Dibblee, 1953
Hill, Mason L. and Dibblee, T. W., Jr.: San Andreas, Garlock and Big Pine Faults, California, Bull. Geol. Soc. Amer., Vol. 64, No. 4, 1953.

Hill and Hobson, 1968
Hill, M. L. and Hobson, H. D.: Possible Post-Cretaceous Slip on the San Andreas Fault. In Proceedings of Conference on Geologic Problems of San Andreas Fault System. Edited by William R. Dickinson and Arthur Grantz. Stanford Univ. Pubs., Geological Sciences, Volume XI, Stanford, California, 1968.

C—038793

C-038793

References (continued)

Hsu, 1968
Hsu, K. Jinghwa: Principles of Melanges and Their Bearing on The Franciscan-Knoxville Paradox. Geol. Soc. Amer. Bull., Vol. 79, pp 1063-1074, August 1968.

Irwin, 1964
Irwin, W. P.: Late Mesozoic Orogenies in the Ultramafic Belts of Northwestern California and Southwestern Oregon. U.S.G.S. Prof. Paper 501-C, 1964.

Leith, 1949
Leith, Carlton James: Geology of the Quien Sabe Quadrangle, California. Bull. 147, State of California Division of Mines, 1949.

McKee, 1958
McKee, Elliott Bates, Jr.: The Geology of the Pacheco Pass Area, California. Stanford University, Ph.D. Thesis, 1959.

McLaughlin, 1971
McLaughlin, Robert J.: Geologic Map of the Sargent Fault Zone in the Vicinity of Mount Madonna, Santa Clara County, California. U.S.G.S. Open File Report, Menlo Park, California, 1971.

Page, 1966, 1970
Page, Ben M.: Geology of the Coast Ranges of California. In Geology of Northern California. Edgar H. Bailey, Editor. Bull. 190, California Bureau of Mines and Geology, San Francisco, California, 1966.

----------1970: Sur-Nacimiento Fault Zone of California, Continental Margin Tectonics. Geol. Soc. Amer. Bull., Vol. 81, March 1970.

Oakeshott, 1966
Oakeshott, Gordon B.: San Andreas Fault in the California Coast Ranges Province. In Geology of Northern California; Edgar H. Bailey, Editor. Bull. 190, California Bureau of Mines and Geology, San Francisco, 1966.

C-038794

C-038794

Radbruch, 1968
Radbruch, Dorothy H.: New Evidence of Historic Fault Activity in Alameda, Contra Costa, and Santa Clara Counties, California. In Proceedings of Conference on Geologic Problems of San Andreas Fault System. Edited by William R. Dickinson and Arthur Grantz. Stanford University Publications, Geological Sciences, Vol. XI, 1968.

Rogers and Nason, 1971
Rogers, Thomas R. and Nason, Robert D.: Active Displacement on the Calaveras Fault Zone at Hollister, California. Bull. Sesm. Soc. Amer., Vol. 61, No. 2, pp 399-416. April 1971.

Stewart, 1968
Stewart, Samuel W.: Preliminary Comparison of Seismic Traveltimes and Inferred Crustal Structure Adjacent to the San Andreas Fault in the Diablo and Gabilan Ranges of Central California. In Proceedings of Conference on Geologic Problems of San Andreas Fault System. Edited by William R. Dickinson and Arthur Grantz. Stanford University Publications, Geological Sciences, Vol. XI, 1968.

Taliaferro, 1943
Taliaferro, N. L.: Geologic History and Structure of the Central Coast Ranges of California; California Div. of Mines and Geol. Bull., 1943.

Tarling, 1968
Continental Drift, the Study of the Earth's Surface.

Yeats, 1968
Yeats, Robert S.: Southern California Structure and the History of the Pacific Basin. Geol. Soc. Amer. Bull., Vol. 79, No. 12, 1968, pp 1693-1702.

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APPENDICES

APPENDIX I

EXISTING ENVIRONMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA

APPENDIX I

EXISTING ENVIRONMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA

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APPENDIX I

EXISTING ENVIRONMENT IN THE SACRAMENTO-SAN JOAQUIN DELTA

The magnitude and diversity of the agricultural, fishery, wildlife, recreation, and navigation values associated with the Delta are highly important not only to the economy of the state of California, but to the entire Nation. Due to their uniqueness, it is essential that these values be preserved and, where possible, enhanced.

In its virgin state the Delta consisted of swamp and overflow lands that were inundated by ordinary high tides. The lands were covered with dense growths of tules, willows, and cottonwood trees. There was very little natural relief to the relatively flat surface of the Delta. An occasional sand hummock was the only feature visible above the natural plane of the sea-level swampland. Large numbers of waterfowl and wildlife were present.

a. Geography

The Delta area (shown on following page), consisting of about 690,000 acres of land and 50,000 acres of water, is located at the confluence of the Sacramento and San Joaquin Rivers. The two rivers enter the Delta from two corners of the triangular-shaped area and flow out through the third corner into Suisun Bay and subsequently into San Pablo Bay, San Francisco Bay and the Pacific Ocean.

After more than a century of man's activity, the Delta relief has been noticeably changed. Artificial levees have been constructed along the natural waterways to divide the Delta into about 50 separate parcels. These have been dewatered, drained, and leveled to form islands. About 700 miles of meandering waterways separating the land areas serve as the source of water and waste disposal for agricultural drains and carry runoff from the Central Valley to San Francisco Bay and the Pacific Ocean. These waters also provide habitat for a varied fishery and are used for both recreational boating and commercial navigation.

About 425,000 acres of the central land area of the Delta, commonly known as the Delta lowlands, lie between an elevation of 5 feet above and 15 feet below sea level. These lands are composed of peat, organic sediments, and alluvium 5 to 80 feet deep. Wind erosion and agricultural activity have caused a "sinking" of the land surface of peaty soils at a rate of up to 0.1 foot/year. The islands are protected from high tides and floods by manmade levees. The levees were built to enclose vast tracts of overflowed land. The water was then drained, leaving islands ranging from 200 to 23,000 acres in area. Each of the islands is saucer-shaped in profile but irregular in plan.

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The remaining 265,000 acres of land contained within the legal boundaries of the Delta, as defined by the California Water Code, are commonly known as the Delta uplands. Elevation of these land areas generally ranges from 5 feet above sea level to about 25 feet above.

b. Climate

The Sacramento-San Joaquin Delta area has a Mediterranean type of climate with warm, rainless summers and cool, moist winters. Cool ocean breezes entering the Delta area through the Carquinez Strait, very strong at times in the western portion, temper the extreme heat conditions which occur in other parts of the Central Valley. Prevailing winds over most of the Delta are from the west. The mean temperature is approximately 60°F with 45°F to 50°F from December to March, and about 75°F plus from June to September.

The annual rainfall over the Delta varies from about 18 inches in the eastern and central parts to about 12 inches in the southern part. More than 50 percent of the precipitation falls during the winter. Ocean and local fogs, coupled with the extensive areas of open water, produce a fairly high atmospheric humidity over the area even during the summer months.

Climatic conditions of the Delta area, coupled with manmade pollutants from agricultural burning and industrial processes in and around the Delta have a future potential for producing smog problems in the fall and winter months when an inversion condition develops throughout the Central Valley. Agricultural practices, by lowering the soil water table and tilling the surface, allow the peaty soils to oxidize and be carried off by the wind. In the past this has caused extensive peat dust storms in parts of the Delta. Current programs designed to modify the agricultural practice of clean tillage through intercropping or leaving stubble to hold the soil are helping to alleviate the problem.

Regulatory agencies of the local, State and Federal governments are engaged in an extensive program for elimination of the conditions favorable to smog pollution in the Delta area. In addition to automobile and industrial emission control, permits are required for agricultural burning and are issued only for those days when climatic conditions are favorable to movement of air pollutants from the Delta.

c. Soils

The Delta area constitutes one of the more distinct elements in the complex physiographic and soil patterns of California. Its peculiar pedologic, physiographic, agronomic and other features

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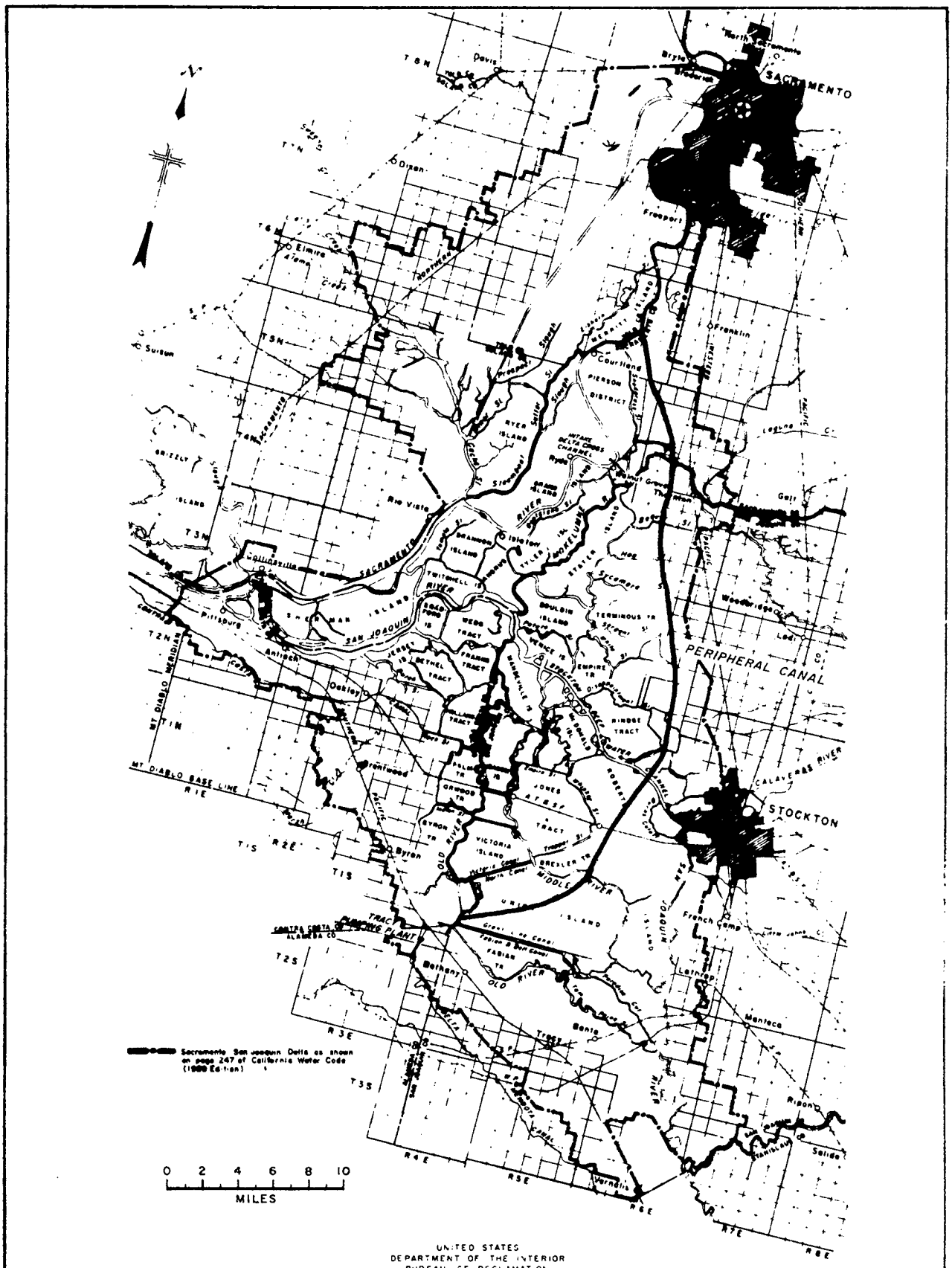

UNITED STATES
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DELTA DIV-PERIPHERAL CANAL UNIT-CALIF

SACRAMENTO-SAN JOAQUIN DELTA AREA

JANUARY 17, 1972

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make it definitely unique. The soils of the Delta can be placed into two general categories: organic and mineral. Location of these soils in the Delta is shown on plate I-2 following this page.

The soils within each category have common characteristics and bear close relationships to one another even though they differ significantly from other soils in California.

Most organic soils are derived from the water-saturated layer of tule-reed peat. The accumulation of plant remains covers approximately 415,000 acres from the junction of the Sacramento and San Joaquin Rivers, northward, eastward, and southward. The underlying material is a light gray mineral sediment. The peat ranges in depth from 2 feet along the eastern margin to about 40 feet at the western tip and averages about 18 feet.

The mineral soils are developed over transported materials of mixed mineralogical composition. These have developed profiles of moderately definite carbonate tendency. Their color ranges from brown to dark gray. With a few exceptions, they occupy flat basin-like areas on the lower slopes of the surrounding valley plain. They are subject to poor drainage and concentration of salts. These bodies can best be described as the transitional zone between the well-drained mineral soils of the upper valley and the waterlogged organic soils of the island country along the lower courses of the Sacramento and San Joaquin Rivers.

d. Minerals

The mineral resources of the Delta include sand dredged from the river channels and natural gas. Features of the CVP do not intersect any known mineral deposits. There is some possibility that existing or proposed features might cross some natural gas deposits, but this is not considered a problem as such deposits could be recovered using the area adjacent to the facilities.

e. Vegetation

Much of the land area of the Delta is extensively cultivated. A few scattered areas support tules and other natural vegetation. The manmade levees support vegetation characteristic of the alluvial plains and banks along the valley streams surrounding the Delta. Along the Sacramento River levees where the soil is quite mineral, Fremont cottonwoods, sycamore, black walnut, willows, and water-loving perennials grow near the waterline, and oaks, California buckeye, poison oak, wild grape, blackberry, and rye-grass grow higher on the levee section and on the adjacent higher sand, silty and loamy lands. In the central part of the Delta where soils are organic in origin and drainage is very poor, Fremont

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cottonwoods, willows, and blackberries are found, but the tule, particularly the common tule, is the most characteristic vegetation.

f. Agricultural and Industrial Economy

The fertile soils and convenient water supplies have led to an intensive agricultural development encompassing about 573,000 acres. The Delta, once famous for asparagus, potatoes, celery, and truck crops, presently produces large quantities of cereal and legume crops. This transition has been largely the result of competition with other producing areas for available markets and labor supplies and, more recently, higher price structures for these crops. The annual gross farm income is over $170 million.

The Delta's agricultural economy for many years (prior to CVP and SWP) was dependent upon repulsion of ocean salinity by uncontrolled widely fluctuating freshwater outflow. During the past 30 years, the Delta has been protected from salinity intrusion during the summer months by releases from upstream reservoirs of the Central Valley Project and more recently the State Water Project.

Several towns and cities are located in the upland areas and an industrial complex is expanding in the western part of the Delta. Early industrial development centered around food and kindred products, fishing, lumber, and shipbuilding activity. Large water-using industries, such as steel, paper products, and chemicals have developed in the western area where water, rail, and highway transportation, coupled with dependable water supplies, made available by physical works, have stimulated growth. This growth has been at an average rate of $20 million per year in capital investments through either establishment of new industries or expansion and modernization of old industries.

g. Transportation

Highways, railroads, deepwater channels, and waterways provide transportation in, around and through the Delta. In addition, commercial airports are located in Stockton and Sacramento, and several smaller public and private airfields are located in and adjacent to the Delta.

The interior Delta is crisscrossed by a system of levee and farm roads. Since a large part of the roads within the Delta remain in private ownership, land access to the Delta waterways by potential recreation users is restricted.

