Economic Aspects—benefits, detriments, and costs

Only direct, tangible benefits and detriments to the initial recipient were evaluated for comparison with direct costs. However, it must be recognized that direct, intangible benefits and detriments would also result from project operation. The ratios of benefits to costs provide a guide to project selection, but consideration should also be given to the net benefits in making the final project selection. Although variations in benefit-cost ratios can result from different basic economic premises, the relative comparison of alternative projects would not change.

Certain significant benefits and detriments were not evaluated. All alternative plans would improve the quality of water exported to the San Joaquin Valley and reduce the drainage problems there. Only direct benefits of flood protection to agriculture were evaluated, but this protection would also benefit principal highways and urban developments. The estimated recreation benefits from land made available for development were considered to be equivalent to the value of the land. Intangible benefits would also accrue to recreation, and intangible detriments would result from reduced convenience of access into some channels. Only detriments to commercial fishing are shown, but intangible detriments to sport fishing would also accrue.

All estimates of benefits, detriments, and costs, including amortization, operation, and maintenance, reflect annual equivalent values for the period 1960-2020. An interest rate of four percent per annum was used in the analysis.

Attention is invited to the net benefits of the Comprehensive Delta Water Project which are less than the net benefits of the Typical Alternative Delta Water Project. This condition results from inclusion of economically unjustified flood control for large areas south of the San Joaquin River wherein the direct benefits would be less than the costs. However, flood control for some of the critical areas south of the San Joaquin River warrants further study.

ESTIMATED ANNUAL BENEFITS, DETRIMENTS, AND COSTS
(In thousands of dollars)

Item	Chipps Island Barrier Project	Single Purpose Delta Water Project	Typical Alternative Delta Water Project	Comprehensive Delta Water Project
Benefits				
Water salvage (for export)	8,337	8,963	8,963	8,963
Improved water quality—municipal, industrial, and irrigation	880	880	880	880
Supplemental municipal and industrial water supply	503	1,343	1,343	1,343
Flood and seepage control	—	—	530	1,022
Vehicular transportation	—	—	410	734
Recreation	—	19	37	58
Total Benefits	9,720	11,205	12,163	13,000
Detriments				
Commercial navigation	617	18	24	27
Commercial fisheries	844	203	254	287
Total Detriments	1,461	221	278	314
BENEFITS MINUS DETRIMENTS	8,259	10,984	11,885	12,686
Costs				
Capital amortization	6,825	1,358	1,965	2,846
Annual operation and maintenance	2,077	691	884	1,136
Total Costs	8,902	2,049	2,849	3,982
NET BENEFITS	–643	8,935	9,036	8,704
BENEFIT–COST RATIO	0.93:1	5.36:1	4.17:1	3.19:1

Economic Aspects—allocation of costs

The capital and operational costs of each of the alternative projects were allocated among the project functions by the Separable Costs-Remaining Benefits method. In this method, all costs assignable to single functions are identified, and the remaining multipurpose costs are distributed among the functions in proportion to the benefits provided by the project, or in proportion to the lowest cost alternative means of providing equivalent benefits. The lowest value of either the benefits or alternative means is used as a limit.

The basic allocations were made in terms of present worth values (1960) of all costs and benefits. This procedure properly accounts for the time-value of money (interest) and the wide variation in dates of expenditure of money and realization of benefits. Allocations of the capital and operational costs in terms of actual expenditures, rather than present worth, are indicated in the accompanying tabulations to permit convenient comparisons with total amounts of these costs.

Attention is invited to the allocated costs of the Chipps Island Barrier Project. The costs which would be allocated to water salvage and western Delta water supply were limited by the lowest cost alternative means of providing equivalent benefits, which would be the Single Purpose Delta Water Project. The values

ALLOCATION OF ESTIMATED CAPITAL COSTS
(In thousands)

Item	Chipps Island Barrier Project	Single Purpose Delta Water Project	Typical Alternative Delta Water Project	Comprehensive Delta Water Project
Water salvage (for export)	$38,384	$38,444	$38,662	$41,655
Western Delta water supply [1]	8,098	8,111	8,156	8,788
Flood and seepage control	none	none	11,900	25,159
Vehicular transportation	none	none	8,132	18,083
Recreation land	none	none	681	1,429
Unassigned local costs	155,490	none	none	2,945
TOTALS	$201,972	$46,555	$67,531	$98,059

[1] For improvement in quality and supplemental water supplies. Allocated costs include portions properly attributable to upstream water users for future effects on the western Delta area due to increased water use in areas tributary to the Delta. Definite values attributable to upstream water users would be dependent upon resolution, negotiated or otherwise, of water rights problems.

shown for the Chipps Island Barrier Project are slightly less than those for the lowest cost alternative, since the funds for the former would be expended at an earlier date. The allocations to both projects in present worth values would be the same. As the costs which may be properly allocated to water salvage and western Delta water supply are less than the total cost, a portion of the costs of the Chipps Island Barrier Project are shown as unassigned local costs. If these costs are not repaid from sources other than water users, the Chipps Island Barrier Project would be financially infeasible.

Attention is also invited to the allocated costs of the Comprehensive Delta Water Project which indicate certain unassigned local costs. In this case the costs of flood and seepage control in areas south of the San Joaquin River exceed the direct benefits of flood and seepage control in these areas. Therefore, the allocation to flood and seepage control for these areas was limited to the benefits. These flood and seepage control features of the Comprehensive Delta Water Project are not economically justified.

After the costs were allocated to principal project functions, it was necessary to make suballocations among particular groups of beneficiaries. These suballocations, which are indicated on the following pages, were also made by the Separable Costs-Remaining Benefits method and were the basis for computing the average annual costs to beneficiaries throughout a 60-year period. In the adjoining tabulations the amounts allocated to vehicular transportation include some costs which would be suballocated to recreation access to reflect the benefits to the public for improved access to recreation areas of the Delta. It is estimated that about $7,075,000 of the capital costs and $92,000 of the annual operational costs for vehicular transportation under the Typical Alternative Delta Water Project would be suballocated to recreation access. Under the Comprehensive Delta Water Project these respective amounts would be $15,123,000 and $176,000. These foregoing amounts would be in addition to the basic allocation to recreation land, which reflects the value of lands made available for recreational development.

ALLOCATION OF ESTIMATED AVERAGE ANNUAL OPERATIONAL COSTS
(In thousands)

Item	Chipps Island Barrier Project	Single Purpose Delta Water Project	Typical Alternative Delta Water Project	Comprehensive Delta Water Project
Water salvage (for export)	$395	$571	$506	$483
Western Delta water supply [1]	83	120	107	102
Flood and seepage control	none	none	156	292
Vehicular transportation	none	none	106	210
Recreation land	none	none	9	16
Unassigned local costs	1,599	none	none	34
TOTALS	$2,077	$691	$884	$1,137

[1] For improvement in quality and supplemental water supplies. Allocated costs include portions properly attributable to upstream water users for future effects on the western Delta area due to increased water use in areas tributary to the Delta. Definite values attributable to upstream water users would be dependent upon resolution, negotiated or otherwise, of water rights problems.

Economic Aspects—costs of project services

It was assumed that all project costs not specifically declared nonreimbursable would be repaid by all beneficiaries of project functions. In accordance with the contracting principles established for water service under the State Water Resources Development System, the conservation features of the Delta water facilities will be financially integrated with other conservation features of the system. The cost of supplemental water required by Delta water users will include the Delta Water Charge and an allocated transportation charge.

Estimates of present and future costs of water supply in the western Delta area were predicated on continuation of current federal salinity control policy, which limits the minimum regulated outflow from the Delta to 1,500 second-feet, considered necessary to afford satisfactory quality control at the Central Valley Project pumping plants. Estimates of increased future costs without the State Water Facilities reflect continued upstream depletion of surplus water in the Delta, and represent average costs during the next 60 years. Estimates of costs shown for project conditions also reflect average costs during the next 60 years. It is emphasized that the estimates are comparative average annual *costs* during a 60-year period and do not reflect estimates of year by year *prices* which may be established.

The amounts allocated for repayment were limited by the lowest cost alternative means of accomplishing equivalent benefits. It may be noted that the costs of water supply in the western Delta area would be the same for the Chipps Island Barrier Project, Single Purpose Delta Water Project, and Comprehensive Delta Water Project. The Single Purpose Delta Water Project would be the lowest cost alternative means of providing water supplies and it limits the amount which may be allocated under the other two projects.

The costs of the Typical Alternative Delta Water Project allocated to water salvage would amount to an average of $0.64

COMPARATIVE SUMMARY OF ESTIMATED AVERAGE ANNUAL COSTS OF WATER SUPPLY IN WESTERN DELTA AREA WITH AND WITHOUT STATE WATER FACILITIES DURING 1960-2020 [1]

Item	Future cost without State Water Facilities	Chipps Island Barrier Project	Single Purpose Delta Water Project	Typical Alternative Delta Water Project	Comprehensive Delta Water Project
Contra Costa Canal service, $/acre-foot [2]	14.52 [3]	11.66	11.66	11.64	11.66
Substitute municipal and industrial water supply, $/acre-foot	[4]	[4]	3.45	3.33	3.45
Supplemental water supply [5]					
Contra Costa County, $/acre-foot	15.20	9.06	9.06	8.92	9.06
Solano County, $/acre-foot	17.00	8.82	8.82	8.68	8.82
Agricultural water supply, $/acre [6]	7.91 [7]	1.50	1.50	1.45	1.50

[1] Average of estimated costs during a 60-year period. Values do not necessarily reflect *prices* for project services.
[2] For all municipal and industrial water served from the Contra Costa Canal. All costs include $11 per acre-foot for water from the canal. Allocated costs reflect benefits from improved quality.
[3] Includes estimated excess water treatment due to salinity degradation.
[4] Estimated future cost of high quality water from Delta channels will vary between $2.00 and $5.00 per acre-foot, depending upon plant locations and operations.
[5] All supplemental project water available through operation of the Montezuma Aqueduct.
[6] Costs reflect average for about 34,000 acres in the western Delta lowlands.
[7] Cost expressed as loss per acre due to salinity incursion.

per acre-foot for all water exported from the Delta by the State Water Facilities. Similar costs with the other projects would be about $0.66 per acre-foot.

It is anticipated that a federal contribution would be provided for flood and seepage control. This contribution, tentatively estimated at $10,123,000 for the Typical Alternative Delta Water Project and $16,020,000 for the Comprehensive Delta Water Project, would probably reflect current federal policy for allocation of costs of levee improvements, and would be based on reduced flood damages and net savings from reduced levee maintenance costs. Local costs of maintaining existing levees incorporated in the master levee system probably would not be directly met by local districts. Maintenance would be included in the total project costs, and a portion of these costs would be allocated to local beneficiaries.

The total project costs allocated to vehicular transportation were suballocated to the benefited counties and to the general public. The allocation to the general public reflects enhancement of recreation, and was considered nonreimbursable.

COMPARATIVE SUMMARY OF ESTIMATED ANNUAL COSTS OF FLOOD AND SEEPAGE CONTROL WITH AND WITHOUT DELTA WATER FACILITIES DURING 1960-2020 [1]

(Per acre)

Item	Island-group					
	Isleton	Lodi	Holt	Tracy	Brentwood	Sherman
Present control cost	$8.00	$8.00	$7.50	$6.50	$7.50	$9.00
Future control cost without a project	10.85	10.29	9.16	7.50	8.83	13.10
Annual damage savings with a project	2.80	1.65	0.35	0.20	1.32	3.12
Typical Alternative Delta Water Project						
Allocated project cost	2.04	2.17				
Interior levees and pumping cost	7.96	7.34				
Total control cost	$10.00	$9.51				
Net savings	3.65	2.43				
Comprehensive Delta Water Project						
Allocated project cost	2.15	2.29	2.09	2.29	2.38	2.53
Interior levees and pumping cost	7.96	7.34	6.66	4.97	6.04	10.57
Total control cost	$10.11	$9.63	$8.75	$7.26	$8.42	$13.10
Net savings	3.54	2.31	0.76	0.44	1.73	3.12

[1] Average of estimated costs during a 60-year period. Values do not necessarily reflect prices for project services.