(1) Highways and Railroads. A network of Federal, State, and county highways, and a number of private roads cross or are adjacent to the Delta. Additionally, two railroads are located in

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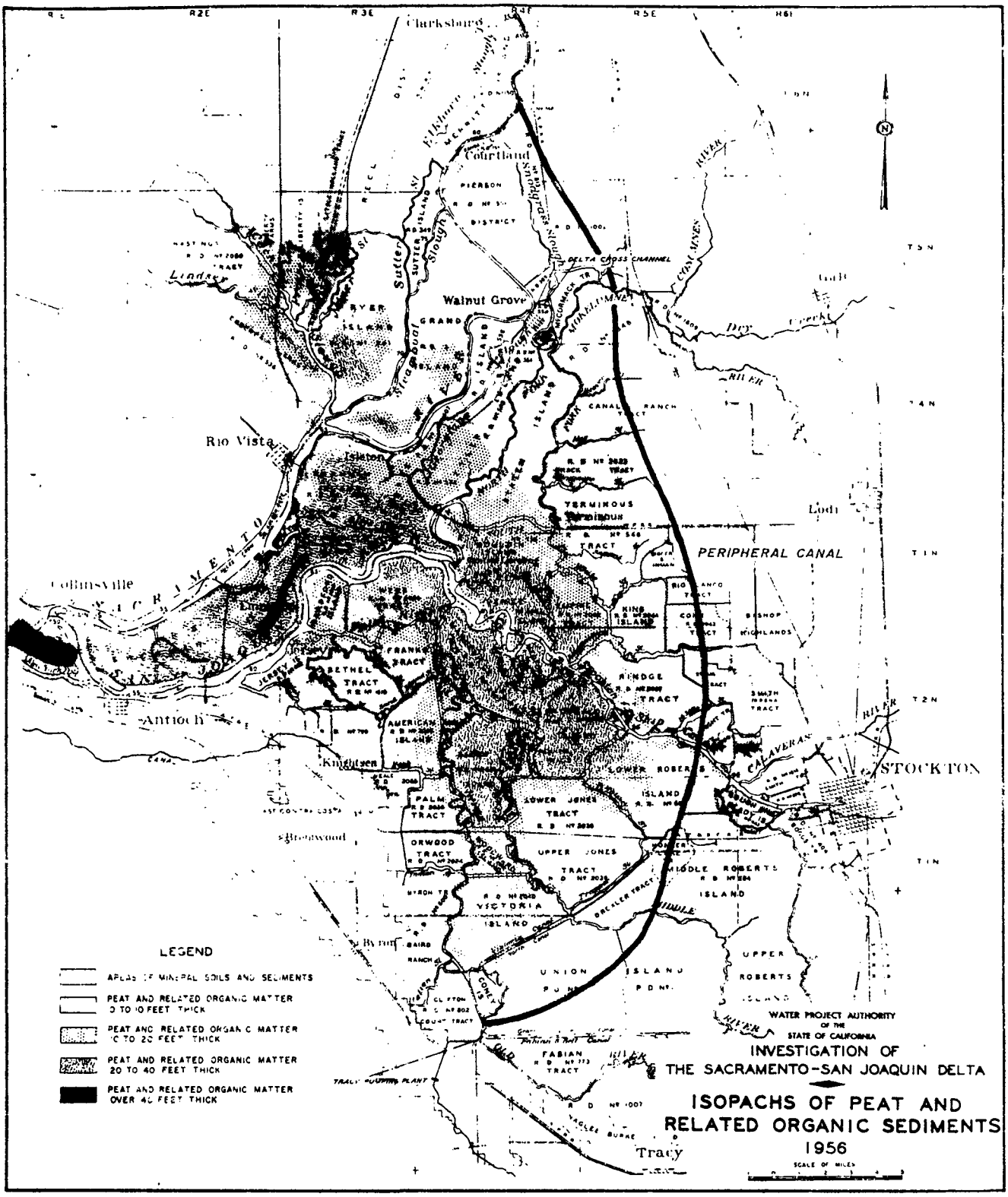

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the eastern portion of the Delta providing north and south transportation links within the valley, and a third crosses the Delta providing an east-west route. Interstate 5, a Federal highway, transverses the eastern and southern portions of the Delta. Interstate 5 is a major interstate highway which extends from Canada to Mexico. Within California, Interstate 5 is constructed or under construction, except for a 19-mile segment between Lambert Road in southern Sacramento County and Eight-Mile Road north of Stockton. This segment is currently scheduled for completion in 1979. However, funding limitations may delay the completion date.

Three State highways transverse the Delta area. State Route 160 is located on the crown of the levee of the Sacramento River, entering the Delta near Sacramento and extending to Antioch. State Route 12, an east-west highway, crosses west of Lodi and passes through Rio Vista. State Route 4, another east-west route, crosses west of Stockton, passing through Brentwood and Antioch.

The three rail lines which serve areas in the Delta are the Atchison, Topeka, and Santa Fe (AT&SF); Southern Pacific; and Western Pacific Railroads. The AT&SF provides freight and passenger service to Stockton and cities to the west of the Delta, in the western Delta and San Francisco Bay areas. The Southern Pacific Railroad provides freight service from Sacramento south to Isleton.

The Western Pacific Railroad provides passenger and freight service both to Sacramento and Stockton, and lies east of Interstate 5 alinement.

(2) Waterways and Deepwater Channels. Essentially all of the Delta channels are defined as navigable channels, and most are accessible, at least to small craft. In addition, deepwater channels have been constructed to serve the inland ports of Stockton and Sacramento approximately 100 miles inland from the ocean. Deep draft commercial navigation to the Port of Stockton in general follows the San Joaquin River, and to Sacramento follows the Sacramento River to north of Rio Vista, where it enters the Sacramento River Deepwater Ship Channel, which lies west of the Sacramento River. Commercial barge traffic still utilizes the Sacramento River, as well as the Sacramento River Deepwater Ship Channel.

h. Hydrology

Precipitation in California's Central Valley is typically concentrated in the winter months, while the summers are relatively dry. Most of the valley is tributary to the Delta, and so the

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volume of water entering the Delta usually undergoes large seasonal variations. In addition, the total valley runoff varies substantially from year to year. These seasonal and annual variations are reflected in variations in the magnitude and distribution of flows in the Delta channel network. Other factors causing Delta flows to vary are precipitation within the Delta, consumption of water by agriculture, and the operations of water projects within the Delta and on tributary streams.

The following data are based on a 33-year hydrologic study period for water years 1921-22 through 1953-54 assuming that water projects in existence in 1973 were operated during that period and assuming water demands at the 1973 level of development. (The water year extends October 1 through September 30 of the following year.) The data which are presented under the headings Delta Inflow, Internal Net Use, and Delta Exports are average values for the 33-year study period to show variations affecting Delta hydrology.

Delta inflow from the entire Central Valley plus Trinity River importation for the study period was estimated to average about 20,700,000 acre-feet per year at the 1973 development level. The inflow for the median hydrologic year, 1924-25 was estimated to be above 15,500,000 acre-feet. The degree of variation in inflows extended from a minimum of about 9,700,000 acre-feet in 1923-24 (dry year) to a maximum of about 42,200,000 acre-feet in 1937-38 (wet year).

Seasonal variation of the total Delta inflow is shown in the following tabulation by monthly averages for 1924-25, the median year.

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TYPICAL DELTA INFLOW FROM CENTRAL VALLEY
1973 Level of Development
1924-25 Hydrologic Conditions
(1,000's Acre-Feet)

Month	Inflow	Percent of Total
October	800	5
November	700	5
December	1,000	6
January	900	6
February	4,300	28
March	1,100	7
April	1,700	11
May	1,400	9
June	900	6
July	800	5
August	900	6
September	1,000	6
TOTAL	15,500	100

Inflows to the Delta may be categorized into three major groups: (1) Sacramento Valley inflows, including floodflows carried by the Yolo Bypass; (2) San Joaquin Valley inflows, including minor contributions from eastern Contra Costa County; and (3) east side stream inflows, including those of the Mokelumne, Cosumnes, and Calaveras Rivers and other smaller streams.

Variation of annual flow volumes (in 1,000 acre-feet) for the three major groups is as follows:

Inflow Group	Annual Average[a]	1923-24 Minimum	1937-38 Maximum
Sacramento Valley	17,200	8,000	31,900
San Joaquin Valley	2,500	1,500	8,000
East Side Streams	1,000	200	2,300
Central Valley Total	20,700	9,700	42,200

a For 33-year study, 1973 level of development.

The above shows that Delta inflow is dominated by the Sacramento River which accounts for 80 percent of the total, on

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the average. The San Joaquin Valley contributes 15 percent, and the east side streams account for the remaining 5 percent.

Internal net use of water within the Delta includes the combined effect of consumptive use by agriculture and evaporation from water surfaces which peaks in the summer and precipitation which is greatest during the winter. Use in the Delta uplands may be estimated from records of water pumped to individual farms. In the Delta lowlands, however, much of the water used by crops seeps through the levees surrounding the many islands and cannot be measured. Therefore, estimates of water consumed by various crops are based on field or laboratory measurements of unit consumptive use. The unit consumptive use (designated in acre-feet per year) varies with the type of crops and time of year. These figures when multiplied by the acreages of the various crops show the consumptive water use in acre-feet. The consumptive use modified by precipitation results in net use from Delta channels. Estimates of net water use are subject to inaccuracies due to the random variation of weather conditions from day to day and from year to year. Further uncertainty is introduced because the rate of net use by plants may be different from the rate of actual diversion from the adjacent channels since the amounts of available moisture contained in the soil changes from month to month.

Because of the inherent inaccuracies, it has been necessary to adopt an average set of values of net water use in the Delta to provide a common basis for planning estimates between the California Department of Water Resources and the U.S. Bureau of Reclamation. These average values which were based on estimates of net use for a 33-year period ending in 1953-54 are shown on the following table:

AVERAGE DELTA INTERNAL NET USE
1970 Level of Development[a]
(1,000's Acre-Feet)

October	112	April	49
November	43	May	114
December	-30	June	186
January	-61	July	268
February	-86	August	252
March	-40	September	173
		TOTAL	980

a The negative numbers in the winter months show that precipitation and runoff within the Delta were greater than use by plants in these months.

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The maximum net use of 268,000 acre-feet occurs in July and is equivalent to an average of over 4,300 ft^3/s. Delta net use, therefore, has a substantial effect on flows in the network of channels during the summer months.

Delta exports began in 1940 with the beginning of operation of the Contra Costa Canal of the Central Valley Project (CVP). Export by the Central Valley Project Tracy Pumping Plant began in 1951, and the State Water Project's Delta Pumping Plant began in 1967. Minor exports are also made by the city of Vallejo.

The total of these exports is increasing from year to year as the water requirements of the service areas to which they supply water increase. The amount exported in any given month in a year, however, depends on the hydrology of that year. Conditions are tabulated on the following table which shows the average monthly variation in exports for the 33-year hydrologic period (1921 through 1954) at the 1973 level of development. The 1973 level figures are not the actual 1973 export amounts. They are averages for the 33-year study period assuming 1973 level of water use.

AVERAGE DELTA EXPORTS
1973 Level of Development
(1,000's Acre-feet)

Month	Tracy Pumping Plant	Delta Pumping Plant	Contra Costa Canal	City of Vallejo	Total
October	250	216	8	1	475
November	207	260	7	1	475
December	259	197	6	1	463
January	31	146	6	1	184
February	121	146	6	1	274
March	191	146	7	1	345
April	213	115	8	1	337
May	270	20	9	1	300
June	255	90	10	2	357
July	273	134	11	2	420
August	245	193	11	2	451
September	199	240	9	1	449
TOTAL	2,514	1,903	98	15	4,530

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Exports are dominated by those at the Tracy and Delta Pumping Plants and are greatest in the spring and summer, and least during the winter. The present installed capacity of these plants is about 11,000 ft^3/s. However, even the current maximum exports, with monthly averages in the neighborhood of 7,500 ft^3/s, have a great effect on the magnitudes and directions of flow in some of the Delta channels, with minor effects on water levels.

Delta Flow Distributions - As previously described, the instantaneous flow at a given point in the Delta is in a state of continuous change, reversing about four times daily, but the flow can be summed during a complete tidal cycle to give the net flow. The magnitude and direction of net flows throughout the Delta channel network effects the aquatic environment, both from the standpoint of chemical water quality and in regard to the biota, particularly migratory fish and fish food.

Flow distributions in the Delta depend on the combined influences of inflows, use within the Delta, and exports. They are further dependent on the divisions of flow which occur at channel intersections.

Inflows and exports are routinely measured with some accuracy. As previously noted, internal Delta use must be estimated and is subject to uncertainty. Measurement of net flow divisions at the most important channel intersections has been attempted but has not been entirely successful. Therefore, the descriptions of flow distributions which follow will be qualitative rather than quantitative. The general direction of flows in the principal Delta channels under present conditions is shown on plate I-3 following page I-10.

After entering the Delta at its northern extremity, water in the Sacramento River Channel is diverted into other channels at several major points. The first diversion occurs at Sutter Slough, near Courtland, where water flows west. A short distance to the south, Steamboat Slough causes an additional westerly diversion. The two sloughs pass among a group of islands devoted to agriculture, merge, and rejoin the Sacramento River at Junction Point, north of Rio Vista. The net flows in Sutter and Steamboat Sloughs are influenced by the operation of the gated Delta Cross Channel; the flows being higher when the channel is closed than when it is open, other conditions being the same.

The Delta Cross Channel diverts water eastward from the Sacramento River into Snodgrass Slough. From there, the water passes into the north and south forks of the Mokelumne River and flows southward toward the San Joaquin River. This artificial

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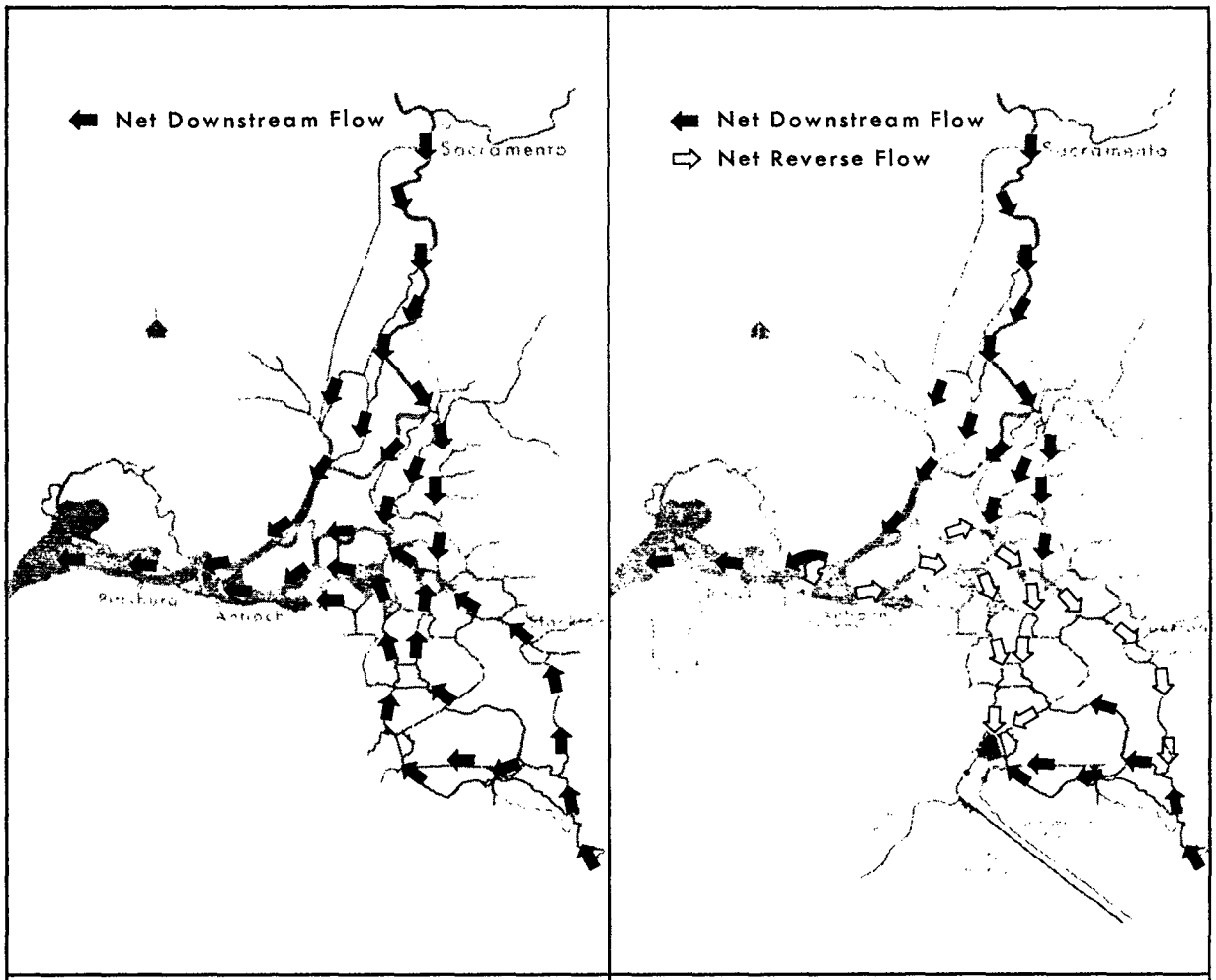
DIRECTION OF WATER FLOW SACRAMENTO-SAN JOAQUIN DELTA



PAST (PRIOR TO WATER DEVELOPMENT)	PRESENT (WITH CVP AND SWP)

channel was completed in 1951 by the U.S. Bureau of Reclamation for the purpose of providing increased amounts of good quality Sacramento River water in the central part of the Delta where it would be available for export by the Central Valley Project's Tracy Pumping Plant. Sacramento River water exported from this source reaches the Tracy Pumping Plant and, since 1967, the State Water Project's Delta Pumping Plant, via Old and Middle Rivers in the southern Delta. The gates on the Delta Cross Channel are normally open when flow in the Sacramento River is less than 30,000 ft^3/s. When open, it has a marked effect on tidal action in the Mokelumne River system and has a much greater impact on net flow in the north fork than on the south fork. This is because the south fork is somewhat smaller and has a restricted section near its north end.

At Walnut Grove, Georgiana Slough diverts flow from the Sacramento River southward to the Mokelumne River and the Central Delta. The effect of Georgiana Slough is thus similar to that of the Delta Cross Channel, in that it allows cross-Delta flow.

Threemile Slough, a few miles south of Rio Vista, is another channel the Sacramento River intersects on its way to San Francisco Bay. This slough, named for its length, connects the Sacramento and San Joaquin Rivers. Threemile Slough allows an exchange of water between the Sacramento and San Joaquin Rivers.