COMPARATIVE SUMMARY OF ESTIMATED ANNUAL COSTS AND SAVINGS WITH VEHICULAR TRANSPORTATION IMPROVEMENTS DURING 1960-2020 [1]

Item	Contra Costa County	San Joaquin County	Sacramento County
Typical Alternative Delta Water Project			
Allocated project cost	$—	$41,400	$4,500
Operational savings to present road system	—	38,500	1,100
Savings to road users	—	265,700	105,200
Net savings	—	268,800	101,800
Comprehensive Delta Water Project			
Allocated project cost	13,300	95,700	11,200
Operational savings to present road system	2,900	59,300	5,000
Savings to road users	82,000	465,600	119,700
Net savings	71,600	429,200	113,500

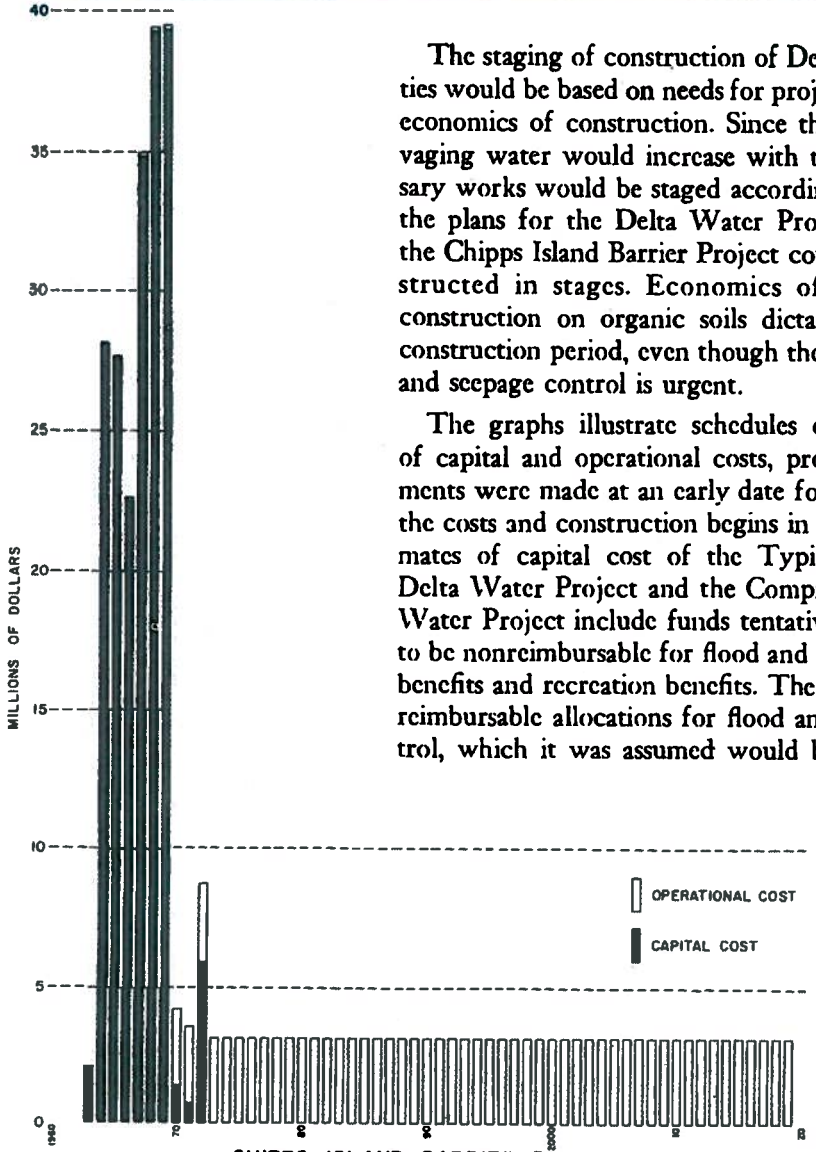
[1] Average of estimated costs during a 60-year period. Values do not necessarily reflect prices for project services.
NOTE: There would not be any vehicular transportation improvements in portions of other counties within the Delta.

Economic Aspects—repayment

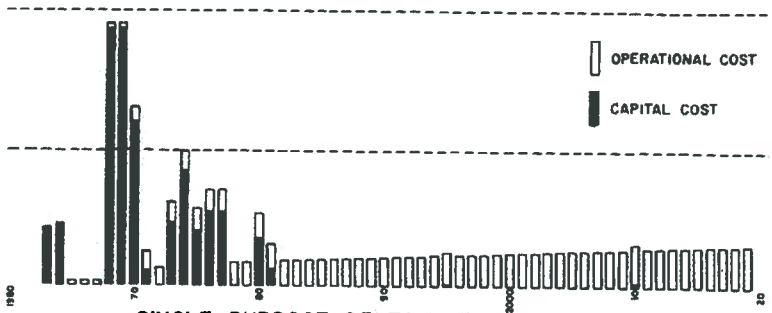
The staging of construction of Delta water facilities would be based on needs for project services and economics of construction. Since the need for salvaging water would increase with time, the necessary works would be staged accordingly for any of the plans for the Delta Water Project. However, the Chipps Island Barrier Project could not be constructed in stages. Economics of master levee construction on organic soils dictate an extended construction period, even though the need for flood and seepage control is urgent.

The graphs illustrate schedules of expenditures of capital and operational costs, provided arrangements were made at an early date for repayment of the costs and construction begins in 1963. The estimates of capital cost of the Typical Alternative Delta Water Project and the Comprehensive Delta Water Project include funds tentatively considered to be nonreimbursable for flood and seepage control benefits and recreation benefits. The estimated nonreimbursable allocations for flood and seepage control, which it was assumed would be provided by the Federal Government, amount to about $10,123,000 for the Typical Alternative Delta Water Project and $16,020,000 for the Comprehensive Delta Water Project. The estimated allocation of capital costs to recreation land and access would be $7,756,000 with the Typical Alternative Delta Water Project and $16,552,000 with the Comprehensive Delta Water Project. The corresponding allocations of annual operational costs would be $101,000 and $192,000, respectively. It was assumed that the allocated capital costs for recreation land and access would be nonreimbursable and be borne by the State of California. It was also assumed that the annual operational costs would be reimbursable from gas tax funds and nominal rental charges on land made available for recreation development.

The allocated reimbursable costs for water salvage and western Delta water supply would be repaid by water charges. The charges would be based on integrated repayment of other necessary State Water Facilities. The reimbursable costs of flood



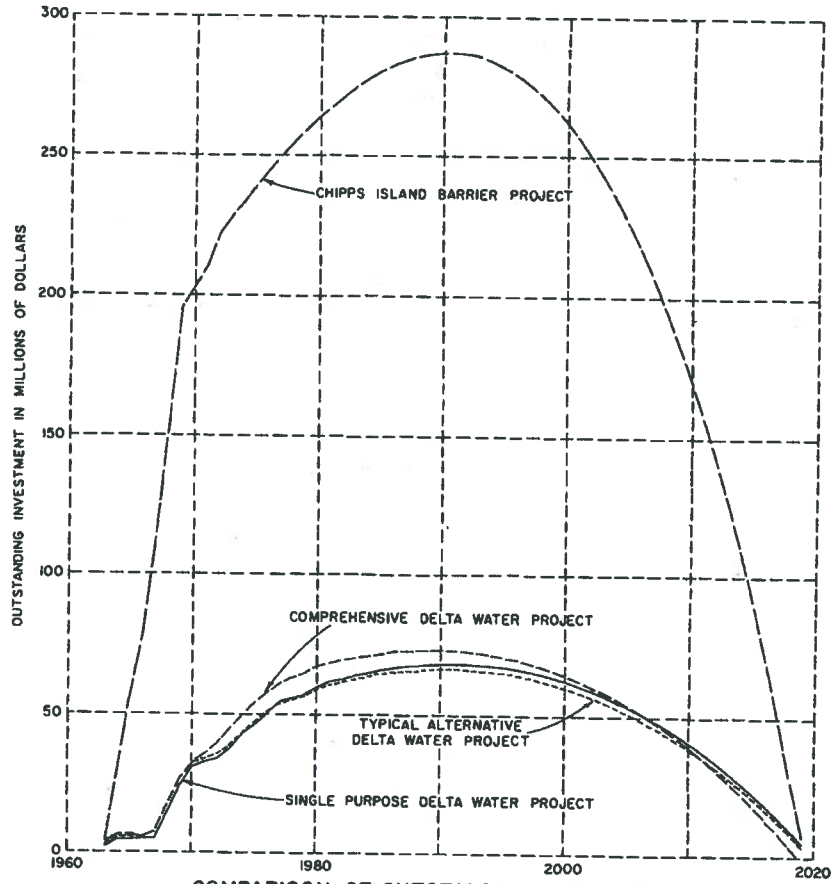
CHIPPS ISLAND BARRIER PROJECT



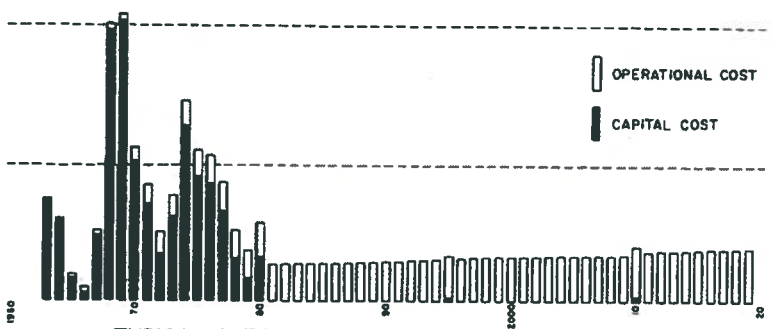
SINGLE PURPOSE DELTA WATER PROJECT

and seepage control and vehicular transportation improvements would be repaid by annual payments from the beneficiaries of flood and seepage control and from the counties, respectively. It was assumed that unassigned local costs of the Chipps Island Barrier Project would be recovered in annual payments in proportion to the projected industrial tax base. This assumed method of repayment would necessitate a rate of about $1.19 per $100 of assessed valuation throughout a 60-year period. It was also assumed that unassigned local costs of the Comprehensive Delta Water Project would be recovered in annual payments based upon the total acreage of land south of the San Joaquin River which would benefit from flood and seepage control. An annual payment of $0.86 per acre would be required.

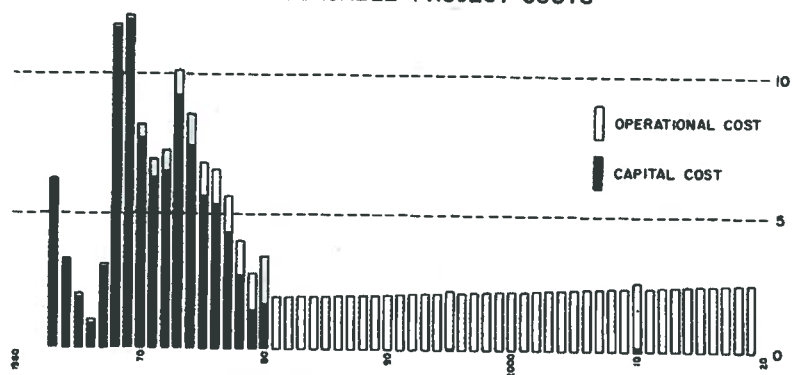
The comparative investment requirements for allocated reimbursable costs, including interest and operational costs, of the several projects are shown in the accompanying graph.



COMPARISON OF OUTSTANDING INVESTMENT
REIMBURSABLE PROJECT COSTS



TYPICAL ALTERNATIVE DELTA WATER PROJECT



COMPREHENSIVE DELTA WATER PROJECT

Conclusions and Recommendations

CONCLUSIONS

GENERAL

The plans for Delta water facilities described in this report are consistent with and would accomplish the water development purposes embraced in the California Water Resources Development Bond Act approved on November 8, 1960. Additional features could be incorporated to provide flood and seepage control, transportation, and recreation benefits.

WATER SUPPLY

Problems of water quality in the western portion of the Delta necessitate early construction of facilities to provide suitable water supplies for present and future uses.

WATER SALVAGE

Without physical control works in the Delta, increasingly greater quantities of fresh water from upstream storage will be required to repel ocean salinity and maintain good quality water for use within and export from the Delta. Water salvage will be dependent upon coordinated operation of regulatory storage, export works, and Delta water facilities.

FLOOD AND SEEPAGE CONTROL

The magnitude of flood damage and the costs of flood and seepage control will become increasingly greater as the land surface of many Delta islands continues to subside. A master levee system would reduce these costs. Early initiation of construction is necessary to economically provide stable levees.

VEHICULAR TRANSPORTATION AND RECREATION

Improvements to the road system in the Delta are needed to reduce costs of vehicular shipment and to develop the recreation potential to accommodate an estimated 7,000,000 recreation-days in 1990, and 14,000,000 recreation-days in 2020.

DELTA WATER FACILITIES

1. The Chipps Island Barrier Project would be functionally feasible, would provide adequate water supplies of acceptable quality for the Delta, and would salvage water otherwise needed for salinity control amounting to an estimated annual average of 1,900,000 acre-feet based on a 60-year period. However, the net benefits would be less than the project costs in a ratio of 0.93:1. Therefore, the project would not be economically justified. The project would not be financially feasible, unless revenues could be obtained from local taxes in addition to revenues derived from water sales.

2. The alternative plans of the Delta Water Project would be functionally feasible, would permit export of full water demands on the State Water Facilities, and would provide adequate water supplies, both in quality and quantity, for the Delta. The project would salvage water otherwise needed for salinity control amounting to an estimated annual average of 2,050,000 acre-feet based on a 60-year period.