The pressure of winter floods on the Sacramento River is relieved by diverting excess waters into the Yolo Bypass above Sacramento. These floodwaters rejoin the Sacramento and enter the Delta through Cache and Prospect Sloughs and the Sacramento Ship Channel north of Rio Vista.

Along the eastern side of the Delta, the Mokelumne and Cosumnes Rivers and Dry Creek join and enter the Delta as the Mokelumne River a few miles east of Walnut Grove. These waters flows southward in the two forks of the Mokelumne and discharge into the San Joaquin River in the central Delta. Other streams entering the Delta along its east side include the Calaveras River, Bear Creek, Littlejohns Creek, and Mormon Slough.

The San Joaquin River enters the Delta at its southern limit near Vernalis and flows toward Stockton. A major flow division occurs north of Mossdale, where a portion of the San Joaquin River flows west in Old River. The proportion of flow thus diverted is strongly influenced by the export pumps near Tracy. If the pumps are not operating, about half of the San Joaquin River flows into Old River. When the pumps are in operation, however, they may draw the entire inflow of the San Joaquin River into Old River depending on the rate of pumping in relation to the flow of the river.

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As internal net use of water in the Delta is not measured, it is not possible to accurately determine its impact on Delta flow distributions in any month or year. It can be assumed, however, that for any reach of channel, the proportion of the estimated total internal net use is equal to the proportion of the Delta's agricultural area served by the channel.

The Federal and State pumping plants, located close together on Old River near Tracy, exert a major influence on flow distributions in the southern and western portions of the Delta. A smaller, more localized effect is caused by the operation of the Federal Contra Costa Canal which exports water from Rock Slough.

The effect of the Federal and State exports depends on their magnitude relative to Delta inflows and internal net uses. The several general cases are summarized as follows:

(1) If there is sufficient flow in the San Joaquin River at Mossdale to at least meet the total exports and internal uses in the southern Delta, then seaward flow will be maintained in all Delta channels.

(2) If the San Joaquin River does not meet the exports and the southern Delta internal uses, the deficit may be made up by inflows from the eastern stream group and by Sacramento River water flowing through Georgiana Slough and the Delta Cross Channel. In this case, the net flow in Old and Middle Rivers and the channels connecting them will be reversed; that is, the flow will be southerly, toward the export pumps. If the pumping is sufficiently larger than the San Joaquin River inflow, the direction of net flow in the San Joaquin River between Stockton and Old River will be reversed; that is, the net flow will be southerly toward the head of Old River.

(3) If the export and internal uses are greater than the combined inflows from the San Joaquin River and the eastern streams, together with the flows in Georgiana Slough and the Delta Cross Channel, then the balance is made of water from the Sacramento River, flowing southerly through Threemile Slough, or by Sacramento River water which passes the westerly end of Sherman Island and travels easterly up the San Joaquin River past Antioch. In this case, net flow in the San Joaquin River is reversed from Collinsville to Old River.

The Contra Costa Canal, with its diversion from Old River via Rock Slough, contributes to the reversal of flows in the southern and western Delta when they occur.

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i. Tidal Influence

The dominant gravitational force producing tides is that of the moon. With reference to a fixed point, the moon orbits the earth in about 24 hours and 50 minutes, the average duration of a complete tidal cycle. A tidal cycle consists of two periods of rising tide and two periods of falling tide. The relative maximum and minimum elevations achieved at a point are called lower low tide, lower high tide, higher low tide, and higher high tide. The difference between higher high tide and lower low tide is called the diurnal range. The tide range varies from place to place on the ocean surface depending on local conditions. It varies from day to day as the positions of the moon and sun change relative to the earth. An inflowing or rising tide is known as floodtide, and outgoing or falling as ebbtide.

Within the Delta, the maximum daily tidal variations are about 3 feet at the town of Hood on the Sacramento River in the northern Delta, about 4 feet at the confluence of the Mokelumne and San Joaquin Rivers in the central Delta, about 4 feet at Clifton Court on Old River in the southwestern Delta and about 5 feet at Antioch on the San Joaquin River in the western Delta. Concurrent with tidal rise and fall, water in the channels moves upstream and downstream for a distance of several miles and circulates through the interconnected channels. This tidal action is a vital part of the environment of the Delta.

Tidal action and resultant currents distribute the Delta's aquatic food supply among the channels. Tidal and wind action also maintain high turbidity levels in the water which, with few exceptions, maintains algal growth below nuisance levels. The tidal flows greatly overshadow summer and fall net channel flows in the western Delta. For example, the tidal flow in the Sacramento and San Joaquin Rivers near Antioch range from 150,000 to 250,000 ft^3/s while the net Delta outflow varies from 3,000 to 11,000 ft^3/s. It should be noted that prior to the CVP, the net Delta outflow during certain dry periods was negative, with salt from the bay moving into the Delta as can be seen by the salinity encroachment shown on plate I-4.

j. Water Quality

(1) General. Quality of water in the Delta is determined by seven major factors. These are: (1) Quality and quantity of inflow waters from the Sacramento and San Joaquin Rivers; (2) quantity of diversion; (3) quantity and quality of waste return flows within the Delta; (4) the degree of mixing that takes place within the system of waterways; (5) activities which change flow regimen of the waterways such as dredging for navigation and levee maintenance; (6) the climatic conditions; and (7) tidal influence.

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The Sacramento River contributes approximately 80 percent of the total inflow to the Delta. The San Joaquin River and east side streams contribute the remaining 20 percent. At present, under the coordinated operation of the Central Valley Project and the State Water Project, Sacramento River water flows through the natural and manmade channels of the Delta to the Federal and State pumping plants. This method of water transfer also serves to meet demands within the Delta.

Salinity intrusion into the Delta results from the flooding and ebbing of ocean tides through the San Francisco Bay and Delta system. The extent of the intrusion is dependent on the amount of Delta freshwater outflow.

Prior to the operation of Shasta Dam of the Federal Central Valley Project, saline water intruded into the Delta beyond Emmaton on the Sacramento River and Jersey Point on the San Joaquin River in 14 out of 24 years between 1920 to 1943. This is illustrated by the lines on plate I-4 on the following page, which indicate the limit of maximum intrusion of salinity of 1,000 parts chlorides per million parts of water. Subsequent to the operation of Shasta Reservoir, sufficient water has been released from storage to prevent saline water from intruding beyond the extreme western Delta as shown on plate I-5.

In the report, "San Joaquin Master Drain Effects of Water Quality on San Francisco Bay and Delta," January 1967, the U.S. Department of the Interior, Federal Water Pollution Control Administration (now EPA), used their current water quality data to determine the contribution of total dissolved solids (TDS), chlorides (Cl), total nigrogen (N), phosphorus (P), and biochemical oxygen demand (BOD) by streams tributary to the Delta. The quality data were adjusted to reflect median streamflow conditions for "present" upstream development by establishing a relationship between streamflow and pollutant load in pounds per day. As excerpted from table 16 of the above report, the resulting "design" quality inflow for the Delta tributary streams in a typical July and January for "present" conditions is shown in the following tabulation. (Eastern Delta streams include the Cosumnes, Mokelumne and Calaveras Rivers and Dry Creek.)

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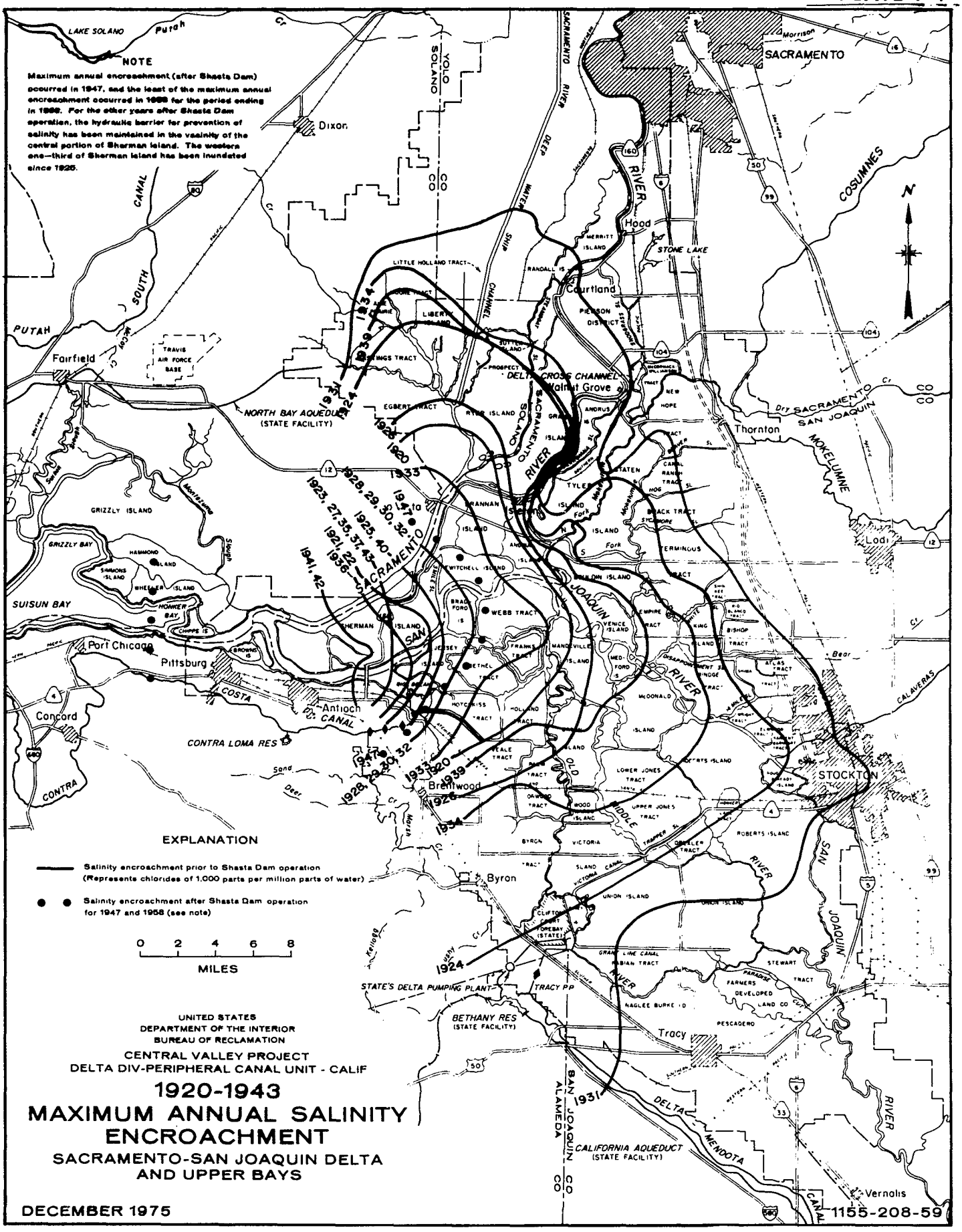
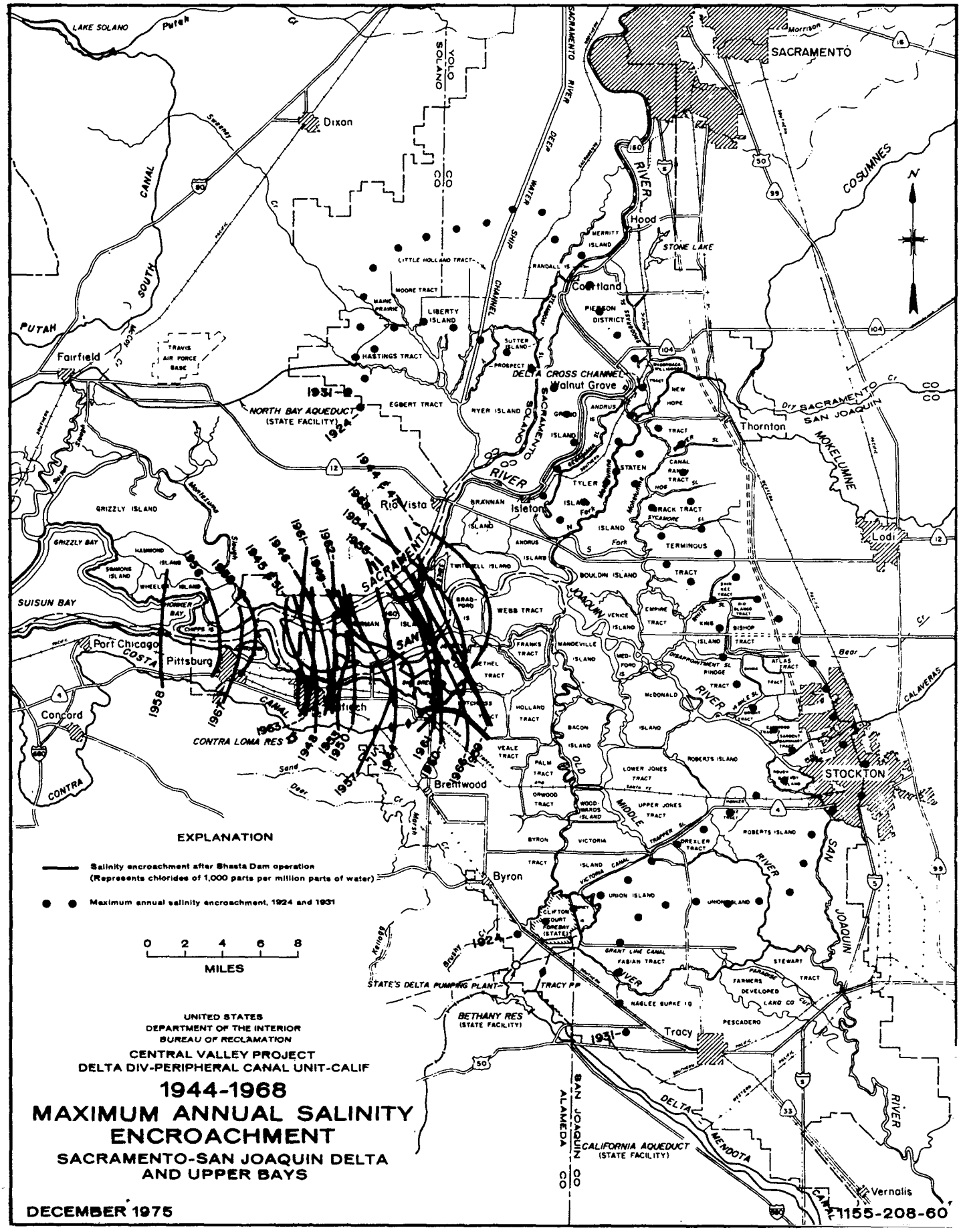

NOTE
Maximum annual encroachment (after Shasta Dam) occurred in 1947, and the least of the maximum annual encroachment occurred in 1958 for the period ending in 1968. For the other years after Shasta Dam operation, the hydraulic barrier for prevention of salinity has been maintained in the vicinity of the central portion of Sherman Island. The western one-third of Sherman Island has been inundated since 1926.
LAKE SOLANO
Putah
Dixon
SACRAMENTO
Hood
STONE LAKE
Courtland
Fairfield
PUTAH
SOUTH
CANAL
TRAVIS AIR FORCE BASE
NORTH BAY AQUEDUCT (STATE FACILITY)
DELTA CROSS CHANNEL
Walnut Grove
Thornton
Dry
SACRAMENTO
SAN JOAQUIN
MOKELUMNE
COSUMNES
GRIZZLY ISLAND
GRIZZLY BAY
SUISUN BAY
HONKER BAY
Port Chicago
Pittsburg
Concord
CONTRA COSTA CANAL
CONTRA LOMA RES
Antioch
Brentwood
Byron
Lodi
STOCKTON
Tracy
STATE'S DELTA PUMPING PLANT
TRACY PP
BETHANY RES (STATE FACILITY)
CALIFORNIA AQUEDUCT (STATE FACILITY)
DELTA MENDOTA CANAL
Vernalis
1934
1939
1931
1924
1928
1920
1933
1923, 27, 35, 37, 43
1925, 40
1928, 29, 30, 32
1947
1921, 22
1936
1941, 42
1947
1928, 29, 30, 32
1933
1920
1939
1926
1934
1924
1931
EXPLANATION
Salinity encroachment prior to Shasta Dam operation (Represents chlorides of 1,000 parts per million parts of water)
Salinity encroachment after Shasta Dam operation for 1947 and 1958 (see note)
0 2 4 6 8
MILES
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
DELTA DIV-PERIPHERAL CANAL UNIT - CALIF
1920-1943
MAXIMUM ANNUAL SALINITY ENCROACHMENT
SACRAMENTO-SAN JOAQUIN DELTA AND UPPER BAYS
DECEMBER 1975
1155-208-59


EXPLANATION
Salinity encroachment after Shasta Dam operation
(Represents chlorides of 1,000 parts per million parts of water)
Maximum annual salinity encroachment, 1924 and 1931
0 2 4 6 8
MILES
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
DELTA DIV-PERIPHERAL CANAL UNIT-CALIF
1944-1968
MAXIMUM ANNUAL SALINITY
ENCROACHMENT
SACRAMENTO-SAN JOAQUIN DELTA
AND UPPER BAYS
DECEMBER 1975
1155-208-60
SACRAMENTO
Dixon
Fairfield
Rio Vista
Isleton
Walnut Grove
Hood
Courtland
Thornton
Lodi
Pittsburg
Port Chicago
Concord
Antioch
Brentwood
Byron
Tracy
STOCKTON
Vernalis
SUISUN BAY
NORTH BAY AQUEDUCT
(STATE FACILITY)
CONTRA LOMA RES
STATE'S DELTA PUMPING PLANT
TRACY PP
BETHANY RES
(STATE FACILITY)
CALIFORNIA AQUEDUCT
(STATE FACILITY)
DELTA CROSS CHANNEL
SACRAMENTO RIVER
SAN JOAQUIN RIVER
MOKELUMNE
COSUMNES
CALAVERAS
SOUTH BAY AQUEDUCT
CONTRA COSTA CANAL
TRAVIS AIR FORCE BASE
SAN JOAQUIN CO
ALAMEDA CO
SOLANO CO
YOLO CO
CONTRA COSTA CO

	Sacramento River	San Joaquin River	Eastern Streams
		July Condition	
Flow, ft^3/s	10,968	902	309
TDS (mg/1)	123	684	139
Cl (mg/1)	14	166	14
N (mg/1)	0.3	1.0	0.3
P (mg/1)	0.07	0.25	0.07
BOD (mg/1)	0.8	2.2	0.8
		January Condition	
Flow, ft^3/s	21,509	2,228	1,138
TDS (mg/1)	88	308	88
Cl (mg/1)	8	86	8
N (mg/1)	0.3	1.0	0.3
P (mg/1)	0.07	0.16	0.07
BOD (mg/1)	0.8	1.2	0.8

Water quality problems that exist at present in varying degrees in the Delta may be categorized as (1) eutrophication and related dissolved oxygen deficiencies, (2) salinity, (3) toxic materials, and (4) bacteriological quality.

(2) Eutrophication and Dissolved Oxygen Deficiencies. The most significant enrichment resulting in dissolved oxygen problems in the Delta occurs in the San Joaquin River and dead-end sloughs in the eastern Delta which receive wastes but have very little flow. In the western Delta channels municipal wastes, together with industrial process and cooling water return flows, constitute a potential problem to western Delta water supplies.

The problem in the San Joaquin River between Vernalis and in the vicinity of the Stockton Ship Channel occurs mainly in the late summer and fall and coincide with low riverflows, high temperatures, and the harvesting season when fruit and vegetable canneries are in full operation. During summer months the San Joaquin River above Stockton is essentially a waste drain enriched by agricultural, municipal and industrial wastes. The river is extremely turbid as a result of silt accompanying drainage and high algal populations resulting from enrichment. Typical summer plankton counts in the Delta system have ranged from 3 million cells per liter in the Sacramento River at Walnut Grove to more than 70 million cells per liter in the San Joaquin River below Mossdale. These algal blooms occur almost every summer and are indicative of excessive enrichment of San Joaquin River waters.

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Increasingly, in recent years, low dissolved oxygen levels have been recorded in the eastern and southern fringes of the Delta. These low oxygen levels are attributable to respiration and decay of algae and to decay of wastes from municipal and industrial processes. The most serious impact from the low dissolved oxygen levels has been on salmon migrating through the San Joaquin system in the vicinity of Stockton. The following tabulation of data from the Bureau of Reclamation's water quality sampling program show minimum dissolved oxygen in this area that was recorded from 1968 through 1973. These low dissolved oxygen levels (less than 5.0 mg/1) take place only in the dead-end sloughs of the eastern Delta and in the southeastern Delta channels such as Old River and the Stockton Ship Channel near Stockton. Low dissolved oxygen levels do not presently occur in the western Delta-Suisun Bay area. The mean dissolved oxygen reading from all stations in the Bureau's Delta-Suisun Bay Surveillance Program for 1969 and 1973 was 8.9 mg/1, with dissolved oxygen levels seldom falling below 8.0 mg/1.

Station name	Minimum recorded D.O. (mg/1)
*Beaver Slough near Thornton	0.2
*Hog Slough near Thornton	3.8
*Sycamore Slough near Lodi	0
*Disappointment Slough near Lodi	0.9
Stockton Ship Channel at Light 40	3.6
Old River at Tracy Road	2.8
*Snodgrass Slough at Southern Pacific Railroad Bridge	4.0
*White Slough at Rio Blanco Tract	0.3

* Dead-end sloughs

(A minimum D.O. level of 5.0 mg/1 is deemed necessary for sustaining salmon migrations.)

(3) Salinity. Due to seasonal salinity intrusion into the extreme western Delta (Antioch area), municipal and industrial water diversions from the Delta waterways must be discontinued and process water purchased from the Contra Costa Canal, CVP, during the late summer months. The average annual maximum seasonal salinity intrusion (average for the maximum month) at Jersey Point under CVP operating conditions from 1954 through 1968 has been about 750 p/m TDS (300 p/m Cl). For similar hydrological years under preproject conditions (natural Delta inflow index), the estimated average annual maximum salinity at Jersey Point

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would have been about 1,400 p/m TDS (600 p/m Cl). However, historical salinity prior to CVP operations was significantly worse in critical dry years. As an example, the recorded mean tidal salinity in 1931 peaked at 11,000 TDS (6,600 Cl) at Jersey Point.

Some increases in winter salinities in the western Delta have been recorded in the vicinity of the Contra Costa Canal intake during recent years. Based on water quality sampling data, these increases appear to be attributable to winter salt leaching of agricultural lands in areas of the Delta adjacent to Old River and Rock Slough and along the San Joaquin River upstream of the Delta.

Table 20 of DWR Bulletin No. 123, "Delta and Suisun Bay Water Quality Investigation," dated August 1967 presents the average seasonal quantities and qualities of agricultural drainage for the Delta in 1964. For August 1964 the drain flows amounted to about 1,200 ft^3/s and the quality averaged from about 240 p/m TDS in the northern Delta, 676 p/m TDS in the western Delta, to 860 p/m TDS in the southeastern Delta. In January 1964 the drain flows amounted to about 1,600 ft^3/s and the quality averaged from about 860 p/m TDS in both the northern and southwestern Delta, and 890 p/m TDS in the western Delta.

A major portion of the extreme southern Delta does have significant water quality problems. A combination of streamflows that contain a high proportion of drainage return flow, due to upstream water use and waste disposal, and municipal and industrial waste disposal within the channels degrade quality of water in this area. On some occasions in the past, this water quality degradation has produced high concentrations of TDS in water diverted to the Central Valley Project. Agricultural diverters using waters from the lower San Joaquin River have often been damaged in the past due to high TDS concentrations resulting from upstream agricultural return flows and from local waste disposal and water circulation conditions. The following tabulation shows TDS data recorded during 1972 by the Delta Water Users Association--a group of southern Delta agricultural water users:

	Total dissolved solids in parts per million (p/m)			
	May	June	July	August
Vernalis	617	631	715	687
Paradise Cut	980	1,095	1,025	971
Tom Paine Slough	1,170	1,050	1,225	1,068

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Referencing of the above data to plate I-6 shows that while water crossing the Delta to the export pumps was 450 p/m TDS or less and water coming into the Delta from the San Joaquin River at Vernalis was 715 p/m TDS or less, water being used in Paradise Cut was continually in excess of 970 p/m TDS and in Tom Paine Slough was in excess of 1,050 p/m TDS. This data provides an example of localized pollution problems of agricultural water users along the lower San Joaquin River in the southern Delta.

Water quality standards adopted by both the Federal and State governments require maintenance of 500 p/m TDS monthly average at Vernalis on the San Joaquin River. Releases from the New Melones Reservoir (presently under construction) will be utilized to implement this standard.

Since the CVP began operation in 1944, ocean salinity has caused no major problems in the eastern Delta area. Salinities in some of the smaller channels rise during the summer months due to agricultural return flows and during the winter months due to agricultural leaching operations. State and Federal standards require maintenance of normal year monthly average TDS concentration of 500 p/m or less at some control stations in the central portion of the Delta, and up to 700 p/m in the eastern Delta channels.

(4) Toxic materials. During low flow portions of the year waters flowing into the Delta had been used and reused for agricultural purposes many times prior to reaching the Delta. During the course of this use material used in the drainage area such as chlorinated hydrocarbon pesticides and organophosphate compounds accumulate in the surface runoff and are brought into the Delta. Municipal and industrial waste discharges, agricultural operations in the Delta, and accidental spills or discharges of chemicals also contribute to toxicity levels of Delta waters. The following tabulation excerpted from table 20 of the study report, "San Joaquin Master Drain Effects on Water Quality of San Francisco Bay and Delta," January 1967, U.S. Department of the Interior, Federal Water Pollution Control Administration, shows concentrations of pesticides in Delta waters for the period 1963-66. This tabulation derived from California Department of Water Resources data is indicative of present levels of toxic materials in the Delta, with the exception of DDT and DDD compounds. Since the mid-1960's the use of nondegradable pesticides has declined, and there are indications that the pesticide levels in the Central Valley and the Delta have declined since the 1963-66 period, and will continue to decline in the future.

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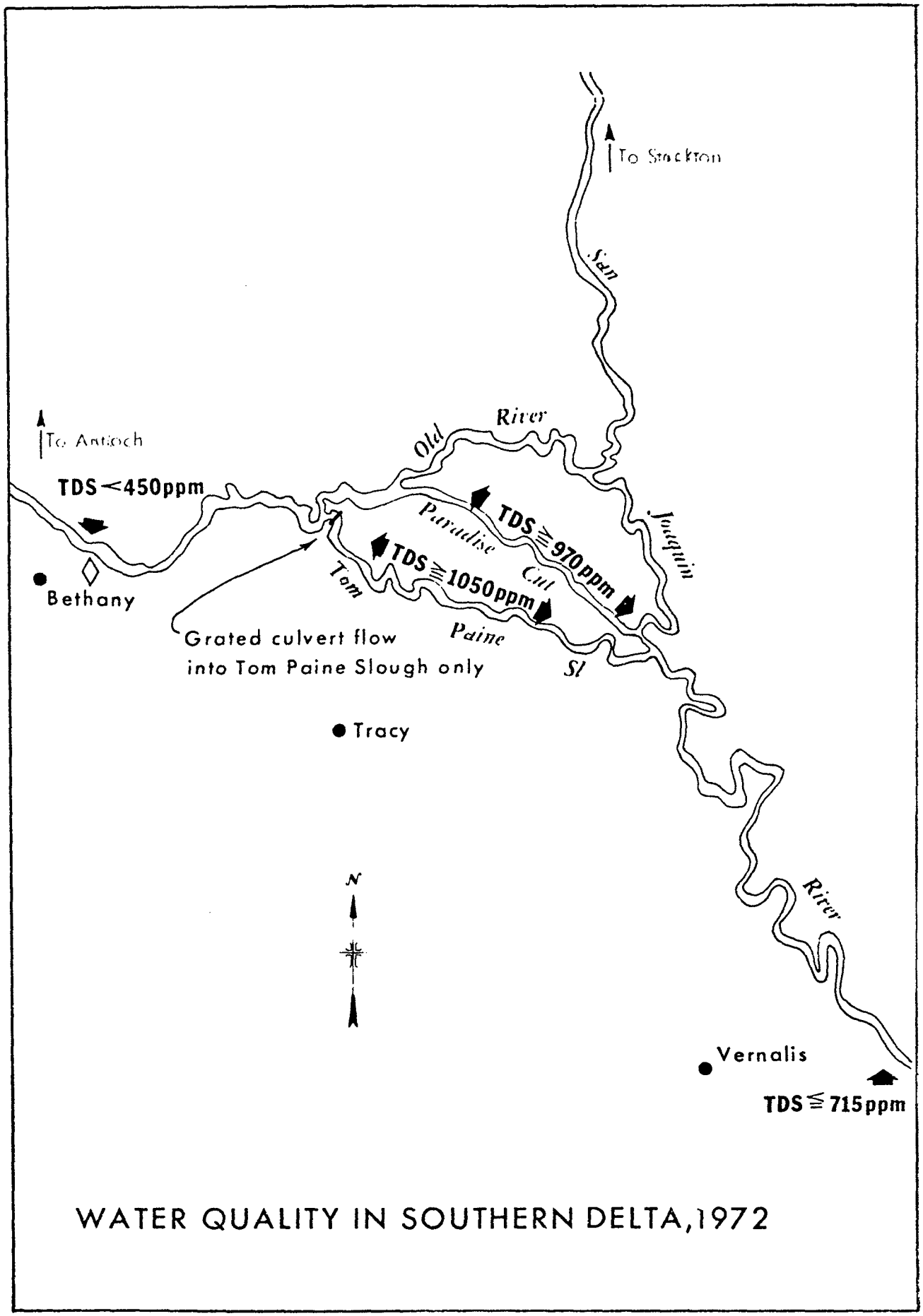

WATER QUALITY IN SOUTHERN DELTA, 1972

Appendix I

Pesticide Compound[a]	San Joaquin River @ Vernalis mean	peak	%[b]	Sacramento River @ Walnut Grove mean	peak	%[b]	San Joaquin River @ Antioch mean	peak	%[b]
Chlorinated Hydrocarbons (No. of Analyses)			(109)			(113)			(68)
DDT-DDD	<.070	.400	82	<.055	.200	75	<.058	.170	94
Toxaphene[c]	<.100	.930	32	<.040	.400	16	<.037	.320	6
DDE	<.032	.100	41	<.032	.100	46	<.030	.050	47
Heptachlor Epox.	<.032	.065	34	<.030	.040	48	<.030	.050	56
Lindane	<.031	.070	33	<.030	.070	32	<.032	.100	47
BHC[c]	<.030	.070	6	<.030	.100	9	<.031	.080	3
Dieldrin	<.032	.075	13	<.032	.150	16	<.033	.100	9
Heptachlor	<.030	<.030	4	<.030	.040	5	<.030	.030	0
Thiophosphates (No. of Analyses)			(60)			(52)			(49)
Parathion	<.060	13.9	5	<.060	5.08	4	<.060	5.30	4
Malathion	<.060	.120	8	<.060	.080	10	<.060	.080	6
Baytex	<.060	1.20	10	<.060	<.060	4	<.060	<.060	10
Ethion	<.060	<0.60	10	<.060	<.060	2	<.060	<.060	2

[a] Units of measurement in micrograms per liter.
[b] % = Percent of samples in which detected.
[c] Presumptive.
[d] = There was no measured amount and the sensitivity of the tests was limited to the values indicated.

Although only the Antioch site is common to both sampling programs, pesticide analysis data from the Bureau of Reclamation's Delta-Suisun Bay Surveillance Program gives evidence of the continued decline of pesticide levels in the Delta and Suisun Bay as shown below for the 1971-72 sampling year.

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Station number	Location	Samples
D6	Carquinez Strait at Martinez	12
D12	San Joaquin River at Antioch	13
D14A	Big Break	12
D15	San Joaquin River at Jersey Point	10
D19	Frank's Tract	12
D24	Sacramento River at Rio Vista	12
P2	Mokelumne River below Cosumnes River	17
P8	Stockton Ship Channel at Light 40	17
	Total number of samples	105

Pesticides detected	Limits of detection (microgram/liter)
Aldrin	.003
BHC	.003
DDE	.003
DDT	.010
Dieldrin	.003
Meptachlor	.003
Meptachlor-Epox.	.003
Toxaphen	.100
Arochlor (analyzed once at each site)	.028

Type and incidence of pesticide detection

	D6	D12	D14A	D15	D19	D24	P2	P8
Aldrin							1/.009[a]	1/.009
BHC							1/.005	1/.006
DDE						1/.021	1/.007	1/.003
Meptachlor-Epox.							1/.007	1/.013[b]
Arochlor	1/.034			1/.054		1/.090	1/.038	1/.047

[a] 1/.009 means pesticide occurred in one sample at a concentration of .009 micrograms per liter.
[b] Presumptive.

(5) Bacteriological Quality. Bacteriological quality of Delta waters as measured by the presence of coliform bacteria generally depends upon the proximity to a waste discharge point and method of treatment of wastes discharged into the Delta. Highest concentration of coliform organisms are found in the western Delta.

Future enforcement of treatment requirements for municipal waste effluents discharging into receiving waters of the Delta and tributary streams by the State Water Resources

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Control Board plus waste discharge restrictions on commercial and pleasure boating should eliminate most problems of bacterial contamination.

k. Ground Water

Ground-water levels are variable and fluctuate widely in short periods of time. At present, recharge of ground water appears to result from a number of sources including seepage from rivers and sloughs, infiltration from rainfall, and influent seepage of irrigation water. Although dependent on many factors, seepage is primarily dependent upon the difference in elevation between the water level in the channel and the ground-water table level, the period of time the water level in the channel remains above the level of the water table, and the permeability of the soils through which the water travels. In April 1966, the Bureau of Reclamation and Department of Water Resources developed a ground-water monitoring system for the Peripheral Canal.