3. The Chipps Island Barrier Project would probably cause disastrous reductions in the fisheries resource of the Delta. The Single Purpose Delta Water Project would be the least detrimental of all projects and would reduce some losses of fish and

Advanced Planning, Design, and Operation Studies

It is anticipated that the results of the planning studies summarized in this bulletin and described in detail in the supporting office reports will be the basis for selection of a general plan for the Delta Water Project. However, it is recognized that definite plans, designs, and operation programs will be dependent upon further studies and negotiations on certain aspects of the project plans.

LOCAL ACTION

Early consideration should be given by local agencies to the extent of their interest in facilities which could be constructed to provide local benefits. Acute water supply problems in the western Delta, particularly in the agricultural lowlands, warrant early resolution of interest in plans for water supply facilities. Consideration should be given to creation of master districts to represent related areas of interest in flood and seepage control benefits.

UNITED STATES CORPS OF ENGINEERS

Studies for flood and seepage control benefits and estimates of the federal contribution were based on methods and preliminary studies of the Corps of Engineers. Conditions in the Delta do not precisely fit standard procedures, and it will be necessary for the Corps of Engineers to make a detailed review of these studies to determine the extent of federal interest.

UNITED STATES BUREAU OF RECLAMATION

The Delta Water Project would enhance the operation of the Federal Central Valley Project by improving and insuring the quality of water exported from the Delta and by providing good quality water in the western Delta area in lieu of salinity control. The extent of federal interest in these benefits should be jointly analyzed by the Bureau of Reclamation and the Department of Water Resources.

HIGHWAYS

The channel closures and wide landward berms of the master levee system offer excellent opportunities for enhancing the road network in the Delta. Studies should be made by the State Division of Highways and county highway departments of transportation enhancement features, such as better road surfacing and connecting roads, which might be incorporated in the project plans.

FISHERY RESOURCES

To more definitely predict the anticipated project effects on fisheries and to design the fish screens and other remedial measures, it will be necessary to study certain biological aspects of the Delta fisheries. Joint studies of the anticipated project effects should be undertaken by the Department of Fish and Game and the Department of Water Resources.

OTHER STUDIES

Advance planning studies of flow distribution, salinity incursion, water quality, and sedimentation should continue throughout the design and early operation phases of project construction.

Test levee construction now being conducted pursuant to legislative directives will be continued to determine the most economical and efficient means of construction to provide an adequate levee system.

A general plan for remedial recreation facilities and recreation enhancement has been developed. Specific plans for facilities and development of land which can be made available for recreation uses should be prepared by county agencies, the Department of Water Resources, and other appropriate state agencies.

Acknowledgments

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COOPERATIVE STUDIES

U. S. Corps of Engineers
Sacramento District—flood control and navigation aspects
San Francisco District—preliminary designs, Chipps Island Barrier Project

U. S. Coast and Geodetic Survey—subsidence surveying

California Department of Fish and Game—fish and game studies

Contra Costa County Water Agency—industrial water use studies

University of California
Berkeley—electric analog model of Delta channels
Davis—organic soil salination research

Stanford University—salinity incursion analyses

Parsons, Brinckerhoff, Hall and Macdonald—recreation studies

WESTERN DELTA ADVISORY COMMITTEE

A special Western Delta Advisory Committee was established at the suggestion of the Director of Water Resources to advise the department, primarily on studies of water requirements and plans in the western Delta. Committee membership, which has not endorsed all aspects of this report, included:

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Thomas M. Carlson
William J. O'Connell

San Joaquin County

L. H. Bradley
Clifford B. Bull, Vice-Chairman
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U. S. Bureau of Reclamation

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August 3, 2010

Via email interimplan@deltacouncil.ca.gov

Delta Stewardship Council
650 Capitol Mall, Fifth Floor
Sacramento, CA 95814

Re: Comments - Second Draft Interim Plan

Background

The sportfishing industry (ocean, estuary and tributaries), natural gas storage, fuel transmission line and Pacific Flyway waterfowl habitat should be included.

Declining Water Supply Reliability and Water Quality

This section should include an explanation that the SWP and CVP promised and the law provides that project diversions be limited to water which is surplus to the present and future needs including environmental needs of the Delta and other areas of origin. That both projects are obligated to fully mitigate their adverse impacts and additionally provide salinity control for the Delta. The SWP has the obligation to preserve fish and wildlife pursuant to Water Code section 11912. The CVP has the fish and wildlife restoration obligations as per the CVPIA including the P.L. 102-575 section 3406(b)(1) obligation to ensure by the year 2002 natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991. "Anadromous fish" means those stocks of salmon (including steelhead), striped bass, sturgeon, and American shad." (Note: There is a separate program for the San Joaquin River between Friant Dam and the Mendota Pool.)

Water supply reliability has declined in major part due to the failure of the SWP to develop as planned by the year 2000 an additional yield of 5 million acre feet per year of surplus water from North Coast rivers to supplement Delta inflow so as to allow the delivery of the 4.25± million acre feet of SWP contract entitlement. The reliability of water supply has been further aggravated by the CVP addition of the San Luis Unit commitments in excess of 1 million acre

feet per year without adding carryover storage and without a San Joaquin Valley drain with an outlet for salts to reach the ocean. The resulting degradation of the San Joaquin River has additionally reduced supply due to the need for dilution and reduced opportunity for reuse and reclamation.

The SWP and CVP increased dependence on unregulated flow has resulted in violations of water quality standards, increased salinity intrusion into Suisun Bay and the western Delta and reduced flushing flows for the Bay-Delta Estuary.

A realistic determination of the true availability of surplus water in the Delta watershed is critical to proper planning and decision making. Present and future area of origin needs as well as climate change and other factors need to be recognized. The planning for the CVP and SWP did not contemplate the current reliance on unregulated flow within the Delta watershed and also underestimated the environmental water needs. Such planning reflects an average shortage of natural flow of 8 million acre feet per year over the 1927-34 dry cycle just to meet the needs within the Sacramento-San Joaquin River Watersheds without exports. It is uncertain whether and to what extent groundwater basins can be used to fill such shortage.

"Sea level rise" as it may affect the Delta needs to be independently and honestly examined. Historic in-Delta water elevation data needs to be examined to determine if in the last 100 years there is a measurable increase. The low end of the predictions of seven (7) inches in the next 100 years may in reality be zero (0). Delta levees can be raised. (Although in some locations requiring greater effort to provide even the high prediction of fifty-five (55) inches over the next 100 years.)

Sufficient outflow to maintain the "null zone" in Suisun Bay with variability to push the saline intrusion farther toward the west in wetter years is the variability which sustained historic fish populations. Greater salinity intrusion into the western Delta and interior Delta is not a replication of historic conditions. The salinity intrusion in the months of August or September of the most critically dry years was not frequent or regularly re-occurring. Prior to the 1980's "deal" to supply the Suisun Marsh duck clubs with water through the Montezuma Gates the Marsh was to a great extent interconnected with the Suisun Bay and adequate water quality was provided through the interconnection with outflow. The Montezuma Gate supply has resulted in less outflow to Suisun Bay to the detriment of fish.

Declining Ecosystem Health

SWP and CVP reliance on export of unregulated flow rather than release of stored water carried over from flood years and other periods of above normal precipitation has greatly contributed, if not, caused the present crises for ecosystem health.

Restoration focus on Pre-Gold Rush conditions in the estuary rather than Pre-SWP or Pre-CVP and Pre-SWP misses the mark. Ecosystem conditions were relatively good until the late 1960's. This appears to coincide with the commencement of SWP exports from the Delta.

Prior to reclamation, the Delta was swamp and overflowed land. The evaporation of fresh water from the swamp and overflowed land was far greater than what is consumed by the current farming of the Delta. The major rivers and sloughs in the central and western Delta were shallow in comparison to current conditions and there were hundreds of connecting sloughs running into and through the tule swamp. How and if such conditions were better for anadromous fish which would periodically get flushed into the swamp has not been demonstrated. The reclamation of the swamp and overflowed lands pursuant to the encouragement of the United States under the Arkansas Act of 1850 and the resulting obligation of the State to reclaim the Delta has resulted in the current system of levees, channels and dredger cuts. Much of the organic soil of the swamp has oxidized due to burning, drainage, cultivation and wind erosion such that swampland restoration, even if arguably desirable, is not feasible.

Diversions in the Delta impact fish to a lesser extent than the SWP and CVP pumping plants not only because they are grossly smaller in capacity but because they divert a much smaller percentage of the flow from the adjoining channels and in most cases divert from near the bottom of the channels rather than higher in the water column preferred by sensitive fish species.

The Delta's role in providing critical habitat for migratory waterfowl of the Pacific Flyway should not be overlooked.

Threats to the Delta Communities and Economy

Subsidence should not be generalized. There are specific locations where subsidence is a problem. Even on the islands in the western Delta with deepest peat soils there are areas where there is no remaining peat and no subsidence. In much of the Delta subsidence is not an issue.

Unreliable Storage and Conveyance

Providing salinity control for the Delta is a major purpose and obligation of both the SWP and CVP. Provision of salinity control and an adequate water supply for the Delta and other areas of origin is promised pre-condition to the export of water from the Delta.

Aging of levees is typically beneficial in that consolidation of compressible foundation soils increases with time and th further addition of soil to the levee section. Massive levee failures during wet periods should not cause detrimental salinity intrusion into the Delta and the difficulty in repair is greatly overstated.

Water supply reliability to the areas dependent upon exports from the Delta is greatly dependent upon the pumping facilities and hundreds of miles of canals and pipelines most of which are more vulnerable to earthquake and terrorist threats than Delta levees.

Reliability to urban areas in particular should be provided with the addition of desalting facilities for brackish and in some cases ocean water which could provide emergency supplies and supplement water reclamation during other periods.

As explained previously, the Sacramento and San Joaquin River Watersheds cannot and never were planned to supply the water needed by the SWP or the San Luis Unit addition to the CVP. Downstream and other storage can help better utilize wet period flows but due to the length of historic six year droughts the ability to carry over sufficient amounts of water to provide firm supplies in the 4th, 5th and 6th years is not possible.

Increasing Risks to People, Property and Infrastructure

Delta flood risks have in our view been overstated. There will be occasionally levee failures however, Delta levees have been increasingly improved during and since the 1980's. Numerous weak spots failed and were repaired and substantial efforts to mitigate the risk were initiated after the 1986 floods.

These comments are limited in scope and preliminary. The South Delta Water Agency joins in these comments.

Yours very truly,

DANTE JOHN NOMELLINI
Manager and Co-Counsel

DJN:ju

Attachment C

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CENTRAL DELTA WATER AGENCY

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January 28, 2011

Via email deltaplanscoping@deltacouncil.ca.gov

Ms. Terry Macauley
Delta Stewardship Council
980 Ninth Street, Suite 1500
Sacramento, CA 95814

Re: Notice of Preparation
Draft Environmental Impact Report for the Delta Plan

Dear Ms. Macauley:

Thank you for the opportunity to submit the following comments:

Project Objectives

To develop a plan to achieve the "Coequal goals" of "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem" it is necessary to include an evaluation and recognition of the limited availability of water in the Delta watershed. CEQA allows a baseline which reflects current conditions. The SWRCB for D-1641 and CALFED for its Record of Decision used levels of exports in their baselines which are unsustainable. The result of course was an environmental document which did not appropriately reflect the unmitigated impacts to the environment and inflated the projected availability of water.

Surplus Water from the Delta Watershed Is Not Sufficient To Sustain Desired Levels of Exports

The planning for the State Water Project did not anticipate that the project would be operated after the year 2000 without five (5) million acre feet per year of supplemental water from North Coast watersheds. Attached hereto are the title page and excerpts from DWR's December 1960 Bulletin 76 report to the Legislature on the Delta Water Facilities. A complete copy of the Bulletin 76 report is being forwarded by separate email. The enlargements and highlights are mine. Exhibit A is the title page. Exhibit B is page 13 where it is shown that reduction in natural inflow due to upstream development and build-up in exports require the importation of the 5,000,000 acre feet from the north coast. Exhibit C is a blowup of the graph

from page 13. It shows the expected increase in demand and timing of the planned imports from the North Coastal Projects. Exhibit D is a blowup of the graph from page 11 which shows the timing and specific projects included in the plan. None of the North Coast Projects were constructed due in major part to wild at scenic river legislation and rejection of the Dos Rios project.

Attached hereto as Exhibit E is a copy of the hydrographs from page 116 of the Weber Foundation Studies titled "An Approach To A California Public Works Plan" submitted to the California Legislature on January 28, 1960. The highlights and margin notes are mine. Exhibit F includes pages 113 through 118 of the Weber Foundation Studies which explains the State Water Plan source of the data and adjustments.

The 1928/29-1933/34 six year drought period reflected on Exhibit E shows the average yearly runoff is 17.631 million acre feet with local requirements of 25.690 million acre feet. There is a shortage during the drought period within the Delta Watershed of 8.049 million acre feet per year without any exports. It is questionable whether the groundwater basins can be successfully mined to meet the shortage within the watershed let alone the export demands. A comparable review of the hydrograph for the North Coast area reflects that surplus water could be developed.