Installation of the monitoring system began in August 1966, and became fully operational in 1969. Water levels in the study area are monitored through a network of wells and piezometers, shown on plate I-7 following page I-21. Additional information obtained by: use of infrared photography and subsurface exploration to identify areas susceptible to seepage and flooding; use of aerial photography and surveillance to determine land use, cropping, irrigation and leaching practices; and collection of power consumption records for drainage pumps located in the study area to develop a profile of pre-canal drainage pumping. Information is also obtained on agricultural practices so that any changes occurring in the parameters being monitored can be evaluated.

During the spring of 1971, after a minimum of 2 years of full-scale data collection, all information was analyzed and the monitoring of ground-water wells was revised as shown below. Water levels in investigation wells, near the proposed Peripheral Canal alinement, drilled in July of 1966 and measured five different times through January 1967, ranged from just below ground level to 12 feet deep and fluctuated in a range from 2 to 6 feet.

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Approximate number and frequency of measurements[a]	Prior to July 1971	July 1971 to January 1973[b]
Sites measured monthly	520	210
Sites measured continuously	20	40
Sites measured semiannually	0	210
Sites measured annually	0	50

[a] Semiannual measurements taken in spring and fall to approximate the annual high and low ground-water levels, respectively. Annual measurements taken in the spring.

[b] Thirty measurement sites destroyed or removed during this period.

Ground-water quality, determined from samples obtained along the proposed Peripheral Canal alinement, can be defined as very hard and alkaline. Twenty-six samples taken during 1964 and 1965 had the following generalized characteristics:

	Average Total	Range
Hardness	639 p/m	113 to 1420 p/m
Specific Conductance	1818 micromhos	540 to 4700 micromhos
Chloride	363 p/m	35 to 1220 p/m
Sulfate	147 p/m	10 to 533 p/m

Two samples also showed an unusually high concentration of nitrate-nitrogen of 153 to 241 p/m. This is believed to be very localized, resulting from local land use practices.

Ground water in the area is used for local domestic purposes, but only on a very small scale for irrigation. Waterlogged areas represent only a very small portion of the canal right-of-way area.

1. Water Transfer

Operation of the Contra Costa Canal during the 1940's required no significant alteration of patterns of streamflow that had developed among the manmade islands of the Delta. In 1951 start of operations of the Delta-Mendota Canal for diversion of water to the San Joaquin Valley necessitated major modification of streamflow patterns in the Delta (plate I-3 following page I-10. in order to provide a good quality of water at the diversion pumps during the summer months. After the normal winter rainfall and resulting floodflows subsided, the San Joaquin River water which was drawn toward the intake to the pumps was of very poor quality (high in total dissolved solids and organic material, compared to

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Sacramento River quality). This deteriorated quality resulted primarily from low streamflow and return flows by upstream water diverters.

The Delta Cross Channel was placed in operation in 1951 to provide for transport of Sacramento River flows across the Delta to the pumps. With the Cross Channel in operation, water was diverted from the Sacramento River near Walnut Grove into the Mokelumne River system. With this system of transfer, a high quality of water has resulted at the points of diversion and in the central Delta and in the parts of the Middle and Old River Channels in the southern Delta.

In 1967 the Delta Pumping Plant of the State Water Project began operation for diversion of water from the southern Delta to the south San Francisco Bay area, the San Joaquin Valley, and southern California by use of the same transfer method. This increased diversion from the Delta necessitated additional Central Valley Project releases from upstream storage to insure that water quality criteria at the point of diversion are met in dry years.

In most years since 1954, during periods of low Delta outflow, reverse net flows in the western Delta have occurred along the main channel of the San Joaquin River from Antioch to the mid-Delta area, generally in increasing magnitude and duration. These reverse flows occur because the north-south channels in the interior Delta are limited in the amount of flow they can carry, and inflow from the San Joaquin River is often low. This means that a portion of the water being conveyed to the pumps and to south Delta irrigators is drawn through the western Delta near Antioch and up the San Joaquin River.

As pointed out, operation of the Federal Central Valley Project and more recently the State Water Project, has been beneficial to most of the Delta area from a water quality standpoint. However, from a fishery standpoint several environmental problems have occurred which require correction. Young fish of all species and quantities of plankton and other basic fish food are attracted to the pumps and, despite use of louver screening devices, there are losses attributed to pumping. In this context, "loss" indicates that the fish are physically transferred from the Delta to export area canals and reservoirs. One positive result of this resource transference has been the striped bass fishery in San Luis and Contra Loma Reservoirs, O'Neill Forebay and the canal systems. In 1971 and 1972, the number of fish caught in San Luis Reservoir, although considerably smaller in individual fish size, was roughly equivalent to 50 percent of the total striped bass catch for the Bay-Delta system. A fishery of some of the other fish going through the louvers such as catfish has also developed, while salmon and steelhead appear to be lost to the system.

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The flows in some of the Delta channels are modified by the cross-Delta method of water transfer, causing reverse flows in some channels. These factors impede the passage of anadromous fish bound for San Joaquin River spawning grounds and might have contributed to the decline of runs of the past. However, other effects such as low spring and fall riverflows, unscreened upstream diversions, and waste disposal are also considered to have an adverse impact on the anadromous fishery.

m. Fishery

(1) General. Striped bass, king salmon, white sturgeon, green sturgeon, steelhead trout, American shad, white catfish, channel catfish, black crappie, largemouth bass, brown bullhead, and a number of other species of fish depend upon the Delta for part or all of their life cycle. Of these species the striped bass, American shad, largemouth bass, white and channel catfish, and black crappie are introduced fish not native to the Delta.

Spawning migrations of striped bass, king salmon, American shad and white sturgeon occur in the Sacramento River and its tributaries. Mature striped bass migrate upriver in the spring and spawn primarily from late April to late May, depending upon river conditions. Spawning occurs upriver from the city of Sacramento. There are three populations of king salmon in the Sacramento River system. Fall-run salmon migrate upriver in late summer and fall and spawn in fall and early winter, winter-run salmon migrate upriver in winter and spawn the following summer, and spring-run salmon migrate upriver in spring and spawn in fall. The main Sacramento and its principal tributaries are utilized. American shad migrate upriver from April to June and spawn along a broad stretch of the Sacramento River from Hood up to Red Bluff. Major spawning also occurs in the Feather, American, and Yuba Rivers. White sturgeon migrate upriver in late winter and spring and spawn in the upper reaches of the Sacramento River.

Spawning in the San Joaquin system is more limited. Striped bass spawn in the main San Joaquin River and its associated sloughs from Antioch upriver to Venice Island. Eggs are deposited several weeks later than in the Sacramento. The fall run of king salmon is virtually the only salmon race utilizing the San Joaquin River. Spawning occurs in the major San Joaquin tributaries - the Cosumnes, Mokelumne, Stanislaus, Tuolumne and Merced Rivers.

Present project diversions have fish protective facilities that effectively prevent passage of adult striped bass,

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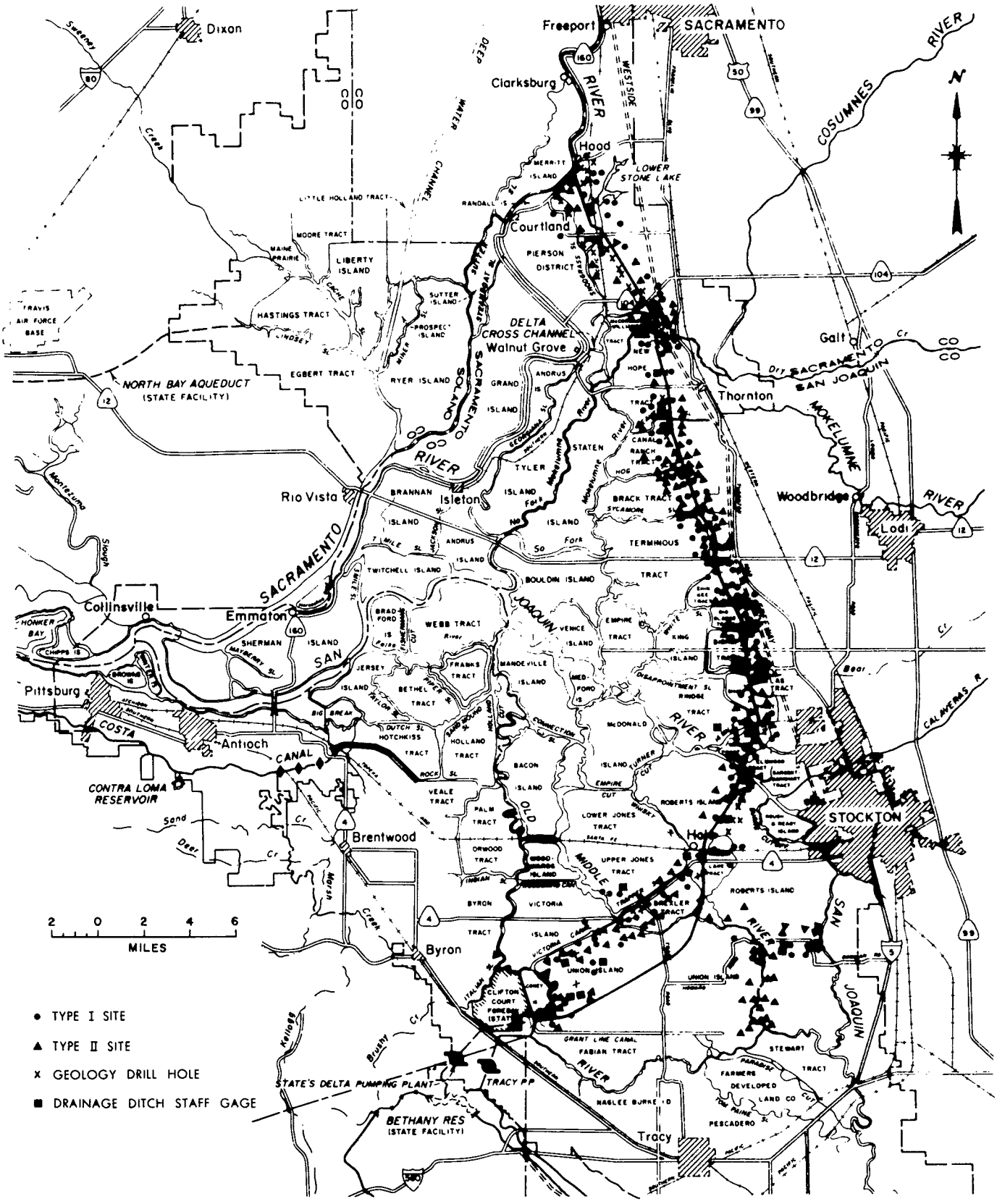

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CENTRAL VALLEY PROJECT
DELTA DIVISION CALIFORNIA

PERIPHERAL CANAL GROUNDWATER MONITORING PROGRAM
SAMPLING STATION LOCATIONS

APRIL 1973

863-208-454

C—038830

salmon, shad and sturgeon into the pumps. However, diversions create unnatural flow conditions causing reverse (upstream) flow in some channels. This results in straying from home stream water by adult fish migrating upriver. If the migrating adults do not arrive at their spawning grounds in sufficient time, females will either abort or deposit their eggs under stress, both conditions resulting in increased egg mortality. Even if the eggs are deposited, the habitat may be undesirable, resulting in increased mortality. Females that arrive late on the spawning grounds experience decreased egg viability. These conditions primarily occur with salmon.

Another result of unnatural flow conditions is the displacement of a fishery from one watershed to another. Apparently this occurred with striped bass in the San Joaquin, where altered flows caused the bass to utilize the Sacramento. However, this was not a simple transferal, as decreased survival occurred.

Annual angler-day use for striped bass is estimated at 2,200,000. Salmon passing through the Delta provide an ocean sport fishery of 326,000 angler-days, a river sport fishery of 65,400 angler-days, and a commercial catch averaging 5,784,000 pounds off the California coast. These fish also contribute substantially to the salmon landings north of the California border.

Warm-water game fish provide a substantial part of the angler-day activity in the Delta. Species of importance to the sport fishery include largemouth bass, white catfish, brown bullheads, and a variety of sunfish. Warm-water fishery in 1964 provided about 1,000,000 angler-days of use. (This is the most recent estimate made by the U.S. Fish and Wildlife Service.)

Striped bass are one of the most important sport fish in the Delta. They are long lived and highly productive. Although it is believed that spawning activity varies with riverflow conditions, approximately 55 percent of the striped bass in California spawn in the Sacramento River above the Delta, while the remaining 45 percent of the striped bass spawn in the San Joaquin River system. Their eggs and larvae are extremely vulnerable to pump diversions, and during the first month of life, swimming ability of juvenile bass is not strong enough to avoid the currents induced by the pumping. By changing diversion location and/or curtailing exports during spawning periods, a good portion of the young bass now passing through the screens could be retained in the Delta fishery.

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(2) San Joaquin River Pollution Block. A pollution block exists in most years below the city of Stockton which interferes with the migration of salmon and steelhead up the San Joaquin River in the fall months. Waste returns from other cities, such as Tracy and Lodi, contribute to water pollution in their respective areas. Also, lack of circulation in many of the dead-end sloughs of the Delta channels deteriorates the quality of water. These factors affect both resident and anadromous fish reproduction as well as their food supply. As an interim measure, prior to the construction of the Peripheral Canal, the California Department of Fish and Game, the California Department of Water Resources, the U.S. Fish and Wildlife Service, and the U.S. Bureau of Reclamation have established a program to reduce the San Joaquin River pollution block in the fall so that the salmon run could be enhanced. The program is designed to bring levels of dissolved oxygen above 5 p/m in the river at Stockton where levels occasionally drop to zero. To achieve the needed flow past Stockton, the California Department of Water Resources places a temporary dam in Old River to ensure that a larger percent of San Joaquin River flows reach Stockton. Also, as necessary, the Bureau of Reclamation releases water from the Delta-Mendota Canal to augment the San Joaquin River flows to assist in flushing out the pollution block. This interim measure is limited by available capacity in the canal systems and wasteways, severity of the oxygen demand causing the low dissolved oxygen and by other demands affected by the temporary dam in Old River.

As a result of these activities and other flow improvements due to seasonal releases of water from upstream reservoirs in the San Joaquin Basin, salmon spawning runs have increased from a low of 320 fish in 1963 to a high of 44,000 fish in 1971.

Flows of streams in the San Joaquin Valley such as the Merced, Tuolumne, and Stanislaus Rivers have been greatly depleted because of upstream use of water. An active program to increase minimum flows for fishery protection has been developed for the Tuolumne and Stanislaus Rivers by the California Department of Fish and Game. Further monitoring of flow schedules to rehabilitate the upper San Joaquin River system for anadromous and warm-water game fish is continuing. Full rehabilitation of these streams is dependent on the maintenance of positive downstream flow through the Delta, a suitable salinity gradient, and the elimination of pollution blocks.

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n. Wildlife

The Delta provides habitat for a wide variety of wildlife. The waterways, marshlands and agricultural lands of the Delta are rated second only to Suisun Marsh in importance to wintering waterfowl in the Bay area. Aerial surveys conducted regularly by the California Department of Fish and Game have recorded well over 1,000,000 ducks and 250,000 geese in the Delta at one time. Upland game birds occur throughout the Delta, and use the levee system and the natural island tracts for wintering habitat. In addition, most species of shore birds and wading birds found in California winter in the Delta area.

Upland game species include California quail, ring-necked pheasants, mourning doves, cottontail rabbits, and black-tailed jackrabbits.

Fur-bearing mammals include long-tailed weasel, spotted skunk, striped skunk, Virginia oppossum, mink, otter, beaver, muskrat, raccoon, grey fox, and bobcat.

The Delta supports important waterfowl resources. Species of ducks wintering in the Delta and Bay areas, in ranking order of abundance, are pintail, baldpate, mallard, shoveler, green-winged teal, ruddy duck, canvasback, scaups, gadwall, bufflehead, and scoters. Geese, though less common than ducks, are represented by the Canada goose, snow goose, the white-fronted goose, and whistling swans.

Ground squirrels, and miscellaneous other nonprotected birds and mammals also inhabit the area.

o. Endangered Species

Two uncommon species of fish occur in the Delta--the thicktail chub (*Gila crassicauda*), classified as endangered by the California Department of Fish and Game, and the Sacramento perch (*Archoplites interruptus*), classified as status undetermined by the U.S. Fish and Wildlife Service. The thicktail chub is rarely seen and has been in this status for more than 30 years. The decline of the Sacramento perch is related in part to its habit of laying eggs in an unguarded nest. The introduced sunfish and carp prey on the unguarded eggs. The Sacramento perch has been widely introduced into other waters in California as well as in other states, but is nowhere truly abundant.

The endangered mammal, the salt marsh harvest mouse (*Reithrodontotonys raviventris halicoetes*) ranges into the lower end of the Delta. The greater sandhill crane (*Grus canadensis tabida*) occurs near the proposed right-of-way for the Peripheral

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Canal. The range of the endangered American peregrine falcon (Falco peregrinus anatum), and Southern bald eagle (Haliacetus leucocephalus leucocephalus) includes the Delta. Two endangered geese--the Tule white-fronted goose (Anser canadensis gambelli) and the Aleutian Canada goose (Branta canadensis leucopareia) have both been recorded in the Delta area.