The hydrology supporting the State Water Project planning explains why the development of the North Coast Projects was deemed necessary to sustain the SWP exports. Current unimpaired flow determinations by DWR which are set forth in Exhibit G show an even greater shortage for the 1929-1934 drought in that the average unimpaired flow is only 13.12 million acre feet, not 17.631 million acre feet as used in the SWP planning. Exhibit G also reflects that for the 1987-1992 six year drought the average unimpaired flow was even lower, i.e., 12.71 vs. 13.12 million acre feet.

In addition to the lack of precipitation in the Delta watershed to meet local and export needs are the environmental needs. Water is needed for mitigation of project impacts and the affirmative obligations for salinity control and fish restoration.

The planning for the SWP and CVP underestimated the needs to protect fish both as to flow requirements and carryover storage required for temperature control. In 2009 after only two (2) dry years, the SWP and CVP violated the February outflow requirements claiming that meeting the outflow requirements would reduce storage below the point necessary to meet cold water requirements for salmon later in the year. Although they lied and the real reason for the violation was the ongoing pumping of the natural flow to help fill San Luis Reservoir, the incident clearly shows the inability of the projects to provide surplus water for export in the 4th, 5th and 6th years of a six-year drought. There is evidence that droughts longer than six years are possible.

Reliability of Water Supply Also Applies to the Water Needs Within the Delta and Other Areas of Origin.

In addressing the reliability of water supply for the purpose of export from the Delta, it must be recognized that the exports are limited to water which is truly surplus to the present and future needs of the Delta and other areas of origin and the affirmative obligations of the projects including provision of salinity control, an adequate water supply for the Delta and restoration of fish.

The cornerstones to the export of water from the Delta by the SWP and CVP are the promises and law that exports are limited to such surplus water.

Exhibit H includes the October 12, 1948, promise from Secretary of the Interior Krug that "There is no intent on the part of the Bureau of Reclamation ever to divert from the Sacramento Valley a single acre foot of water which might be used in the valley now or later." Exhibit I is a copy of Water Code section 11460 which codified the promises and made it clear that the application would be to the "watershed or area wherein water originates, or an area immediately adjacent thereto which can conveniently be supplied with water therefrom." Exhibit J includes the sections related to WC 11460. Not included is WC 11128 which applies WC 11460 and WC 11463 to any agency of the State or Federal Government undertaking construction or operation of the projects. Exhibit K is a copy of WC 11207 which provides that "Salinity control in the Sacramento-San Joaquin Delta" is a primary purpose of Shasta Dam. Exhibit L is a copy of the 1960 ballot argument in favor of the California Water Resources Development Bond Act which spawned the State Water Project. Of particular note are the following representations:

"No area will be deprived of water to meet the needs of another nor will any area be asked to pay for water delivered to another."

"Under this Act the water rights of Northern California will remain securely protected."

"A much needed drainage system and water supply will be provided in the San Joaquin Valley."

Exhibit M contains copies of Water Code sections 12200 through 12205 commonly referred to as the "Delta Protection Act." These sections added by Statutes of 1959 confirm the projects obligations to provide salinity control and an adequate water supply for the Delta.

WC 12204 provides that "In determining the availability of water for export from the Sacramento-San Joaquin Delta no water shall be exported which is necessary to meet the requirements of Sections 12202 and 12203 of this chapter." The requirements are salinity control and an adequate water supply. Exhibit N which is a copy of page 12 of the above-referenced Bulletin 76 interprets the Delta Protection Act.

"In 1959 the State Legislature directed that water shall not be diverted from the Delta for use elsewhere unless adequate supplies for the Delta are first provided."

As related to the Peripheral Canal or Tunnels or any other isolated conveyance facility, the requirements of WC 12205 are particularly relevant.

"It is the policy of the State that the operation and management of releases from storage into the Sacramento-San Joaquin Delta of water for use outside the area in which such water originates shall be integrated to the maximum extent possible to permit fulfillment of the objectives of this part." The objectives include salinity control and an adequate water supply. Conveyance facilities which transport stored water to the export pumps with no outlets or releases to provide salinity control and an adequate water supply in the Delta would not comply.

The export projects must fully mitigate their respective impacts. Failure to require such full mitigation is a shift of the cost of the project to someone else. The State Water Resources Development Bond Act was intended to preclude such a shift in costs. See also Goodman v. Riverside (1993) 140 Cal.App.3d 900 at 906 for the requirement that the costs of the entire project be paid by the contractors. Water Code section 11912 requires that the costs necessary for the preservation of fish and wildlife be charged to the contractors. The term "preservation" appears to be broader than mitigation and appears to create an affirmative obligation beyond mitigation.

Title 34 of Public Law 102-575 referred to as the Central Valley Project Improvement Act in section 3406(b)(l) authorizes and directs the Secretary of Interior to enact and implement a program which makes all reasonable efforts to ensure by the year 2002 natural production of anadromous fish (including salmon, steelhead, striped bass, sturgeon and American shad) will be sustainable on a long term basis at levels not less than twice the average levels attained during the period of 1967-1991.

Reliability of water supply for exports from the Delta should include a clear confirmation of the types and numbers of years when no water will be available for export and provide estimates of the amounts that might be available in other years. Care should be taken to model carryover storage with due consideration of temperature, flow and area of origin requirements to determine the firm yield available for export.

Protecting, Restoring and Enhancing the Delta Ecosystem Should Not Be Focused On Conditions Prior To Reclamation of the Delta.

The Delta Swamp and Overflowed Lands were fully reclaimed by about 1925. See Exhibit O from said above-referenced Bulletin 76. Due to subsidence of peat soils from oxidation, erosion, compaction and other causes, much of the land is below sea level and if

levees are breached or removed would become a waterbody with some riparian vegetation. Such a condition would on average evaporate or consume much more water than present uses. See Exhibit P.

Fish species in the Delta appeared to be doing well until the increase in SWP operations in the early and mid 1970's. See Exhibits Q, R, S and T. The CVPIA focus is on averages for 1967-1991. The most dramatic decline in fish species is more recent and includes the period from about 2000 to the present. The plight of the fisheries was recognized back when the striped bass index was recognized as the indicator for the environmental health of the Bay-Delta estuary. In 1978 the SWRCB found that "To provide full mitigation of project impacts on all fish species now would require the virtual shutting down of the project export pumps." See Exhibit U. The SWRCB also found that protection of Suisun Marsh would require an additional two (2) million acre feet of fresh water flow in dry and critical years. See Exhibit V. Exports were not shut down and the two (2) million acre feet was not provided for the Suisun Marsh. See Exhibit W.

In 1987 a review was made by Luna Leopold of the Rozengurt, Herz and Feld 1987 Analysis of the influence of water withdrawals on runoff to the Delta-San Francisco Bay ecosystem (1921-1983): Paul F. Romberg Tiburon Center For Environmental Studies, Tech. Rept. No. 87-7. The review reflected that use of the "Four River Index" rather than the total runoff into the Delta distorted the planning of the SWP and CVP and concluded that it was imperative to preclude any additional diversions of water from the Delta system. See Exhibit X. I will provide by separate email copies of the referenced analysis.

Additional Comments

The secondary planning area should include all of the southern portion of the State that could be potentially served with water from the Delta on the Colorado River, the interrelationship of the supply from the Colorado River to demands for exports from the Delta should not be ignored. The restructuring of water rights, measuring and reporting of surface and ground water and making water use inefficiency the equivalent of waste and unreasonable use are all tools which we believe will be used to destroy the water rights in the Delta and other areas of origin. Protection of such rights is critical to protection of the Bay-Delta watershed. The cost and expense of producing data which is of limited value is unjustified. Water use in the watersheds of origin is not wasteful in that flow into the Delta and into the usable underground is benificial. Transfers outside of the watersheds of origin should be the focus of concern. The cornerstone of protection of the Delta is limiting exports to water which is truly surplus to the present and future needs of the Delta and other areas of origin including environmental needs. The SWP and CVP must not only mitigate their impacts in the Delta, upstream of the Delta (spawning habitat, cold water, etc.) and restore the San Joaquin River both as to fish and drainage from the CVP service areas on the west side, but must meet their affirmative obligations; to provide salinity control and an adequate water supply for the Delta; restore the natural production of anadromous fish

(including salmon, striped bass, sturgeon, etc.) to twice the 1967-1991 levels as required by the CVPIA and integrate to the maximum extent possible all releases from storage for export to provide an adequate water supply and salinity control for the Delta (WC 12205). We oppose isolated conveyance and support maintaining the common Delta Pool. We support self sufficiency and reduction in reliance on the Delta. Delta levees should be improved with a sufficiently funded locally managed levee program with a robust emergency response capability. South Delta permanent agricultural barriers should be installed with low lift pumps or the equivalent to provide adequate water quality and water levels. Channel improvements with dredging/setbacks in the south delta in the areas where export pumping greatly impacts water levels/sedimentation and in the north and south forks of the Mokelumne and the connections to the Delta cross channel should be evaluated. Features of the Delta corridors proposal and fish screens at the cross channel and export facilities should be evaluated. Operational control of the SWP and CVP should be given to an independent watermaster who is directed to and wants to protect the Bay-Delta watershed. Delta outflows should be restored with interconnections to Suisun Marsh. A determination should be made as to the present and future water needs including environmental needs within the Delta and other areas of origin and what water and under what conditions water is truly surplus and available for export. Restoration of habitat should be directed at the post reclamation condition with particular emphasis on outflow and the Suisun marsh. The Delta economy should not be destroyed to mitigate for export project impacts. Exports must be restrained to avoid such impacts. Without the 5 million acre feet of water per year that the SWP was supposed to develop from the north coast region by the year 2000 the water supply planned for export by the SWP does not exist. Similarly the water supply for the San Luis Unit was not supported by new development of yield. Planting of permanent crops dependent upon surplus water should be at the risk of those planting and the allocation of export water should be insulated from political management. Improvement of Paradise Cut with an intake farther upstream, channel improvements, and some levee setbacks should be evaluated. A diversion point west of the Delta should be evaluated. We oppose the BDCP proposed conversion of agricultural land to habitat and instead urge enhancement of the habitat of the in-channel berms and already flooded islands and cuts. Diversion and or spreading of flood water upstream of the Delta to recharge groundwater basins and provide flood control appears to have promise.

Your very truly

DANTE JOHN NOMELLIN, SR.
Manager and Counsel

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Bulletin No. 76

REPORT TO THE
CALIFORNIA STATE LEGISLATURE

ON THE

DELTA WATER FACILITIES

AS AN INTEGRAL FEATURE OF

THE STATE WATER RESOURCES DEVELOPMENT SYSTEM

EDMUND G. BROWN
Governor

HARVEY O. BANKS
Director

December, 1960

STATEMENT OF CLARIFICATION

This preliminary edition presents a comparison of alternative solutions to the Delta problem. This bulletin shows that the Single Purpose Delta Water Project is the essential minimum project for successful operation of the State Water Facilities. This bulletin also presents, for local consideration, optional modifications of the Single Purpose Delta Water Project which would provide additional local benefits.

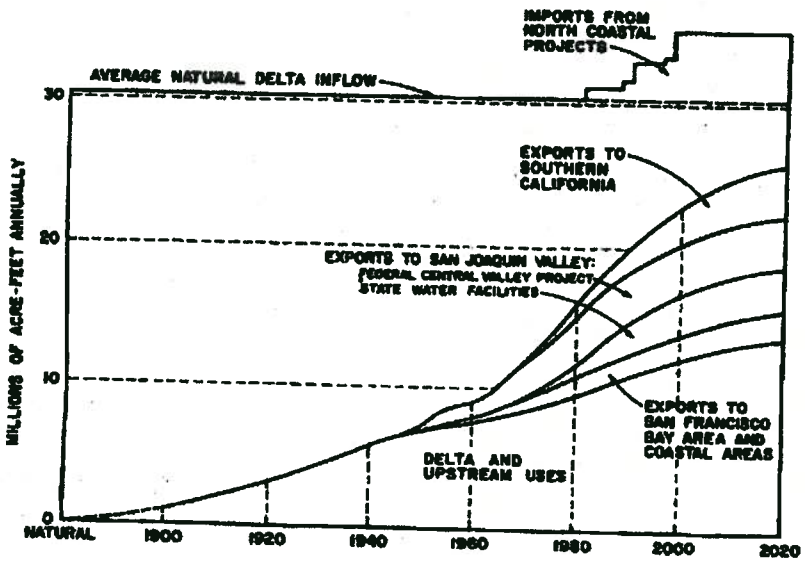
The evaluation of project accomplishments, benefit-cost ratios, and costs of project services, are intended only to indicate the relative merits of these solutions and should not be considered in terms of absolute values. Benefits related to recreation are evaluated for comparative purposes. Detailed recreation studies, presently in progress, will indicate specific recreation benefits.

Subsequent to local review and public hearings on this preliminary edition, a final edition will be prepared setting forth an adjusted plan. The adopted plan will include, in addition to the essential minimum facilities, those justifiable optional modifications requested by local entities.