The California black rail (Laterallus jamaicensis coturniculus) is considered a threatened species by the U.S. Fish and Wildlife Service and will inhabit Delta areas where pickleweed is found. The rare California yellow-billed cuckoo (Coccyzus americanus occidentalis) has been occasionally sighted in the Delta area.

A number of birds which have been considered for the threatened list but whose status is yet undetermined, also occur in the Delta. They include American osprey (Pandion haliaetus carolinensis), Samuel's song sparrow (Melospiza melodia samuelis), and the Suisun song sparrow (Melospiza melodia maxillaris).

There are no endangered amphibians in the Delta. One reptile, the giant garter snake (Thamnophis couchi gigas) is considered rare by the California Department of Fish and Game and status undetermined by the U.S. Fish and Wildlife Service.

p. Recreation

The 1973 projected recreational use of the Delta was estimated at 5.7 million recreation-days and is occurring in spite of almost total absence of public recreation facilities. This use is principally water oriented and includes fishing, cruising, houseboating, picnicking, swimming, water skiing, and hunting.

The 700 miles of Delta waterways are within 2 hours' driving time of the greater San Francisco Bay area and even closer to the growing metropolitan centers of Sacramento, Stockton, and the Pittsburg-Antioch area. During the spring and summer large numbers of tourists from throughout California and from other states spend their annual vacations aboard rented houseboats leisurely cruising the Delta channels. The fishing resource is abundant and varied. The secluded sloughs are ideal for cruising, and long open stretches of water are enjoyed by the water skier. Hunting is also a major activity although it is privately controlled in most instances. Estimated gross annual income from Delta recreation ranges between $12 million and $27 million.

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q. Air Quality

The Delta is in the northwestern corner of the San Joaquin Valley Air Basin and the southern tip of the Sacramento Valley Air Basin. A general discussion of the existing air quality is presented below.

The Delta is located in the path of winds that flow through the Carquinez Strait. During the summer months sea breezes tend to blow in an easterly and northerly direction over the area and in the winter land breezes blow in the opposite direction. This condition also tends to prevail during each day with sea breezes moving inland during the afternoon and land breezes moving out during the night and early morning. Thus, static air conditions which are conducive to poor air quality are not prevalent in the area.

Air quality data compiled by the California Air Resources Board, partially summarized in the following tabulation show that the Federal oxidant standard has been exceeded throughout the year in the Stockton, Sacramento, and Carquinez Strait area. Oxidant can be defined as any of the products of the photochemical process such as ozone, peroxyacetyl nitrate, and peroxybenzoyl nitrate.

Station	Total hours when oxidant equaled or exceeded .08 p/m 1971	1972
Stockton	88	49
Sacramento (10th & P St.)	218	40
Pittsburg	98	146

Air monitoring stations are in operation at Pittsburg west of the Delta, at Sacramento north of the Delta, and at Stockton in the eastern Delta area.

Carbon monoxide is one of the more stable contaminants measured and is believed to give an indication of the air quality trend in an area. Readings at the three stations mentioned above for July 1972 through June 1973 show a maximum hourly average for the year of 3 p/m. Samples taken by the California Department of Transportation in the vicinity of the proposed Interstate 5 project (located near the eastern Delta boundary) indicate that the value of the atmospheric content of carbon monoxide in the project area during the same time span was 1.5 p/m. State and Federal ambient air quality standards for carbon monoxide for a 1-hour averaging time are 40 p/m and 35 p/m, respectively. Comparing these standards with the above air quality data, it can be concluded that the present air quality in the area is good as regards carbon monoxide.

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APPENDIX II

LIST OF PLANTS AND ANIMALS KNOWN TO OCCUR IN AND ADJACENT TO THE SAN FELIPE DIVISION

APPENDIX II

LIST OF PLANTS AND ANIMALS KNOWN TO OCCUR IN AND ADJACENT TO THE SAN FELIPE DIVISION

Mammals

Black-tailed deer	*Odocoileus hemionus columbianus*
Coyote	*Canis latrans*
Bobcat	*Lynx rufus*
Jackrabbit	*Lepus californicus*
Brush rabbit	*Sylvilagus bachmani*
Audubon cottontail	*Sylvilagus audubonii*
Ring-tailed cat	*Bassariscus astutus*
Trowbridge shrew	*Sorex trowbridgii*
Adorned shrew	*Sorex ornatus*
Long-tailed weasel	*Mustela frenata*
Striped skunk	*Mephitis mephitis*
Spotted skunk	*Spilogale putorius*
Opossum	*Didelphis marsupialis*
Raccoon	*Procyon lotor*
San Joaquin kit fox	*Vulpes macrotis mutica*
Grey fox	*Urocyon cinereoargenteus*
Ground squirrel (various)	*Peromyscus*, *Microtis*, etc.
Pocket gopher	*Thomomys bottae*
Broad handed mole	*Scapanus latimanus*
Norway rat	*Rattus norvegicus*
California meadow vole	*Microtus californicus*
Deer mouse	*Peromyscus maniculatus*
Brush mouse	*P. boyiii*
Pinyon mouse	*P. truei*
Western harvest mouse	*Reithrodontomys megalotis*
House mouse	*Mus musculus*
California pocket mouse	*Perognathus californicus*
Bat	*Myotis* sp., *Tadarida* sp.

Birds

California quail	*Lophortys californicus*
Ring-necked pheasant	*Phasianus colchicus*
Mourning dove	*Zenaidura macroura*
Band-tailed pigeon	*Columba fasciata*
Wood duck	*Aix sponsa*
Mallard	*Anas platyrhynchos*
Ruddy duck	*Oxynra jamaicensis*
Pie-billed grebe	*Podilymbus podiceps*
Cinnamon teal duck	*Anas cyanoptera*
Canvasback duck	*Aythya valisineria*

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Birds (Continued)

Coot	Fulica americana
Southern bald eagle	Haliaeetus leucocephalus
Golden eagle	Aquila chrysaetos
Red-tailed hawk	Buteo jamalcensis
Sparrow hawk	Falco sparverius
Red shouldered hawk	Buteo lineatus
White-tailed kite	Elanus leucurus
Red-winged blackbird	Agelaius phoeniceus
Tricolored blackbird	Agelaius tricolor
Brewers blackbird	Euphagus cyanocephalus
Starling	Sturnus vulgaris
White crowned sparrow	Zonotrichia leucophrys
House finch	Carpodacus mexicanus
American goldfinch	Spinus tristis
Greenback finch	Spinus psaltria
Black phoebe	Sayornis nigricans
Yellow throat	Geothlypis trichas
Bewicks wren	Thyromanes bewickii
House wren	Troglodytes aedon
Woodpeckers	Dendrocopus spp.
Yellow-shafted flicker	Colaptes auratus
Red-shafter flicker	Colaptes cafer
Anna's hummingbird	Calypte anna
Black-chinned hummingbird	Archilochus alexandri
Belted kingfishery	Megaceryle alcyon
Brown towhee	Pipilo fuscus
Rufous-sided towhee	Pipilo erythrophthalmus
Mockingbird	Mimus polyglottos
Audubon warbler	Dendroica auduboni
Yellow warbler	Dendroica petechi
Oregon junco	Junco oreganus
Ruby crowned kinglet	Regulus calendula
Yellow-billed magpie	Pica nuttalli
Barn swallow	Hirund rustica
Bank swallow	Riparia riparia
Crow	Corvus brachyrhynchos
Western robin	Turdus migratorius
Western bluebird	Siala mexicana
House sparrow	Passer domesticus
Western meadowlark	Sturnella neglecta
Chestnut-backed chicadee	Parus rufescens
White-breasted nut hatch	Sitta carolinensis
Plain titmouse	Parus inornatus
Common bushtit	Psaltriparus minimus
Killdeer	Charadrius vociferus

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Birds (Continued)

California jay	Aphelecoma coerulescens
Steller jay	Cyanocitta stelleri
Western flycatcher	Empidonax dificilis
Purple finch	Carpodacus purpureus
Bullock oriole	Icterus bullockii
Great horned owl	Bubo virginlanus
Barn owl	Tyto alba
Burrowing owl	Speotyto cunicularia
Screech owl	Otus asio
Turkey vulture	Cathartes aura
Double-crested cormorant	Phalacrocorax auritus
Common egret	Casmerodius albus
Blue heron	Ardea herodias
White pelican	Pelecanus erythrorhynchos
Western grebe	Aechmophorus occidentalis
Varied thrush	Ixoreus naevius
Hermit thrush	Hylocichla guttata
Black-headed grosbeak	Pheucticus melanocephalus
Western wood pewee	Cortopus sordidulus
Caspian tern	Hydroprogne caspia

Reptiles

Western pond turtle	Clemmys marmorata
California red-sided garter snake	Thamnophis sirtalis
Western aquatic garter snake	Thamnophis couchi
Southern Alligator Lizard	Gerrhonotus multicarinatus
San Francisco garter snake	Thamnophis sirtalis tetrataenia
Northwestern fence lizard	Scelophorus o. occidentalis
California side blotched lizard	Uta stansburiana hesperis
California horned lizard	Phrynosonia coronatus frontale
Western skink	Eumeces s. skeltonianus
California whiptail lizard	Cnemidophorous tigris mundus
San Francisco alligator lizard	Gerrhonotus c. coeruleus
California legless lizard	Anniella pulchra
Pacific rubber boa	Charina b. bottae
Pacific ringneck snake	Diadophis punctatus amabilis
Sharp-tailed snake	Contia tenuis
Alameda striped racer	Masticophis e. lateralis
San Joaquin whipsnake	Masticophis flagellum ruddocki

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Reptiles (Continued)

Western yellow-bellied racer	Coluber constrictor flaviventris
Pacific gopher snake	Pituophis melanoleucus catenifer
Coast mountain king snake	Lampropeltis zonata multifasiata
California king snake	Lampropeltis getulus californae
Coast garter snake	Thamnophis elegaus terrestris
Northern pacific rattlesnake	Crotalis viridis oreganus

Amphibians

Tiger salamander	Ambystoma tigrinum
Rough skinned newt	Taricha granulosa
California newt	T. torosa
Yellow-eyed salamander	Ensatima eschscholtzi xanthoptica
Monterey salamander	E. C. eschscholtzi
California slender salamander	Batrachoseps pacificus
Arboreal salamander	Aneides lugubris
Western spadefoot toad	Scophiopus hammondi
California toad	Bufo boreas halophilus
Pacific tree frog	Hyla regilla
Red-legged frog	Rana aurora
Yellow-legged frog	Rana Boylei
Introduced bullfrog	Rana catesbeinana

Fishes

Western suckers	Catostamus occidentalis
Squawfish	Ptychocheilus grandis
Roach	Heoperoleucas symmetricus
Speckled dace	Rhinichthys osculus
Introduced rainbow trout	Salmo gairdnerii
Introduced brown trout	S. trutta
Introduced largemouth black bass	Micropterus salmoides
Introduced bluegill sunfish	Leponiis macropterus
Introduced green sunfish	Leponiis cyanellus
Introduced crappies	Pomoxis spp.
Introduced catfish	Ictalurus spp.
Steelhead (remnant run)	Salmo gairdnerii
Sacramento blackfish	Opthodon microlepidotus
Golden shiner	Notemigonus crysoleucas
Mosquitofish	Gambusia affinis
Rainfish	Lucania parta
Threespine stickleback*	Gasterosteus aculeatus
Goldfish	Carassius auratus
Brown bullhead	Ictalurus nebulosus
White catfish	Ictalurus catus
Sacramento perch	Archoplites interruptus
Hitch	Lauinia exilicauda

Not the endangered species -- unarmored Threespine stickleback - Gasterosteus aculeatus williamsoni.

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Plants

California black oak	Quercus kelloggii
Live oak	Quercus agrifolia
Valley oak	Quercus lobata
Scrub oak	Quercus dumosa
Blue Gum	Eucalyptus globulus
Willows	Salix spp.
Big Leaf Maple	Acer Macrophyllum
White Alder	Alnus rhombifolia
Red alder	Alnus oregona
Sycamore	Platanus racemosa
Digger pine	Pinus sabiniana
Lombardy Poplar	Populus nigra var. Italica
California Buckeye	Aesculus californicus
Oregon Ash	Fraxinus oregona
Cherry	Prunus sp.
Prune	Prunus sp.
Apricot	Prunus sp.
Pear	Pyrus communis
Coyote bush	Baccharis pilularis
Monterey manzanita	Arctostaphylos hookeri
Chamise	Adenostoma fasciculatum
Toyon	Heteromeles arbutifolia
Wild oat	Avena fatua
Foxtail barley	Hordeum jubatum
Wild mustard	Sisymbrium orientale
Black mustard	Brassica nigra
Yellow mustard	Brassica campestris
Filaree	Erodium obtusiplicatum
Buttercup	Ranunculus repens
California poppy	Eschscholzia lemmonii
Poison oak	Rhus diversiloba
Sage	Salvia columbariae
California Sagebrush	Artimesia california
Wild radish	Raphanus sativus
Ferris ceanothus	Ceanothus ferrisae
California balsam root	Balsamorhiza macrolepsis
Hamilton thistle	Cirsium campylon
Cottonwood	Populus fremontii
Black walnut	Juglans hindsii
California blackberry	Rubus vitifolius
California Coffee Berry	Rhamnus californica
California Wild Grape	Vitis californica
Blue Elderberry	Sambucus caerulea
Poison Hemlock	Conium macolatus
Fennel	Foeniculum vulgare

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Plants (Continued)

Fuller's Teasel	*Dipsacus fullonum*
Nightshade	*Solanum nigrum*
Mallow	*Malva parviflora*
Unbrella-Plant	*Cyperus alternifolius*
Creek Nettle	*Urtica gracilis*
Common cattail	*Typha latifolla*
Wild Morning glory	*Convolvulus arvensis*
Common plantain	*Plantago major*
Curly Dock	*Rumex crispus*
California bulrush	*Scirpus californicus*
Cocklebur	*Xanthium canadense*
Giant Horsetail	*Equisetum telmatela*
California Mugwort	*Artemisia vulgaris var. hetrophylla*
Prickly lettuce	*Lactuca scariola*
Field bindwind	*Convolvulus arvensis*
Vetch	*Vicia sativa*
Lupine	*Lupinus succulentus*
Farmer's Foxtail	*Hordeum murinum*
Perennial ryegrass	*Lolium perenne*
Foxtail Brome	*Bromus rubens*
Wild Barley	*Hordeum leporinum*
Ripgut Brome	*Bromus rigidus*
Giant Reed Grass	*Arundo donax*

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APPENDIX III

Memorandum on Phase II of Waste-water

Reclamation and Reuse Study

from

Minutes of the November 13, 1973 meeting of the Board of

Directors of the Santa Clara Valley Water District

(Exhibit for agenda, Item 5)

orandum

TO	FROM
John T. O'Halloran	Donald K. Currlin
SUBJECT	DATE
Supplemental Requirements - Phase II of Wastewater Reclamation and Reuse Study	November 5, 1973

Transmitted herewith is the Progress Report by Consoer-Bechtel on the first portion of Phase II of the Study on Wastewater Reclamation and Reuse in Santa Clara County. In March of 1973, Consoer-Bechtel was authorized to proceed with the following three tasks relating to the use of reclaimed wastewater for domestic consumption:

1. Determine if health standards will permit use of reclaimed water for domestic use.

2. If permitted, determine parameters or conditions under which the use would be allowed.

3. Determine technological dependability and feasibility of use for domestic supply including the method of dilution required for the use of reclaimed water and elimination of pathogens, toxic materials, and stable organics pursuant to the conditions of 2. above.

The report concludes that a study and research program will be necessary before any definitive parameters or conditions can be established. The study and research period has been estimated to take a minimum of five years, and until such time as a research program is undertaken and concluded, it is impossible to determine the technological dependability and feasibility of use of reclaimed wastewater for domestic supply.

These conclusions logically rule out the consideration of use of reclaimed wastewater as an immediate project to supplement the District's anticipated necessary water supplies, and require discussion of the other alternatives and the course of action that the District should take.

There appears to be two other sources which warrant serious consideration at this time. These are the San Felipe Project and further investigation of additional local conservation reservoirs. Both of these sources have problem areas which require resolution and a decision by the Board of Directors at the earliest possible time.

The major problems associated with local reservoirs can be briefly summarized as follows:

1. Insufficient yield to meet long-term requirements even if based on a "zero population growth" projection. (The District's estimate of total requirements is 145,000 A.F. compared to a "zero population growth"

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projection of 75,000 A.F.)

2. Geology, particularly in the eastern hills.

3. Environmental impact. Most reservoirs would require removal of trees or dwellings. (The Hayes Valley Reservoir site is one notable exception.)

4. Cost - Past analyses have demonstrated most reservoirs as not economically justified. However, the cost of alternatives to the reservoirs have changed. New cost analyses should be made to see if local reservoirs have become more or less favorable from an economic standpoint.