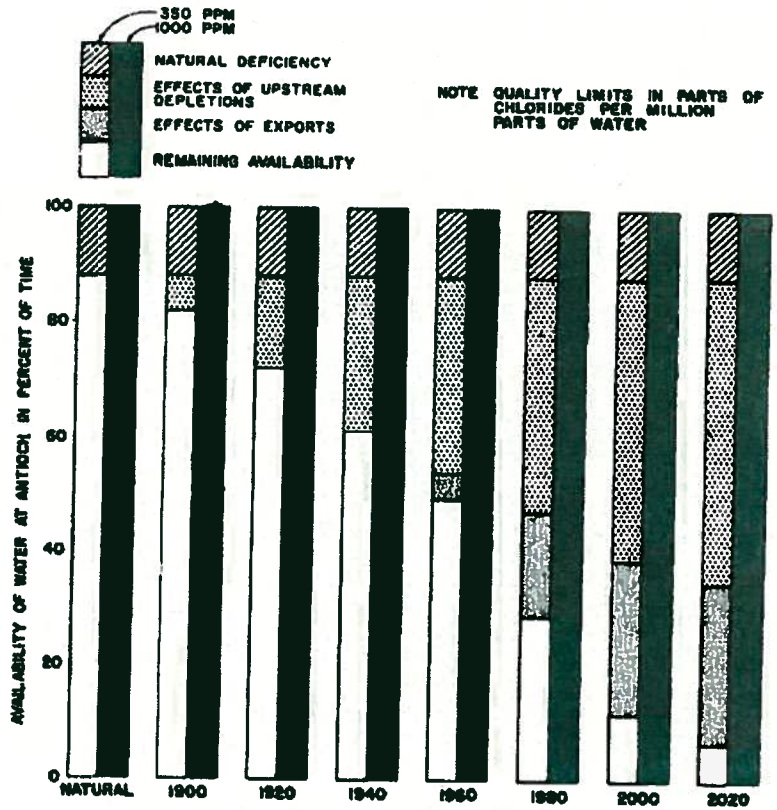
John A. Wilson

EXHIBIT A

The natural availability of good quality water in the Delta is directly related to the amount of surplus water which flows to the ocean. The graph to the right indicates the historic and projected availability of water in the San Joaquin River at Antioch containing less than 350 and 1,000 parts chlorides per million parts water, under long-term average runoff and *without* specific releases for salinity control. It may be noted that even under natural conditions, before any significant upstream water developments, there was a deficiency of water supplies within the specified quality limits. It is anticipated that, without salinity control releases, upstream depletions by the year 2020 will have reduced the availability of water containing less than 1,000 ppm chlorides by about 60 percent, and that exports will have caused an additional 30 percent reduction.



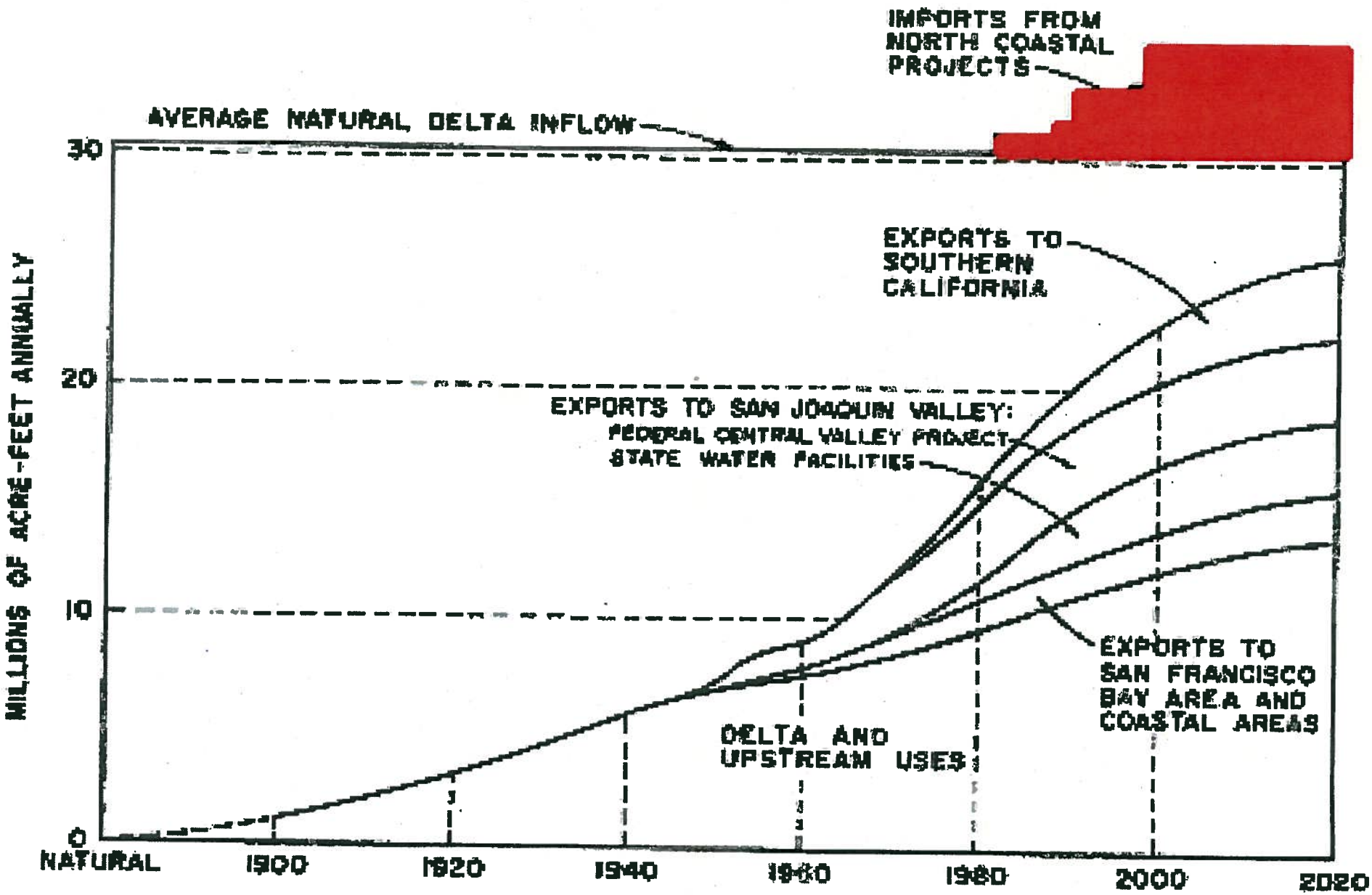
USE OF DELTA WATER SUPPLIES



DELTA WATER QUALITY WITHOUT SALINITY CONTROL

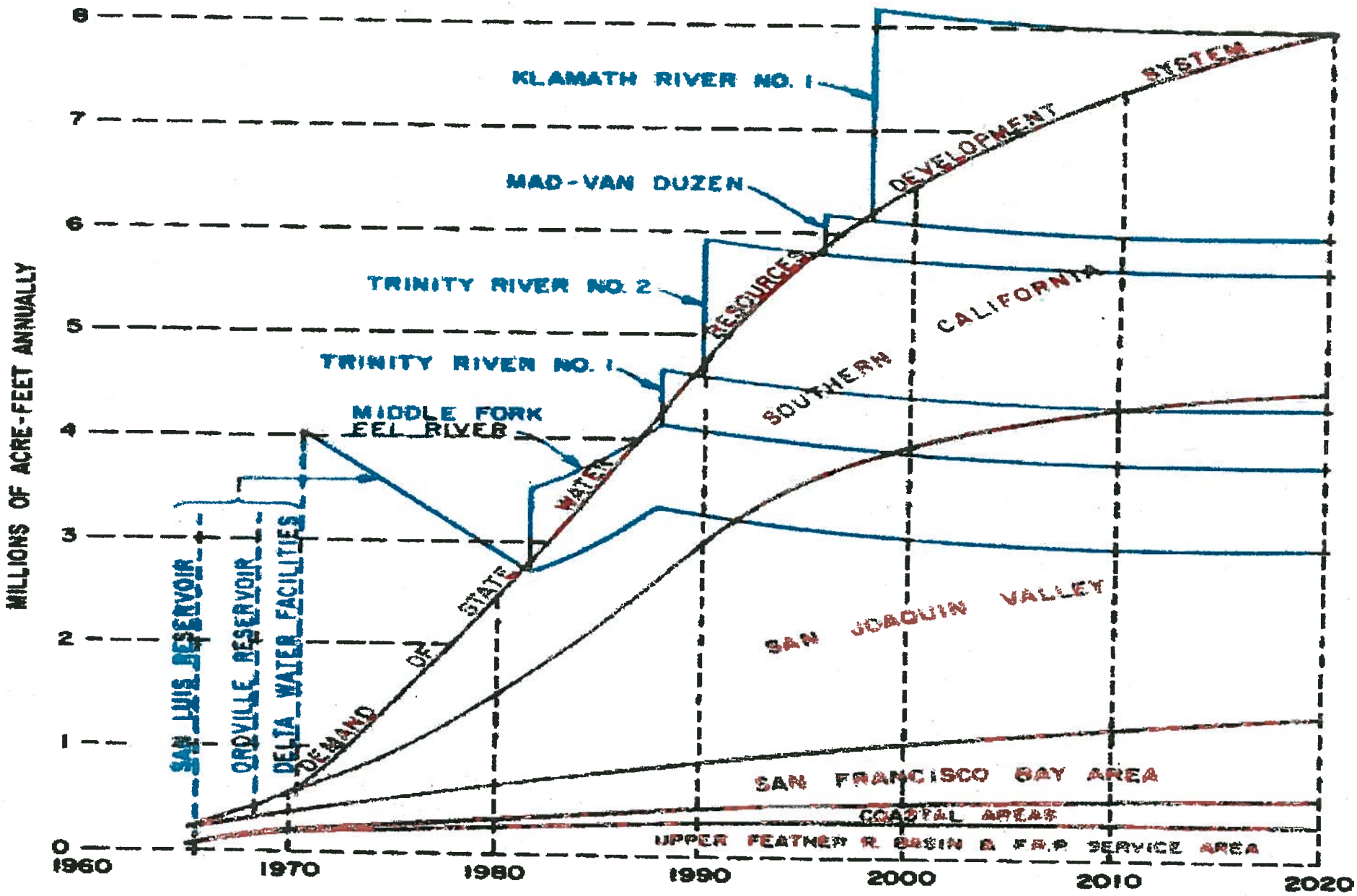
The magnitude of the past and anticipated future uses of water in areas tributary to the Delta, except the Tulare Lake Basin, is indicated in the diagram to the left. It may be noted that, while the present upstream use accounts for reduction of natural inflow to the Delta by almost 25 percent, upstream development during the next 60 years will deplete the inflow by an additional 20 percent. By that date about 22 percent of the natural water supply reaching the Delta will be exported to areas of deficiency by local, state, and federal projects. In addition, economical development of water supplies will necessitate importation of about 5,000,000 acre-feet of water seasonally to the Delta from north coastal streams for transfer to areas of deficiency.

EXHIBIT B



USE OF DELTA WATER SUPPLIES

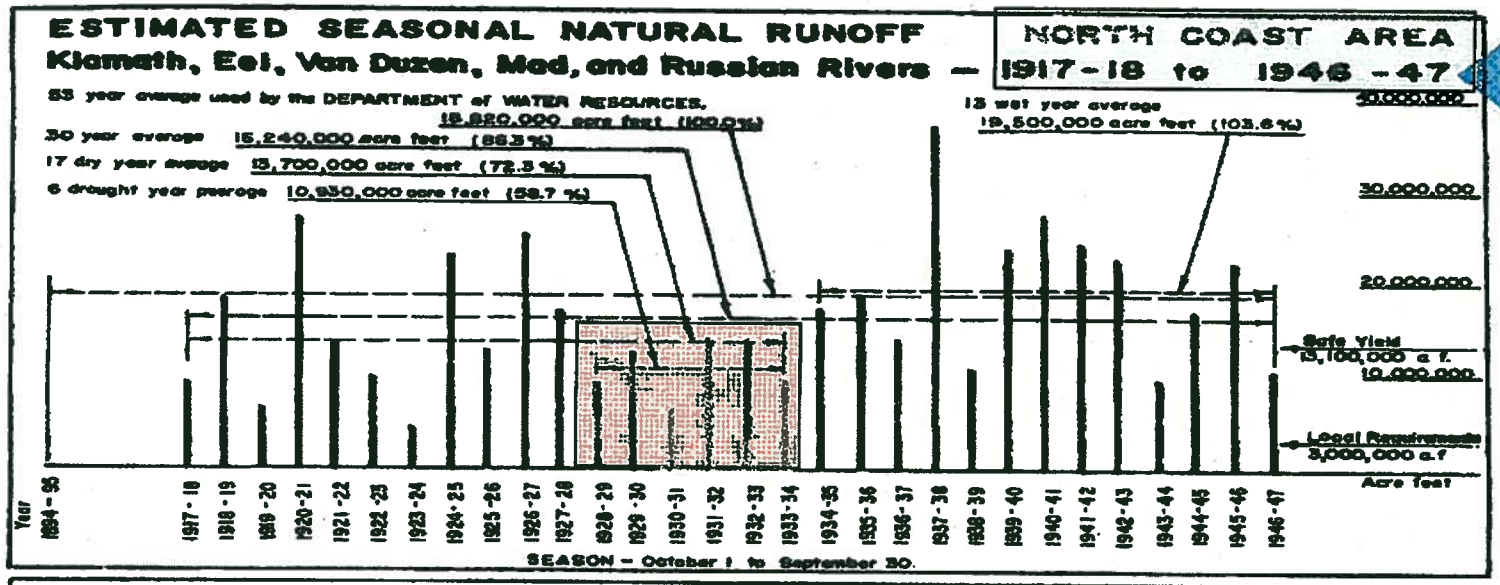
EXHIBIT C



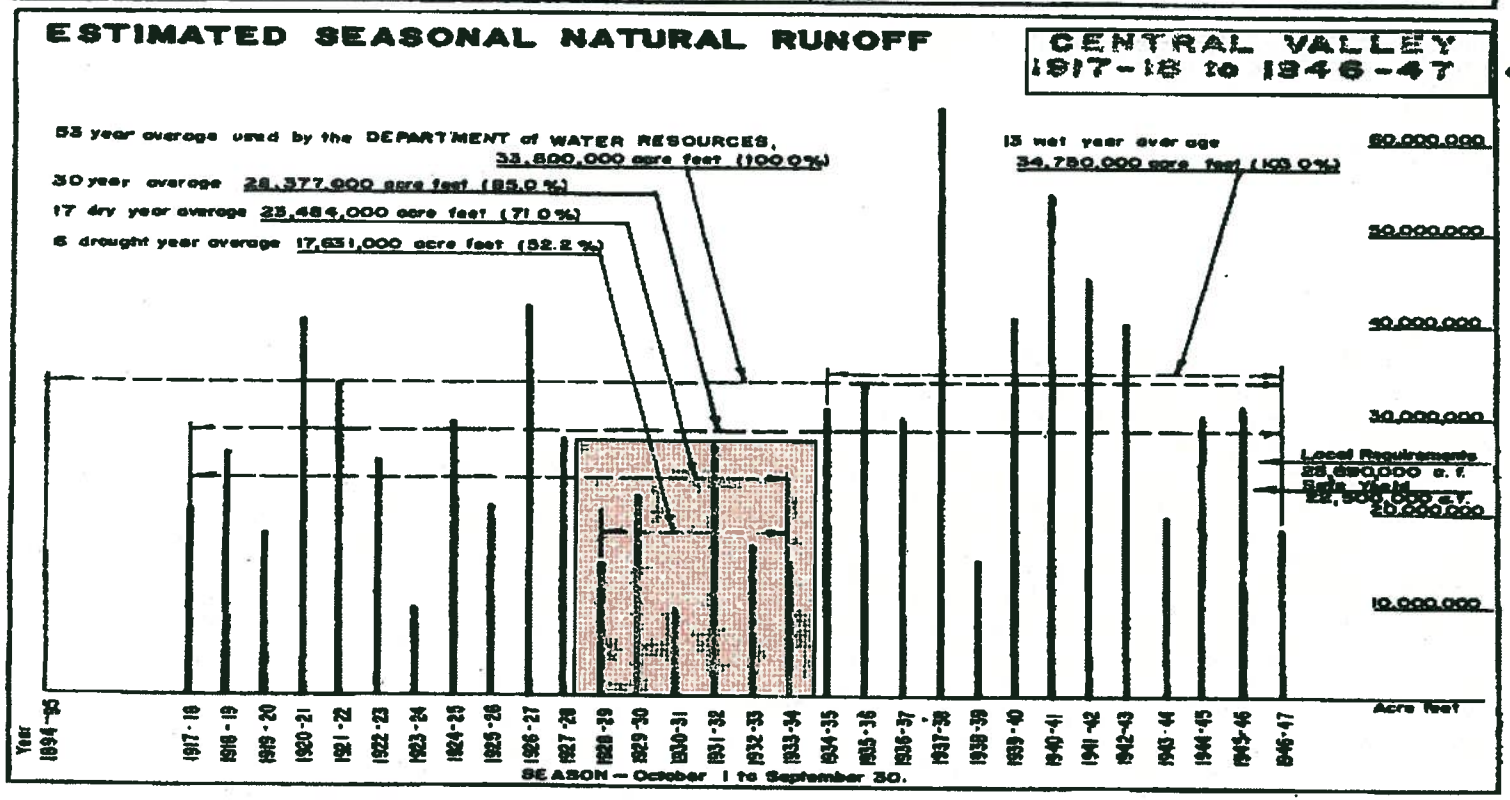
WATER SOURCES AND USES

EXHIBIT D

WEBER FOUNDATION STUDIES



Surplus
7,930,000 AF/ YF



SHORTAGE
8,049,000 AF/Y

EXHIBIT E

SECTION V

BASIC PREMISES

IMPORTANCE OF BASIC PREMISES

Basic premises and basic data are a prerequisite to any sound planning program. In order that the planning be practical and usable, the premises must be realistic and acceptable and the data must be factual. For these reasons a detailed discussion of premises and basic data is included in this report.

Planning cannot arise above the levels established by the premises. If they are limited, so is the planning. If they are false or erroneous, so is the planning. If they are vague, or in conflict with each other, or contrary to important facts, then the planning based upon these assumptions is indefinite, confused and without certain goal. It is not easy to choose and formulate basic premises for studies such as these.

The basic premises are not self-evident. They must be searched for. They have evolved as the result of much research and exploration. They have withstood the erosion of countless tests. As stated here they are believed to be genuinely basic and completely sound.

PREMISE ONE

ALL OF THE WATER RESOURCES AVAILABLE TO THE PEOPLE OF CALIFORNIA SHOULD EVENTUALLY BE DEVELOPED BY AND EQUITABLY DISTRIBUTED FOR THE USE OF THE PEOPLE OF CALIFORNIA

This premise is of prime importance. It colors, limits and conditions all valid thinking regarding water resource development. Its acceptance invalidates at once much of the "project planning" which has heretofore been accepted as proper. It also establishes a standard by which all water development projects and all segments of projects must be tested.

When this premise is accepted, any project must be rejected which develops a water resource for the benefit of a segment of the population to the detriment or neglect of another portion of the population. Also projects must be rejected which are wasteful of water in that a more beneficial (economic) use of the water could be made at some other place. Also rejected are projects which apply a water resource to a present use which will prevent its utilization at some future date for a much more important use.

The acceptance of this premise requires that every use to which any project is put be evaluated in terms of maximum benefit to the whole population, and since the distribution of water limits the distribution of population, water project planning and population planning (land use) must be co-ordinated. The planning agency must be concerned with the ultimate economic return to be derived from each acre-foot of water.

We will run out of available water resources in California before we run out of land suitable for irrigation. There is ultimately no overall state surplus of water. A continually expanding population will, in time, bring us face to face with a very real shortage of fresh water.

Where Is California's Water Supply?

The basic premise that all of the water resources of California must be developed requires that the search for available water supplies be realistic and factual. All the existing information and data regarding water supplies must be critically studied and reviewed. New data must be collected. It is only within the past few years that anyone has attempted to formulate a "water balance sheet" for the State of California. The first such "water balance sheet" to be published appears as Table 3-5 in the State Water Plan (1956 edition).

The figures in this Table 3-5 propose that there is an exportable surplus of 21.22 million acre-feet of water in the north coastal area of California, and in the Sacramento River basin, which can be transported to various water deficient areas in the State.

Critical analysis of the data in Table 3-5 indicates that the figures given for "mean runoff" and "safe yield" are too large to be used as a basis for planning the complete development of California's water resources. The "mean runoff" figures as used in this table are derived by finding the average runoff for a period of 53 years (1894-1947).

Tables and bar graphs of the estimated natural runoff of principal streams of the north coastal area and of the Central Valley follow.

EXHIBIT F
6 pages

TABLE III

ESTIMATED SEASONAL NATURAL RUNOFF 1917-18 TO 1946-47

FROM NORTH COAST AREA

(Klamath R. near Requa, less Klamath R. at Keno, Eel R. at Scotia, Van Duzen R. at Bridgeville, Mad R. at Sweasy Dam, Russian R. at Guerneville)

(In thousands of acre-feet)

Season Oct. 1-Sept. 30	
1917-18	9,551
-19	18,521
1919-20	6,732
-21	27,181
-22	13,672
-23	9,980
-24	4,272
1924-25	23,033
-26	12,624
-27	25,496
-28	17,097
-29	9,133
1929-30	12,440
-31	6,651
-32	13,843
-33	14,150
-34	9,365
6 year mean (1929-34)	10,930
17 year mean (1917-34)	13,700
1934-35	17,021
-36	18,737
-37	13,593
-38	37,326
-39	10,607
1939-40	23,623
-41	27,302
-42	24,181
-43	22,451
-44	9,335
1944-45	16,834
-46	22,109
-47	10,368
13 year mean (1935-47)	19,504
30 year mean (1917-47)	16,240
53 year mean (1894-47) As used by Department of Water Resources	18,820

The Central Valley Area has been subdivided into three parts:

1. Sacramento Valley above Sacramento.
2. The northerly part of the San Joaquin Valley, including the Tuolumne River Basin and all of the area to the north of it, to the Sacramento Valley.
3. The remaining portion of the San Joaquin Valley, to the south of the Tuolumne River Basin.

In each of these subdivisions the estimated runoff is divided into two parts. Part "one" includes the runoff of the streams estimated in Table 62 of "Bulletin No. 1, Water Resources of California, 1951."

Part "two" includes the remainder of the runoff in each subdivision of the Central Valley. The mean seasonal runoff therefor is derived from the quantities given in Table 61 of Bulletin No. 1, for the period extending from 1894-95 to 1946-47. As an approximation of the runoff for each season, the seasonal distribution is assumed to roughly correspond to that of a stream basin selected from Table No. 62, Bulletin No. 1, in each subdivision of the Central Valley. By reason of the small runoff per square mile, from these areas, as compared to that from the selected stream basin, the resulting quantities will tend to be too small for wet years and too large for dry years. However, it is believed that the error will not be relatively significant for overall quantities. In the Sacramento Valley, the runoff of Stony Creek, above canyon mouth, was selected; in the northerly part of the San Joaquin Valley, the runoff of Calaveras River, at Jenny Lind, was used; and in the southerly part of the San Joaquin Valley the runoff of Tule River above Porterville was used as a criterion for seasonal distribution.

In the Sacramento Valley, part "one" includes the runoff of: Sacramento River near Red Bluff; Feather River at Oroville; Yuba River at Smartsville; Bear River at Wheatland; American River at Fair Oaks; Stony Creek above canyon mouth; Cache Creek near Capay; and Putah Creek near Winters.

In the northerly part of the San Joaquin Valley, part "one" includes the runoff of: Tuolumne River near La Grange; Stanislaus River near Knights Ferry; Calaveras River at Jenny Lind; Mokelumne River near Clements; and Cosumnes River at Michigan Bar.

In the southerly part of the San Joaquin Valley, part "one" includes the runoff of: Kern River near Bakersfield; Tule River above Porterville; Kaweah River near Three Rivers; Kings River at Piedra; San Joaquin River above Friant; Fresno River near Daulton; Chowchilla River at Buchanan Damsite; and Merced River at Exchequer.

The foregoing graphs indicate that the 1894-1947 period contains a 17-year dry period (1917-1934) when the average natural runoff was only 72.3 percent in the north coastal area, and 71.0 percent in the Central Valley of the Department of Water Resources 53-year average for these areas. Also these graphs show that during this 17-year dry period there occurred six years of extreme drought (1928-1934), as many Californians can recall. During this six-year drought period the natural runoff in the Central Valley was only 52.2 percent of the average for the 1894-1947 period. In the north coastal area the average dropped to 58.7 percent of the 53-year average. In the single dry season of 1923-24, the runoff fell to 26.6 percent of the 53-year average for the Central Valley, and 22.7 percent in the north coast.