The major problems associated with the San Felipe Project can likewise be summarized as:

1. Uncertainties in continued federal funding and construction of Public Works projects.

2. Re-analysis by the United States Bureau of Reclamation of its pricing policies.

3. Effect of decisions of the State Water Resources Control Board on United States Bureau of Reclamation activities.

4. Willingness of all local contractors to execute contracts for San Felipe water at this time.

5. Environmental impact of the project on the Delta as well as the local area.

6. Costs of the project have increased. The magnitude of the increase will not be known for two to three months.

In recommending a course of action for the District, my objective is to suggest a program that will be responsible to the needs of the area and provide a logical sequence of events for meeting such needs.

The primary need existing today is to decide upon a supplemental source of water. The District's present estimates demonstrate that supplies, including present and future import supplies from Hetch Hetchy and the South Bay Aqueduct, will be exceeded by the water requirements of the District in 1978 - only five years away. There is now no reasonable planning and construction schedule that could meet this date irrespective of the project chosen, whether it were to be local reservoirs, the San Felipe Project or (if there were no health problems) a wastewater reclamation project. After 1978 it will be necessary to start mining the underground water supplies which, if continued for

any appreciable time, will again result in land surface subsidence. Such mining would be occurring at a time when a more proper activity would be to make use of any available surplus waters in order to fill our underground reservoir, eliminate the accumulated overdraft therein, and provide an emergency supply for future periods of temporary shortage.

My concept of a logical sequence of effort to resolve the problem is to establish a "pecking order" for analysis of the available sources and projects which could satisfy the needs of the District. This has partially been accomplished by the analysis contained in Phase I and the attached progress report on Phase II of Wastewater Reclamation and Reuse in Santa Clara County. Concurrently with this work on Phase II the United States Bureau of Reclamation has been updating costs and working on the Environmental Impact Statement for the San Felipe Project. The District's staff has also been working on a contract draft for purchase of water from the Bureau of Reclamation. The San Felipe and wastewater projects are the only two sources which provide sufficient supply to meet the total anticipated needs of the District. Since the wastewater project is at least temporarily unavailable for domestic service, primary effort should now be concentrated on the San Felipe Project. However, the need for supplemental water is of such importance that whenever possible all sources should be under constant analysis.

It is therefore recommended that the following order of priority on present and future projects be established:

First, major effort should be concentrated on resolving problems associated with the San Felipe project.

Second, to the extent of the District's financial capability, work on the Palo Alto project and its associated research in the field of wastewater reclamation should be continued.

Third, the report titled "Summary of Dam and Reservoir Investigation in Santa Clara County", dated 1972, be refined and updated. This report was a summary of all previous studies made on possible reservoirs in Santa Clara County. From this report the reservoirs that appear to be realistic from the standpoint of annual yield and environmental acceptability should be chosen and engineering and financial feasibility of such reservoirs be determined.

Donald K. Cinton
Project Consultant

DKC:pb

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OF CALIFORNIA--HEALTH AND WELFARE AGENCY RONALD REAGAN, Governor

ARTMENT OF HEALTH
ERKELEY WAY
Y 94704

November 7, 1973

Mr. John T. O'Halloran
General Manager
Santa Clara County Flood Control
and Water District
5750 Almaden Expressway
San Jose, California 95118

Dear Mr. O'Halloran:

As requested in your letter of November 1, we have reviewed the report on Water Reclamation and Reuse. We have no comments to offer, other than that in general the report is satisfactory. Regarding Finding #7, it is our opinion that 5 years is the absolute minimum for the indicated study - from the date of initiation.

Yours very truly,

Henry J. Ongerth
State Sanitary Engineer

HJO:ac

November 1, 1973

Mr. Henry J. Ongerth
Chief, Water Sanitation Section
State Department of Health
2151 Berkeley Way
Berkeley, California 94704

Dear Mr. Ongerth:

Enclosed is a progress report on a study of the public health aspects of Water Reclamation and Reuse prepared for the District by Consoer-Bechtel and the District staff. It is requested that you review the report and make any comments thereon that you deem appropriate. The District is particularly interested in obtaining your opinion as to the validity of the findings and the estimate of the time necessary to develop the scientific-technical information to answer the Public Health questions (Finding No. 7). Since this matter is of prime importance to the District Board of Directors, your early attention would be appreciated.

Sincerely yours,

ORIGINAL SIGNED BY

John T. O'Halloran
General Manager

Enclosure : Water Reclamation and Reuse (A Study for the Santa Clara Valley Water District)
Phase II Progress Report on Public Health Aspects
Joint Report by the District Staff & Consoer-Bechtel
October 1973

DKC:scs

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APPENDIX IV

LETTER FROM THE STAFF OF THE STATE HISTORIC PRESERVATION OFFICER

STATE OF CALIFORNIA—RESOURCES AGENCY RONALD REAGAN, Gov.

DEPARTMENT OF PARKS AND RECREATION
P.O. BOX 2390
SACRAMENTO 95811

June 17, 1974

Mr. H. E. Horton
Acting Regional Director
United States Bureau of Reclamation
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825

Dear Mr. Horton:

We have received your letter of June 10, 1974 requesting our comments on possible effects on historical or cultural resources of the South and the Hollister Sub Areas of the San Felipe Division of the Central Valley Project.

As staff for the State Historic Preservation Officer, we have determined that there are no State Historical Landmarks, State Points of Historical Interest, or sites on the National Register of Historic Places in the immediate vicinity of the proposed project facilities.

We appreciate being forwarded a copy of Chapter IV, entitled "Historic Resources", of the report Archeological Impact Evaluation: San Felipe Division, Central Valley Project being prepared by Thomas F. King and Patricia P. Hickman of the Frederick Burk Foundation for Education, California State University, San Francisco. This report notes that "Mission and rancho operation, agricultural development, and the establishment and decline of towns and other population centers have left historic archeological resources scattered widely across the area." (p.44) We suggest that you give consideration to the identification and protection of such resources. Page 44 of the report lists five inventory programs that should be consulted in this regard. These involve the areas of Gilroy, Hollister, San Juan Bautista, San Jose and Santa Clara County. We also will appreciate being forwarded the remainder of the King and Hickman document for review as soon as it is completed.

You should be aware that additional historical values could exist that are not currently recorded on state or federal registers. In this regard, we also suggest you contact the San Benito County Historical Society, 1310 Sunnyslope Road, Hollister, California 95023.

It is gratifying that a comprehensive archeological impact evaluation is already in progress. We shall look forward to reviewing the findings of the completed King and Hickman document with regard to prehistoric cultural resources.

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If we may be of further assistance, please feel free to contact us.

Sincerely,

for

Russell W. Porter, Chief
Grants and Statewide Studies Division

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APPENDIX V

DRAFT CONTRACT SPECIFICATION FOR
ENVIRONMENTAL QUALITY PROTECTION DURING CONSTRUCTION

APPENDIX V

DRAFT CONTRACT SPECIFICATION FOR
ENVIRONMENTAL QUALITY PROTECTION DURING CONSTRUCTION

1. LANDSCAPE PRESERVATION

a. General.--The contractor shall exercise care to preserve the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, for approved construction roads and for excavation operations, all trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage which may be caused by the contractor's construction operations and equipment. Movement of crews and equipment within the right-of-way and over routes provided for access to the work shall be performed in a manner to prevent damage to grazing land, crops, or property.

No special reseeding or replanting will be required under these specifications; however, on completion of the work and in addition to the requirements of Paragraph ____ (Cleanup and Disposal of Waste Material), all work areas shall be smoothed and graded in a manner to conform to the natural appearance of the landscape. Where unnecessary destruction, scarring, damage, or defacing may occur as a result of the contractor's operations the same shall be repaired, replanted, reseeded, or otherwise corrected at the contractor's expense.

b. Construction roads.--The location, alinement and grade of construction roads shall be subject to approval of the contracting officer. When no longer required by the contractor, construction roads shall be made impassable to vehicular traffic and the surfaces shall be scarified and left in a condition which will facilitate natural revegetation.

c. Construction facilities.--The contractor's shop, office, and yard area shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris shall be removed from the site. The area shall be left in a neat and natural appearing condition.

d. Borrow areas and quarry sites.--When directed by the contracting officer, borrow pits and quarry sites shall be so excavated that water will not collect and stand therein. Before being abandoned, the sides of borrow pits and quarry sites shall be brought to stable slopes with slope intersections rounded and shaped to provide a natural appearance. All rubbish, contractor's

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equipment and structures shall be removed from the site. Waste piles shall be leveled and trimmed to regular lines and shaped to provide a neat appearance.

e. Blasting precautions.--In addition to the requirements of Paragraph ___ (Explosives and Blasting), the contractor shall adopt precautions when using explosives which will prevent scattering of rocks, stumps, or other debris outside the work area.

f. Costs.--The cost of all work required by this paragraph shall be included in the price bid in the schedule for other items of work.

2. PRESERVATION OF TREES

a. Preservation.--All trees and shrubbery which are not specifically required to be cleared or removed for construction purposes shall be preserved and shall be protected from any damage that may be caused by the contractor's construction operations and equipment. The removal of trees or shrubs will be permitted only after prior approval by the contracting officer.

The layout of the contractor's construction plant, location of access and haul routes, and operations in borrow and spoil areas shall be planned and conducted in such manner that all trees not approved for removal by the contracting officer shall be preserved and adequately protected from either direct or indirect damage by the contractor's operations. The contractor's construction facilities, such as shops, warehouse, storage areas, and parking areas shall be located and arranged in such manner that removal of trees and shrubs will be the minimum practicable as approved by the contracting officer.

Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage, or other operations, and the contractor shall adequately protect such trees by use of protective barriers or other methods approved by the contracting officer.

Except in emergency cases or when otherwise approved by the contracting officer, trees shall not be used for anchorages. Where such use is approved, the trunk shall be wrapped with a sufficient thickness of burlap or other approved material over which softwood cleats shall be tied before any rope, cable, or wire is placed.

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b. Restoration of damage.--The contractor shall be responsible for injuries to trees and shrubs caused by his operations. The term "injury" shall include, without limitation, bruising, scarring, tearing, and breaking of roots, trunk, or branches. All injured trees and shrubs shall be repaired or restored as nearly as practicable without delay to their original condition at the contractor's expense. The contracting officer will determine the method of repair, treatment, or restoration to be used for injured trees and shrubs as recommended by an experienced horticulturist or tree surgeon provided by and at the expense of the contractor. All repairs, treatment, or restoration of injured trees shall be performed under the direction of a licensed tree surgeon provided by and at the expense of the contractor. Repairs shall include shaping of wounds, sealing of wounds or cuts, and removal of damaged limbs. Scars or wounds shall be sealed with an approved tree dressing. Where tree climbing is necessary, the use of climbing spurs will not be permitted, and climbing ropes will be required where determined necessary for safety.

Trees or shrubs that, in the opinion of the contracting officer, are beyond saving shall be removed and replaced early in the next planting season with the same species or other approved species, and of the maximum size that is practicable to plant and sustain growth in the particular environment. Trees and shrubs shall be watered and maintained for a period of 1 year, and the trees shall be guyed. Any newly planted tree or shrub that dies shall be removed and replaced as directed, with such replacements being maintained for a period of 1 year from the date of replacement.

c. Costs.--The costs of all work required by this paragraph shall be included in the prices bid in the schedule for other items of work.

3. PREVENTION OF WATER POLLUTION AND CONTROL OF TURBIDITY

a. General.--The purpose of this paragraph is to prescribe measures to prevent the pollution of and to limit turbidity increases in Pacheco Creek due to construction required by these specifications. Treatment of waste water pumped from the access shaft will not be required other than sedimentation ponds prior to releasing into the San Luis Reservoir.

b. Laws and regulations.--The contractor shall comply with applicable Federal laws, orders, and regulations, and the laws of the state of California, all as administered by appropriate authorities, concerning the prevention, control, and abatement of water pollution of streams, reservoirs, ground water, or watercourses.

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The Bureau of Reclamation has made application to the Environmental Protection Agency (EPA) for an interim National Pollutant Discharge Elimination System (NPDES) Point Discharge Permit for discharging water into Pacheco Creek. When this permit is received the conditions of the permit will be made known to the contractor or the potential bidders, as the case may be, by an authorized representative of the contracting officer. Since the Point Discharge Permit cannot be transferred, the bidder who is awarded the contract will be required to make application to the State Regional Water Quality Control Board for such a permit in his own name. He will be responsible for complying with all conditions of the interim permit until he receives his own permit.

c. Contingency plan.--At least 10 days prior to beginning of construction of each phase of the work the contractor shall submit to the Bureau of Reclamation, Construction Engineer, for information, six copies of a contingency plan to be followed in the event of an accidental spill of drainage or waste waters from construction operations, petroleum products, chemicals, etc. The plan shall include as a minimum the following:

(1) The names of contractor personnel in responsible charge in the event of an accidental spill.

(2) A listing of persons and/or offices to be notified immediately following an accidental spill together with the appropriate telephone numbers. The following agencies and/or individuals shall be included in the list:

	Name	Telephone No.
State Regional Water Quality Control Board	_____	_____
Environmental Protection Agency (EPA) (Failure to notify the EPA of an accidental spill within 24 hours of its occurrence may result in the levying of a fine against the responsible party by the EPA.)	_____	_____
Bureau of Reclamation	_____	_____

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(3) A listing of types of possible water pollution accidents together with precautions to be taken to prevent their occurrence.

(4) Immediate remedial actions by contractor personnel to be taken in the event of a spill including setting up and maintaining a special monitoring system to measure effectiveness of control measures.

(5) When and where daily samples will be taken until the evidence indicates that the problem has been corrected and normal discharge to the stream can be resumed.

d. Turbidity and pH control.--

(1) Tunnel, earthwork, embankment, and other construction, operations adjacent to, or encroaching on, the stream shall be conducted in a manner to prevent muddy water and eroded materials from entering the stream by construction of intercepting ditches, barriers, settling ponds, or by other approved means. The contractor shall provide sumps, pumps, and associated facilities to lift water from drainage ditches, at the toe of the waste pile slope, into the water treatment facilities. Excavated materials shall not be deposited or stored in or alongside the stream or watercourses where the materials can be washed away by high water or storm runoff. When necessary to perform required construction work in the stream channel or in flowing water, such work shall be scheduled and completed in the shortest practicable period as approved by the contracting officer. This required construction work may include such work as the specified earthwork in or adjacent to the stream channel and construction, and installation of turbidity control structures.

Mechanized equipment shall not be operated in flowing water except as necessary to construct approved crossings or to perform the required construction, as outlined in these specifications.

The contractor's methods of unwatering, of excavating foundations, and/or stockpiling earth and rock materials shall include preventive measures to control silting and erosion and to intercept and settle any runoff of muddy waters. Waste waters from dam construction, aggregate processing, concrete batching, drilling, grouting, or similar construction operations shall not enter flowing or dry watercourses without the use of special approved turbidity control methods.

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(2) Turbid waste water resulting from (a) tunneling operations, (b) ground water intercepted in the tunnel, (c) drainage from tunnel excavation waste disposal areas, and (d) drainage from turbidity control equipment waste sludge shall be treated by the use of a method approved by the contracting officer. Methods for turbidity and pH control described below as Government Methods A, B, and C are acceptable methods for the outlet portal. Settling ponds are the only requirement for turbidity control at the access shaft, although at the contractor's option he may use Methods A, B, or C at the access shaft.

Government Method A, for treating waste water, is based on collecting waste water in a sump or tank and pumping water from the sump or tank to a water clarification plant, such as the Dorr-Oliver Clarifloculator, Pretreater (with a 40-foot-diameter by 14-foot side water depth). The equipment should include chemical feeders or dispensers for both the control of pH and for the control of turbidity and nonfilterable residue with coagulation-flocculation agents. The equipment should include a BIF 25-04 Chemical feeder for hydrated lime and a BIF 1721-22 Chemical feeder with a bag loading hopper for alum, or equal.

Government Method B, for treating waste water is the Dow Turbidity Control System as proposed by Dow Chemical USA, or equal. Method B incorporates use of aboveground equalizing tanks, sedimentation flumes, settling tanks, and retention ponds. Innocuous stabilizing and flocculating chemicals are used, as required.

Government Method C for treating waste water incorporates a water storage pond or tank, a pumping station, pressure tank with filters that can be cleaned by backwashing, required chemical feed equipment, and a lined backwash pit. A successful installation of this type was furnished at the outlet portal of Cunningham Tunnel under Solicitation No. DC-7024 by Case/Cotter, Inc., 6625 East 49th Drive, Commerce City (Denver), Colorado 80022. Chemicals being used for water treatment at this location included liquid alum, soda ash, and a polyelectrolite.

Government Method A, B, or C or any other turbidity and pH control facility furnished by the contractor shall have the minimum capability to meet NPDES* discharge permit requirements, which are estimated to be:

* National Pollutant Discharge Elimination System, P.L. 92-500.

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(1) treat up to 1,500 gal/min of waste water, (2) be able to reduce the suspended solid (nonfilterable residue) concentration in the effluent to not more than 25 p/m (mg/l), (3) be able to maintain pH of the effluent between 6.0 and 9.0, and (4) be able to remove accumulations of oil or other petroleum products from the waste water.