For the purpose of these studies it is more realistic to base the water development planning on the water supply which would be available to California in a 17-year dry period containing a series of drought years such as occurred in the period from 1917 to 1934. Such dry periods are inevitable. Neither the time of

TABLE IV

ESTIMATED SEASONAL NATURAL RUNOFF, 1917-18 TO 1946-47 FROM CENTRAL VALLEY AREA

(In thousands of acre-feet)
(Subdivisions)

Season	*Sacramento Valley*		*N. San Joaquin Valley*		*S. San Joaquin Valley*		*Total*
Oct. 1-Sept. 30	*Part "one"*	*Part "two"*	*Part "one"*	*Part "two"*	*Part "one"*	*Part "two"*	
1917-18	11,426	1,080	3,253	307	4,609	171	20,846
-19	16,832	2,130	3,070	141	4,176	254	26,603
1919-20	9,444	620	2,811	120	4,584	374	17,953
-21	26,161	4,018	4,789	322	5,292	804	40,866
-22	18,380	1,479	5,476	319	7,687	469	33,828
-23	14,361	990	4,245	262	5,351	345	25,554
-24	5,837	405	1,877	34	1,444	83	9,680
1924-25	17,674	2,348	4,550	230	4,681	306	29,789
-26	13,012	1,412	2,317	95	3,517	166	20,519
-27	26,381	3,610	4,943	262	6,707	440	42,343
-28	18,419	1,945	3,560	189	3,589	174	27,866
-29	8,863	688	1,994	59	2,875	186	14,665
1929-30	14,616	1,306	2,579	96	2,935	156	21,688
-31	6,292	456	1,198	20	1,559	67	9,587
-32	14,016	856	4,684	201	6,884	442	27,083
-33	9,335	640	2,277	47	3,685	269	16,253
-34	9,272	785	1,744	83	2,148	74	14,106
6-yr. mean (1929-1934)	10,899	788	2,412	84	3,848	199	17,230
17 yr. mean (1917-34)	14,137	1,458	3,256	164	4,219	251	23,484
1934-35	18,016	2,049	4,617	217	5,853	302	31,054
-36	18,978	1,905	5,320	415	6,573	540	33,731
-37	14,453	1,386	4,551	336	8,256	949	29,931
-38	35,517	6,208	7,979	540	12,219	1,110	63,573
-39	8,511	508	2,001	47	3,297	274	14,638
1939-40	24,912	3,143	5,301	302	6,486	650	40,794
-41	31,517	7,030	5,378	294	9,256	758	54,233
-42	28,255	3,349	5,625	290	7,205	449	45,173
-43	22,862	2,079	6,011	400	7,337	1,105	40,000
-44	11,090	577	2,737	114	4,276	345	19,139
1944-45	16,023	1,274	4,730	222	7,129	640	30,028
-46	18,908	1,737	4,363	170	5,735	314	31,277
-47	11,014	710	2,349	71	3,647	185	17,976
13 yr. mean (1934-47)	20,004	2,459	4,689	263	6,752	586	34,750
30 yr. mean (1917-47)	16,679	1,891	3,877	207	5,317	396	28,377
53 yr. mean (As used by Department of Water Resources) (1894-1947)	19,958	2,591	4,463	288	6,044	456	33,800

their coming nor their duration is predictable. They are, however, facts which we must face and with which we must live.

The Water Supply "Balance Sheet"

The following *Table V* repeats the form and figures in State Water Plan Table 3-5. For comparison purposes new figures are shown in parenthesis ( ) based upon the water supply available during a 17-year dry period. (It is assumed that this dry period is preceded by at least three wet years and that all reservoirs developed for year to year carry-over storage are filled at the beginning of the dry period.) Also, a restudy has been made of water requirements for all areas of the State.

These adjusted figures reveal an overall average annual deficiency of water in California of 6.22 million acre-feet during a 17-year dry period. The sheet can be made to balance by reducing the seasonal water requirements of all areas by 12.7 percent, or to nearly balance by eliminating exports to the Lahontan area. (See notes following table.)

TABLE V

SUMMARY OF ESTIMATED ULTIMATE MEAN SEASONAL EXPORTS AND IMPORTS OF WATER

(Million Acre-Feet)

Figures in parenthesis—Adjusted to 17-year mean and restudy of seasonal requirements.
Other figures—State Water Plan Table 3-5—Bulletin No. 3—May 1956.

Hydrographic area	Mean runoff	Safe yield	Present rights for		Seasonal water requirements	Seasonal surplus for export	Seasonal deficiency to be met by import	Notes
			Import	Export				
COASTAL North Coastal	28.89 (20.40)	13.69 (13.10)			2.10 (3.00)	11.59 (10.10)		#1
San Francisco Bay	1.25 (.90)	.53 (.40)	.67 (.67)		3.51 (3.30)		2.31 (2.23)	#2
Central Coastal—Monterey County South to Ventura County	2.45 (1.80)	1.17 (1.00)			2.36 (2.46)		1.19 (1.46)	#3
South Coastal—Los Angeles County to San Diego County	1.23 (.90)	1.15 (.80)	1.53 (1.53)		5.55 (5.55)		2.87 (3.22)	#4
CENTRAL VALLEY Sacramento River Basin	22.39 (15.60)	18.44 (15.00)			7.72 (9.00)	9.63 (6.00)		#5
San Joaquin and Tulare River Basins	11.25 (7.90)	9.08 (7.50)		.67 (.67)	16.31 (16.69)		7.90 (9.86)	#6
LAHONTAN Area North of Mono Basin	1.84 (1.30)	.31 (.31)			1.33 (.31)		1.02 (.00)	
Mono Basin and Area South	1.33 (1.00)	.83 (.70)		.32 (.32)	5.40 (4.02)		4.84 (3.64)	#7
Colorado Desert	.22 (.13)	.08 (.07)	4.15 (4.15)		5.62 (4.23)		1.39 (.00)	
California's Right to Colorado River Water		5.36 (5.36)		5.36 (5.36)				
Requirements for works in Delta and Losses in Transport and Storage					.72* (1.90)			#8
Totals	70.85 (49.93)	50.64 (44.24)	6.35 (6.35)	6.35 (6.35)	50.62 (50.46)	21.22 (16.10)	21.52 (20.41)	#9
Average Annual Deficiency					(—6.22)			

* Operation of Delta Works only.

Notes on Water Supply "Balance Sheet"

NOTE 1—The adjusted estimates are based on the 17-dry-year (1917-1934) runoff of north coastal watersheds and are 72.3 percent of the figure used by State Water Plan authorities. The adjusted yield, however, is only slightly less. The State Water Plan figure of 2.1 million acre-feet for north coastal use is considered to be too low in the light of probable future industrial developments in the north coastal area. A total use of 3.0 million acre-feet of water appears to be a more realistic figure. This leaves a 10.1 million acre-feet seasonal surplus for export, which is only 87 percent of the amount estimated in the State Water Plan. Even this amount is probably larger than can be practically transported into the Central Valley.

NOTE 2—In the San Francisco Bay area the adjusted estimate based on the 17-dry-year period reduces the safe annual yield from local sources to 0.4 million acre-feet. Restudy of the ultimate seasonal requirements results in a figure of 3.3 million acre-feet. The San Francisco Bay area now imports 0.67 million acre-feet of water from the San Joaquin Basin. (See Note No. 6.)

NOTE 3—The adjusted estimate based on the 17-dry-year period indicates that the safe annual yield in the central coastal area is 1.0 million acre-feet of water. Restudy of the ultimate seasonal water requirement indicates that this area can utilize 2.46 million acre-feet.

NOTE 4—The south coastal area, which has an estimated ultimate annual water requirement of 5.5 million acre-feet, would have, during a 17-dry-year period, a safe annual yield of only 0.8 million acre-feet. This area now has import rights amounting to 1.53 million acre-feet. (0.32 m.a.f. from Mono and Owens basins and 1.21 m.a.f. from the Colorado River.) It must, therefore, import 3.22 million acre-feet from some northern source to meet its ultimate requirements.

NOTE 5—Based upon the 53-year period (1894-1947) the mean annual runoff in the Sacramento River Basin area is 22.39 million acre-feet. During the 17-dry-year period (1918-1937) the average annual runoff is reduced to 15.6 million acre-feet. The safe annual yield is estimated at 15.0 million acre-feet. The seasonal water requirements as estimated in the State Water Plan are too low for a dry period. New acreage coming into production is allotted less than two acre-feet per annum. Restudy of the ultimate water requirements of the Sacramento River Basin area indicates that 9.0 million acre-feet of water per year would be needed to meet annual requirements during such a 17-year dry period.

Notes on Water Supply "Balance Sheet"—Continued

The seasonal surplus available for export is 6.0 million acre-feet of water, which is less than that required to meet deficiences in the San Joaquin and Tulare Basins.

NOTE 6—Average runoff in the San Joaquin and Tulare Basin areas based on the 17-dry-year period (1917-1934) is estimated at 7.88 million acre-feet, 10.1 percent of the 58-year (1894-1947) state total average annual runoff. The safe annual yield is estimated at 7.5 million acre-feet, and the seasonal water requirement is 16.69 million acre-feet. This area, which is thus deficient by 9.19 million acre-feet, exports 0.67 m.a.f. to the San Francisco Bay area, increasing its total deficiency to 9.86 million acre-feet of water.

Considering the great Central Valley as one unit, the average annual safe yield for the 17-dry-year period (1917-1934) is 22.5 million acre-feet, and the combined ultimate water requirements are 25.69 million acre-feet. Consequently, during a 17-dry-year period such as 1917-1934, this area would suffer an average annual water deficiency of 3.19 million acre-feet, or else would require additional usable surface and underground storage capacity of $3.19 \times 17 = 54.2$ million acre-feet plus about 10 percent for carryover and transportation losses. This additional stored capacity would have to be full at the beginning of the 17-year dry period.

NOTE 7—The problem of water for the desert areas of California is a very special one. The estimates of seasonal requirements in the desert areas are based on the available arable land and not upon studies of economic yield per acre-foot of water. The State Water Plan (Bulletin No. 3) estimates that the seasonal water requirements for the irrigation of irrigable areas are 12.35 million acre-feet. A restudy which discards lands which obviously can be served with water only at the expense of more productive lands reduces this seasonal requirement to 9.58 million acre-feet. More critical studies should reduce the figure even further. Water resources in the desert areas are estimated at 5.23 million acre-feet. This includes an estimated safe yield of 1.08 million acre-feet, and a water right of 4.15 million acre-feet from the Colorado River. These areas are now probably richer in water resources than any comparable desert areas on the face of the earth.

The average annual water deficiency of the desert areas as revised for the 17-dry-year period (1917-1934) is estimated at 4.16 million acre-feet. This is 66.8 percent of the average annual deficiency for the entire State. (See Note No. 9.)

NOTE 8—The State Water Plan (Bulletin No. 3) estimates that 0.72 million acre-feet of water is required for the operation of works in the Sacramento-San Joaquin Delta. No allowance is made for losses in the storage and transportation of water. (An earlier version of Table 3-5 made an allowance of 1.74 million acre-feet for the above combined uses.)

The Weber Foundation studies indicate that 1.90 million acre-feet per annum must be allotted for the operation of Delta works and for losses in the transportation of water.

NOTE 9—The State Water Plan "balance sheet" balances; that is, safe seasonal yield equals seasonal water requirements, and seasonal surplus for export equals seasonal deficiencies to be met by import. The water supply figures adjusted to the 17-dry-year period (1917-1934) and the restudied seasonal requirements do not balance but indicate that during a 17-dry-year period California would suffer an average annual deficiency of 6.22 million acre-feet. The figures can be made to balance by reducing the seasonal water requirements of the various areas by 12.7 percent or by having a supplemental volume of more than 105 million acre-feet of stored water supply at the beginning of such a critical period.

If the technical, financial, legal and political problems can be solved, a large part of such storage volume could be provided by ground water basin storage. Some potential surface reservoir sites, such as a Greater Monticello Reservoir and a Great Kern Canyon Reservoir, could provide about 20 percent of that volume, and thereby make it possible to greatly extend the ground water replenishment periods, and thereby increase the total input during wet periods.

PREMISE TWO

THE ECONOMIC FEASIBILITY OF SPECIFIC PROJECTS ESSENTIAL TO THE ULTIMATE DEVELOPMENT OF OUR WATER RESOURCES MUST BE CONSIDERED IN THE LIGHT OF THE TOTAL DEVELOPMENT OF WATER RESOURCES

Preliminary studies of proposed water development projects are required to determine (1) The "engineering feasibility" (practicability) of the project, and (2) The "economic feasibility" (ratio between cost and return) of the project. Inasmuch as the art of the economist is less "scientific" in its approach to the solution of its feasibility problems than is the art of the engineer, much of the controversy regarding project feasibility arises in the economic field.

Many proposed water development projects, which upon investigation prove to be feasible from an engineering standpoint, are judged to be (at a specific time and place) "economically unfeasible" because no definite future value can be assigned to the necessity (demand) for water.

As population gains, and water development in California proceeds, and undeveloped water resources become scarce or more remote, then the limits of economic feasibility approach the limits of engineering feasibility.

Water is a necessity. Ultimately the demand for water will exceed the natural usable supply and the "value" which can be placed upon water will be sufficient to justify as economically feasible any project which is judged to be feasible or practical from an engineering standpoint.

Thus, in these studies, any water development project essential to the ultimate total water development plan, which is feasible from an engineering standpoint, is considered to be ultimately economically feasible. Studies of economic feasibility, separate from engineering feasibility, are important only in determining priorities for the specific projects in the total water development program.