The approved area for locating waste-water treatment facilities at the tunnel outlet portal is shown on Drawing No. _____.

Large flows from the tunnel may require holding ponds to provide the necessary retention period. Any required holding ponds shall be located as far from streams as practicable in an area clear of trees and properly constructed to prohibit seepage from the ponds. Dikes shall be constructed of impervious materials and adequately compacted and have sufficient freeboard to provide protection from accidental discharges. The location, size, and method of construction of ponds shall be submitted to the authorized representative of the contracting officer for approval. Construction of the ponds shall not commence until receipt of such approval.

Method A, B, or C shall be provided with bypass equipment to discharge clear waste-water flows to the streams if such water has suspended concentrations less than 25 p/m (mg/l) and a pH value between 6.0 and 9.0. The decision to bypass water treatment facilities shall be subject to approval by the contracting officer.

All chemicals used in Government Methods A, B, or C must be approved by the Environmental Protection Agency for use in potable water. Also, the types and amounts of chemicals used in any approved method for the control of turbidity or pH shall not cause the effluent to be toxic or in any way harmful to terrestrial wildlife or aquatic life.

The contractor shall return the effluent from waste water treatment facilities to the stream in a manner approved by the contracting officer.

Sludge accumulations from approved water treatment facilities shall be transported to waste disposal areas and deposited so that the material will not wash into any nearby stream during high streamflows or storm runoff. Location of sludge disposal areas shall be approved by the

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contracting officer. Clear water from the top of backwash pond shall be collected and recirculated through the turbidity control system.

If the contractor elects to use either Government Method A, B, or C and his plan for its implementation is approved by the contracting officer, and the approved plan does not effectively control turbidity and pH due to no fault of the contractor, additional work will be directed for which payment will be made in accordance with Clause No. 3 of the General Provisions.

If the contractor elects to propose for approval a plan other than Government Method A, B, or C for turbidity and pH control the contractor shall bear the full responsibility for its satisfactory operation in providing effluent that meets required standards. The approval of the contractor's alternate proposal by the contracting officer shall not be construed to relieve the contractor from this responsibility.

If the contractor elects to rescreen concrete aggregates or process embankment material at the worksite, waste waters from the processing shall not enter watercourses or other surface waters without the use of the turbidity control methods described above. Location and type of turbidity control facilities shall be subject to approval by the construction engineer.

e. Submittal of plans.--Within 30 calendar days after date of award of contract, the contractor shall submit, for approval, six copies of his proposed plan, or his proposed implementation of Government Method A, B. or C. The plan submitted shall show complete design and construction details, arrangement of the turbidity and pH control structures, method for conveying waste waters to the control structures, method for storing and wasting sludge or backwash residue accumulations, and other salient features of his plan. The proposed plan shall also describe (1) chemicals to be used in the water treatment facilities and (2) the methods for handling and disposing of oil or other petroleum products, chemicals, and similar industrial wastes. The details of the turbidity and pH control plan shall be submitted to the Construction Engineer, Post Office _____ _____.

The waste-water treatment facility shall be installed and operable prior to the start of any operations that may cause water pollution. Approval of the contractor's plan shall not relieve the contractor of responsibility for

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designing, constructing, operating, and maintaining a turbidity and pH control plan in a safe and systematic manner, and for repairing at his expense any damage to, or failure of, the turbidity and pH control structures and equipment caused by floods or storm runoff.

f. Miscellaneous pollution control.--The contractor's construction activities shall be performed by methods that will prevent entrance, or accidental spillage of solid matter, contaminants, debris, and other objectionable pollutants and wastes into the stream, into flowing or dry watercourses, or into underground water sources. Such pollutants and wastes include, but are not restricted to refuse, garbage, cement, concrete, sewage effluent, industrial waste, radioactive substances, mercury, oil and other petroleum products, aggregate, processing tailings, mineral salts, and thermal pollution. Sanitary wastes shall be disposed of in accordance with State and local regulations. Oils, petroleum waste products, and chemicals shall not be drained randomly onto the soil, but shall be confined in sealed containers or sealed sumps for removal by the contractor to disposal sites approved by the contracting officer.

g. Payment.--Payment for prevention of water pollution, control of turbidity and pH, and construction of waste-water treatment structures will be made at the lump-sum price bid therefor in the schedule for prevention of water pollution and construction of turbidity control structures. Seventy-five percent of the lump-sum price will be included in the first monthly progress estimate prepared after completion of pH waste-water treatment structures, installation of equipment, and completion of all other appurtenant features necessary for operating the turbidity and pH control facilities. The remaining 25 percent will be included in the first monthly progress payment after removal of the waste-water treatment structures and cleanup of the structure sites.

The lump-sum price bid in the schedule for prevention of water pollution and control of turbidity and pH shall include the cost of:

(1) Furnishing and installing waste-water treatment plant of system, appurtenances capable of removing turbidity and correcting pH, and drainage facilities to channel water to the plant at the outlet portal, and settling ponds near the construction access shaft by the reservoir. The waste-water treatment equipment and appurtenances at the outlet portal shall have a minimum treatment capacity of 1,500 gal/min.* The settling ponds near the construction

* Size will be modified to meet NPDES discharge permit.

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access shaft shall have sufficient volume to handle up to 2,000 gal/min* from the shaft and the effluent shall be clear to the satisfaction of the contracting officer prior to release into the San Luis Reservoir. Should additional capacity be required for treating waste waters from onsite aggregate washing as a part of the contractor's operations, the cost of such additional capacity shall be borne by the contractor.

Paragraph ____ (Draining, Lighting, and Ventilation) describes requirements for handling and measuring drainage flows from the tunnel. If the measured flows from the outlet portal and the access shaft exceed the average rate of 1,500 gal/min and 2,000 gal/min, respectively, for a continuous period of 14 days, the cost of furnishing, installing, and operating pollution and turbidity control facilities to treat flows for the remainder of the continuous period during which the average flows exceed 1,500 gal/min at the outlet portal or 2,000 gal/min from the access shaft will be subject to provisions of Clause No. 3 of the General Provisions.

(2) Furnishing all materials and labor for excavating, leveling, grading, and constructing suitable foundations for installation of the waste-water treatment plant or system and appurtenances to minimize damage during period of high runoff.

(3) Constructing roadways necessary for waste-water treatment plant access and sludge removal.

(4) Furnishing all equipment, materials, and labor for pumping waste water about 290 feet vertically at the access shaft and about 30 feet vertically at the outlet portal, to waste-water settling ponds or treatment plant as required.

(5) Heating of facilities during freezing weather to assure proper operation.

(6) Operating and maintaining the waste-water treatment plant or system and appurtenances in good condition until completion of the work. Maintenance shall include the removal of sludge accumulated during treatment or the waste water, and wasting the sludge in a waste disposal area approved by the construction engineer.

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* Size will be modified to meet NPDES discharge permit.

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(7) Furnishing all chemicals required for waste-water treatment.

(8) Removal of the waste-water treatment plant or system and appurtenances, cleanup of the site, and restoration of the site to its original condition as approved by the contracting officer. All materials, plant, and appurtenances used for turbidity and pH control shall remain the property of the contractor.

(9) Additional measures used by the contractor to prevent water pollution in compliance with the requirements of subparagraph e.

4. WATER QUALITY SAMPLING AND TESTING

The contractor shall accomplish such water quality sampling and testing as is necessary to maintain proper control of his turbidity, oil removal, and pH control operations and insure compliance with these specifications, the HPDES Permit, and the contractor's obtained permit from the California State Regional Water Quality Control Board.

The sampling and testing of water shall be accomplished according to standard procedures described in the latest edition of the EPA publication "Methods for Chemical Analysis of Water and Wastes" dated 1971. As a minimum, the program shall consist of measuring the pH, turbidity, and the water temperature of the effluent from the turbidity control facilities twice each working day. The location for monitoring the effluent shall be specified by the construction engineer.

If little change occurs in flows through the treatment plant and in the stream, the contracting officer may direct that longer time intervals than specified above be used for making measurements.

Turbidity measurements shall be as specified on the NPDES Permit, or as directed by the contracting officer. The requirement will include periodic grab samples which are to be obtained and measured by the contractor using a Hach Model No. 2100A, or equal, or monitoring by a continuous reading Hatch surface scatter turbidimeter Model No. 2411 or 2426, or equal and recorded with a strip chart recorder Hach Model No. 7855-41, or equal, or a combination of both grab samples and continuous monitoring. The location of the recorders shall be approved by the contracting officer.

The turbidimeters, recorders, and laboratory equipment necessary to accomplish water quality testing and sampling required

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by the specifications shall be furnished, installed, and operated by the contractor.

Copies of the recordings shall be submitted daily to the contracting officer and shall include the date, time of day, and name of person or persons responsible for the operation of the turbidimeters and recorders.

Access to all water quality monitoring sites will be maintained by the contractor.

The release of treated effluent to the stream will be subject to the approval of the contracting officer.

To check water quality in the Pacheco Creek, representatives of the contracting officer will periodically make measurements of water temperature, pH, turbidity, suspended solids (nonfilterable residue) and other water quality parameters at the following general locations:

a. Upstream at a point above all construction activity in or adjacent to the stream.

b. Downstream at a point below all construction activity a sufficient distance to permit thorough mixing of turbidity control equipment effluent with stream water.

Any sampling, testing, and monitoring of stream water that may be done by the Government shall in no way relieve the contractor of the responsibility for doing such monitoring as is necessary for controlling of his operations to prevent violation of specified water quality standards.

No separate payment will be made for water quality sampling and testing and the costs thereof shall be included in unit prices bid in the schedule for other items of the work.

5. ABATEMENT OF AIR POLLUTION

The contractor shall comply with applicable Federal, State, and local laws and regulations concerning the prevention and control of air pollution.

In conduct of construction activities and operation of equipment, the contractor shall utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants.

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The emission of dust into the atmosphere will not be permitted during the manufacture, handling, and storage of concrete aggregates, and the contractor shall use such methods and equipment as are necessary for the collection and disposal, or prevention, of dust during these operations. The contractor's methods of storing and handling cement and pozzolans shall also include means of eliminating atmospheric discharges of dust.

Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, shall not be operated until corrective repairs or adjustments are made.

Burning of materials resulting from clearing of trees and brush, combustible construction materials, and rubbish will be permitted only when atmospheric conditions for burning are considered favorable and when authorized by appropriate State or local air pollution or fire authorities. In lieu of burning, such combustible materials may be removed from the site, chipped or shredded, or buried as provided in Paragraph ____ (Clearing). Where open burning is permitted, the burn piles shall be properly constructed to minimize smoke, and in no case shall unapproved materials, such as tires, plastics, rubber products, asphalt products, or other materials that create heavy black smoke or nuisance odors, be burned.

Storage and handling of flammable and combustible materials, provisions for fire prevention, and control of dust resulting from drilling operations shall be in accordance with the applicable provisions of the Department of Labor "Safety and Health Regulations for Construction" and the Bureau of Reclamation Supplement thereto.

Dust nuisance resulting from construction activities shall be prevented in accordance with Paragraph _____ (Dust Abatement).

The costs of complying with this paragraph shall be included in the prices bid in the schedule for the various items of work.

6. DUST ABATEMENT

During the performance of the work required by these specifications or any operations appurtenant thereto, whether on right-of-way provided by the Government or elsewhere, the contractor shall furnish all the labor, equipment, materials, and means required, and shall carry out proper and efficient measures wherever and as often as necessary to reduce the dust nuisance,

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and to prevent dust which has originated from his operations from damaging crops, orchards, cultivated fields, and dwellings, or causing a nuisance to persons and traffic. The contractor will be held liable for any damage resulting from dust originating from his operations under these specifications on Government right-of-way or elsewhere.

The cost of sprinkling or of other methods of reducing formation of dust shall be included in the prices bid in the schedule for other items of work.

7. PRESERVATION OF HISTORICAL AND ARCHEOLOGICAL DATA

a. Public Law 93-291, May 24, 1974, provides for the preservation of scientific, prehistorical, historical, and archeological data (including relics and specimens) which might otherwise be lost due to alteration of the terrain as a result of any Federal construction project.

b. The contractor agrees that should he or any of his employees in the performance of this contract discover evidence of possible scientific, prehistorical, historical, or archeological data he will notify the contracting officer immediately in writing giving the location and nature of the findings.

c. Where appropriate by reason of a discovery, the contracting officer may order delays in the time of performance and/or changes in the work. If such delays and/or changes are ordered, the time of performance and contract price shall be adjusted in accordance with the applicable clauses in the General Provisions of this contract.

d. The contractor agrees to insert this paragraph in all subcontracts which involve the performance of work on the terrain of the site.

e. Prior to the undertaking of construction activities that will affect the site known as Merced County Archeological Site No. 107 located in the San Luis Gonzaga Archeological District, a property listed on the National Register of Historic Places, steps must be taken to mitigate any effect on this property and the procedures established by the Advisory Council for Historic Preservation (36 C.F.R. 800) complied with.

f. Access to, or use of the above site by the contractor will not be permitted until written notification from the contracting officer allows such access and/or use.

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8. PESTICIDES

Pesticides include herbicides, insecticides, fungicides, and rodenticides. Should the contractor find it necessary to use pesticides in work areas of this contract, he shall submit his plan for such use to the contracting officer for written approval. Such plan shall be subject to submittal to and review by the Federal Working Group on Pest Management before the plan is approved.

Pesticides shall only be those registered with the Environmental Protection Agency in compliance with the Federal Environmental Pesticide Control Act of 1972 and other Federal pesticide acts. Pesticides named on the Department of the Interior's "Prohibited List" shall not be used. A copy of the "Prohibited List" can be obtained from regional offices of the Bureau of Reclamation or from the Bureau of Reclamation, Engineering and Research Center, Post Office Box 25007, Denver Federal Center, Denver, Colorado 80225, Attention: Code 203.

9. CLEANUP AND DISPOSAL OF WASTE MATERIALS

a. Cleanup.--The contractor shall at all times keep the construction area, including storage areas used by him, free from accumulations of waste materials or rubbish.

Prior to completion of the work, the contractor shall remove from the vicinity of the work all plant facilities, buildings, rubbish, unused materials, concrete forms, and other like material, belonging to him or used under his direction during construction. All work areas shall be graded and left in a neat manner conforming to the natural appearance of the landscape as provided in Paragraph _____ (Landscape Preservation).

In the event of the contractor's failure to perform the above work, the work may be performed by the Government, at the expense of the contractor, and his surety or sureties shall be liable therefor.

b. Disposal of waste materials.--

(1) General.--Waste materials including, but not restricted to, refuse, garbage, sanitary wastes, industrial wastes, and oil and other petroleum products, shall be disposed of by the contractor. Except as otherwise provided in Paragraph _____ (Clearing), disposal of combustible materials shall be by burying, where burial of such materials is approved by the contracting officer; by burning, where burning of such materials is permitted in accordance with State and local

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laws; or by removal from the construction area. Except as otherwise provided in Paragraph _____ (Disposal of Excavated Materials), disposal of noncombustible materials shall be by burying, where burial of such materials is approved by the contracting officer, or by removal from the construction area. Waste materials removed from the construction area shall be dumped at an approved dump.

(2) Disposal of material by burying.--Only materials approved by the contracting officer may be buried. Burial shall be in pits at locations shown on the drawings or as otherwise approved by the contracting officer. The pits shall be covered by at least 2 feet of earth material prior to abandonment.

(3) Disposal of material by burning.--The contractor shall secure the necessary burning permits from the State and local authorities. All burning shall be in accordance with State and local laws.

All materials to be burned shall be piled in designated burning areas in such a manner as will cause the least fire hazards. Burning shall be thorough and complete and all charred pieces remaining after burning, except for scattered small pieces, shall be removed from the construction area and disposed of as otherwise provided in this paragraph.

The contractor shall, at all times, take special precautions to prevent fire from spreading beyond the piles being burned and shall be liable for any damage caused by his burning operations. The contractor shall have available, at all times, suitable equipment and supplies for use in preventing and suppressing fires and shall be subject to all laws and regulations locally applicable for presuppression, suppression, and prevention of fires.

(4) Disposal of material by removal.--Material disposed of by removal from the construction area shall be removed from the area prior to the completion of the work under these specifications. All materials removed shall become the property of the contractor.

Materials to be disposed of by dumping shall be hauled to an approved dump. It shall be the responsibility of the contractor to make any necessary arrangements with private parties and with county officials pertinent to locations and regulations of such dumping. Any fees or charges required to be paid for dumping of materials shall be paid by the contractor.

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c. Costs.--The costs of complying with this paragraph shall be included in the prices bid in the schedule for the various items of work.

10. ENVIRONMENTAL LITIGATION

If construction under these specifications is suspended, delayed, or interrupted through no fault of the contractor by an order of a court of competent jurisdiction pursuant to environmental litigation, such suspension, delay, or interruption will be considered to be an unreasonable suspension, delay, or interruption pursuant to the provisions of Clause No. 23 of the General Provisions, "Suspension of the Work."

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