Economic feasibility studies in the development of California water resources rest heavily upon the "values" which are and which in the future will be placed upon water development "byproducts" such as power, fish production, recreation, and navigation, and upon such special water expenditures as flood wastes and salt and organic pollution control.

Economic necessity will in the future engender many technological advances which will extend the limits of engineering feasibility. We will (it is sincerely hoped) solve some of the perplexing problems inherent in the subsurface storage of water supplies. Certainly we will learn how to construct larger and longer tunnels at lesser costs than prevail today. We may find ways to reduce loss of water by evaporation from storage reservoir surfaces. Our new understand-

Unimpaired Flow Sacramento and San Joaquin Valley from Department of Water Resources California Data Exchange Center

Water Year	Water Year Sum	Water Year Average
1929	11.24	
1930	16.77	
1931	7.76	
1932	19.75	13.12
1933	12.28	
1934	10.91	
1976	10.17	8.17
1977	6.17	
1987	11.35	
1988	11.71	
1989	18.38	12.71
1990	11.72	
1991	11.64	
1992	11.45	
2007	12.79	13.25
2008	13.71	

EXHIBIT G

On October 12, 1948, Secretary of the Interior Krug, in a public speech at Oroville, stated: "Let me state, clearly and finally, the Interior Department is fully and completely committed to the policy that no water which is needed in the Sacramento Valley will be sent out of it." He added: "There is no intent on the part of the Bureau of Reclamation ever to divert from the Sacramento Valley a single acre-foot of water which might be used in the valley now or later." (Staff 9, p. 799 & SRDWA 19).

On November 15, 1949, Regional Director Richard L. Boke reaffirmed these main policy statements and summarized them in a letter to Congressman Clair Engle, stating, "We believe the foregoing is a summary of the main policy statements by Government officials on the subject of importation of Sacramento Valley water to the San Joaquin Valley." (Staff 9, p. 799 & SRDWA 19).

PROMISE NOT KEPT

D 990 at pages 70 and 71

EXHIBIT H

§ 11460. Prior right to watershed water

In the construction and operation by the department of any project under the provisions of this part a watershed or area wherein water originates, or an area immediately adjacent thereto which can conveniently be supplied with water therefrom, shall not be deprived by the department directly or indirectly of the prior right to all of the water reasonably required to adequately supply the beneficial needs of the watershed, area, or any of the inhabitants or property owners therein.

(Added by Stats.1943, c. 370, p. 1896. Amended by Stats.1957, c. 1932, p. 3410, § 296.)

EXHIBIT I

are fully redeemed and paid. *(Added by Stats.1943, c. 370, p. 1896.)*

§ 11454. Rates and charges; contracts; indemnification provisions

Under such regulations and upon such terms, limitations, and conditions as it prescribes, the department may do any of the following:

(a) Fix and establish the prices, rates, and charges at which the resources and facilities made available by the project shall be sold and disposed of.

(b)(1) Enter into contracts and agreements and do any and all things which in its judgment are necessary, convenient, or expedient for the accomplishment of the purposes and objects of this part.

(2) The contracts and agreements may include provisions for the indemnification of parties with whom the department contracts as necessary to accomplish the purposes and objects of this part, except that the contracts and agreements may not include provisions for the indemnification, including indemnification for any costs of defense, of any party to those contracts or agreements for that party's acts or omissions involving negligence, gross negligence, recklessness, or willful misconduct or for acts or omissions involving negligence, gross negligence, recklessness, or willful misconduct on the part of that party's employees, agents, or contractors.

(3) The Legislature finds and declares that the amendments made to this subdivision during the 1997 portion of the 1997–98 Regular Session are declaratory of existing law. *(Added by Stats.1943, c. 370, p. 1896. Amended by Stats.1957, c. 1932, p. 3410, § 293; Stats.1997, c. 566 (S.B.543), § 1, eff. Sept. 29, 1997.)*

§ 11455. Revenue requirements

The department shall enter into such contracts and fix and establish such prices, rates, and charges so as at all times to provide revenue which will afford sufficient funds to pay all costs of operation and maintenance of the works authorized by this part, together with necessary repairs and replacements thereto, and which will provide at all times sufficient funds for redemption of all bonds and payment of interest thereon, as and when such costs and charges become due and payable. *(Added by Stats. 1943, c. 370, p. 1896. Amended by Stats.1957, c. 1932, p. 3410, § 294.)*

ARTICLE 3. LIMITATION OF POWERS

Section
11460. Prior right to watershed water.
11461. Purchase of watershed water rights.
11462. Creation of new property rights.
11463. Exchange of watershed water.
11464. Conveyance of property.
11465. Revision of charges, established by contract.

§ 11460. Prior right to watershed water

In the construction and operation by the department of any project under the provisions of this part a watershed or area wherein water originates, or an area immediately adjacent thereto which can conveniently be supplied with water therefrom, shall not be deprived by the department directly or indirectly of the prior right to all of the water reasonably required to adequately supply the beneficial needs of the watershed, area, or any of the inhabitants or property owners therein. *(Added by Stats.1943, c. 370, p. 1896. Amended by Stats.1957, c. 1932, p. 3410, § 296.)*

§ 11461. Purchase of watershed water rights

In no other way than by purchase or otherwise as provided in this part shall water rights of a watershed, area, or the inhabitants be impaired or curtailed by the department, but the provisions of this article shall be strictly limited to the acts and proceedings of the department, as such, and shall not apply to any persons or state agencies. *(Added by Stats.1943, c. 370, p. 1896. Amended by Stats.1957, c. 1932, p. 3410, § 297.)*

§ 11462. Creation of new property rights

The provisions of this article shall not be so construed as to create any new property rights other than against the department as provided in this part or to require the department to furnish to any person without adequate compensation therefor any water made available by the construction of any works by the department. *(Added by Stats.1943, c. 370, p. 1896. Amended by Stats.1957, c. 1932, p. 3410, § 298.)*

§ 11463. Exchange of watershed water

In the construction and operation by the department of any project under the provisions of this part, no exchange of the water of any watershed or area for the water of any other watershed or area may be made by the department unless the water requirements of the watershed or area in which the exchange is made are first and at all times met and satisfied to the extent that the requirements would have been met were the exchange not made, and no right to the use of water shall be gained or lost by reason of any such exchange. *(Added by Stats.1943, c. 370, p. 1896. Amended by Stats.1957, c. 1932, p. 3411, § 299.)*

§ 11464. Conveyance of property

No water right, reservoir, conduit, or facility for the generation, production, transmission, or distribution of electric power, acquired by the department shall ever be sold, granted, or conveyed by the department so that the department thereby is divested of the title to and ownership of it. *(Added by Stats.1943, c. 370, p. 1896. Amended by Stats.1957, c. 1932, p. 3411, § 300.)*

§ 11465. Revision of charges, established by contract

The department shall not make any change, alteration, or revision of any rates, prices, or charges established by any contract entered into pursuant to this part except as

EXHIBIT J

§ 11207. Primary purposes

Shasta Dam shall be constructed and used primarily for the following purposes:

(a) Improvement of navigation on the Sacramento River to Red Bluff.

(b) Increasing flood protection in the Sacramento Valley.

(c) Salinity control in the Sacramento-San Joaquin Delta.

(d) Storage and stabilization of the water supply of the Sacramento River for irrigation and domestic use. *(Added by Stats.1943, c. 370, p. 1896.)*

EXHIBIT K

Title	**THE CALIFORNIA WATER RESOURCES DEVELOPMENT BOND ACT**
Year/Election	**1960 general**
Proposition type	**bond (leg)**
Popular vote	**Yes: 3,008,328 (51.5%); No: 2,834,384 (48.5%)**
Pass/Fail	**Pass**
Summary	**This act provides for a bond issue of one billion, seven hundred fifty million dollars ($1,750,000,000) to be used by the Department of Water Resources for the development of the water resources of the State.**

For

Argument in Favor of California Water Resources Development Bond Act

Your vote on this measure will decide whether California will continue to prosper.

This Act, if approved, will launch the statewide water development program which will meet present and future demands of all areas of California. The program will not be a burden on the taxpayer; no new state taxes are involved; the bonds are repaid from project revenues, through the sale of water and power. In other words, it will pay for itself. The bonds will be used over a period of many years and will involve an approximate annual expenditure averaging only $75 million, as compared, for example with $600 million a year we spend on highways.

Existing facilities for furnishing water for California's needs will soon be exhausted because of our rapid population growth and industrial and agricultural expansion. We now face a further critical loss in the Colorado River supply. Without the projects made possible by this Act, we face a major water crisis. We can stand no more delay.

If we fail to act now to provide new sources of water, land development in the great San Joaquin Valley will slow to a halt by 1965 and the return of cultivated areas to wasteland will begin. In southern California, the existing sources of water which have nourished its tremendous expansion will reach capacity by 1970 and further development must wholly cease. In northern California desperately needed flood control and water supplies for many local areas will be denied.

This Act will assure construction funds for new water development facilities to meet California's requirements now and in the future. No area will be deprived of water to meet the needs of another. Nor will any area be asked to pay for water delivered to another.

To meet questions which concerned, southern California, the bonds will finance completion of all facilities needed, as described in the Act. Contracts for delivery of water may not be altered by the Legislature. The tap will be open, and no amount of political maneuvering can shut it off.

Under this Act the water rights of northern California will remain securely protected. In addition, sufficient money is provided for construction of local projects to meet the pressing needs for flood control, recreation and water deliveries in the north.

A much needed drainage system and water supply will be provided in the San Joaquin Valley.

Construction here authorized will provide thousands of jobs. And the program will nourish tremendous industrial and farm and urban expansion which will develop an ever-growing source of employment and economic prosperity for Californians.

Our Legislature has appropriated millions of dollars for work in preparation, and construction is now underway. It would be tragic if this impressive start toward solution of our water problems were now abandoned.

If we fail to act now to insure completion of this constructive program, serious existing water shortages will only get worse. The success of our State is at stake. Vote "Yes" for water for people, for progress, for prosperity!

EXHIBIT L

applicable, and with like effect. Where the law applicable to such agency does not set forth a procedure for the judicial determination of the validity of the public agency's bonds, the action shall be had as in the case of the judicial determination of the general obligation bonds of irrigation districts under the Irrigation District Law (Division 11 (commencing with Section 20500) of this code), as it may now or hereafter be amended, as nearly as the same may be applicable, and with like effect. *(Added by Stats.1966, 1st Ex.Sess., c. 42, p. 351, § 1, eff. May 2, 1966.)*

Part 4.5

SACRAMENTO–SAN JOAQUIN DELTA

Chapter		Section
1.	General Policy	12200
2.	The Delta	12220
3.	Sacramento-San Joaquin Delta Levees	12225

CHAPTER 1. GENERAL POLICY

Section
12200. Legislative findings and declaration.
12201. Necessity of maintenance of water supply.
12202. Salinity control and adequate water supply; substitute water supply; delivery.
12203. Diversion of waters from channels of delta.
12204. Exportation of water from delta.
12205. Storage of water; integration of operation and management of release of water.

§ 12200. Legislative findings and declaration

The Legislature hereby finds that the water problems of the Sacramento-San Joaquin Delta are unique within the State; the Sacramento and San Joaquin Rivers join at the Sacramento-San Joaquin Delta to discharge their fresh water flows into Suisun, San Pablo and San Francisco Bays and thence into the Pacific Ocean; the merging of fresh water with saline bay waters and drainage waters and the withdrawal of fresh water for beneficial uses creates an acute problem of salinity intrusion into the vast network of channels and sloughs of the Delta; the State Water Resources Development System has as one of its objectives the transfer of waters from water-surplus areas in the Sacramento Valley and the north coastal area to water-deficient areas to the south and west of the Sacramento-San Joaquin Delta via the Delta; water surplus to the needs of the areas in which it originates is gathered in the Delta and thereby provides a common source of fresh water supply for water-deficient areas. It is, therefore, hereby declared that a general law cannot be made applicable to said Delta and that the enactment of this law is necessary for the protection, conservation, development, control and use of the waters in the Delta for the public good. *(Added by Stats.1959, c. 1766, p. 4247, § 1.)*

§ 12201. Necessity of maintenance of water supply

The Legislature finds that the maintenance of an adequate water supply in the Delta sufficient to maintain and expand agriculture, industry, urban, and recreational development in the Delta area as set forth in Section 12220, Chapter 2, of this part, and to provide a common source of fresh water for export to areas of water deficiency is necessary to the peace, health, safety and welfare of the people of the State, except that delivery of such water shall be subject to the provisions of Section 10505 and Sections 11460 to 11463, inclusive, of this code. *(Added by Stats.1959, c. 1766, p. 4247, § 1.)*

§ 12202. Salinity control and adequate water supply; substitute water supply; delivery

Among the functions to be provided by the State Water Resources Development System, in coordination with the activities of the United States in providing salinity control for the Delta through operation of the Federal Central Valley Project, shall be the provision of salinity control and an adequate water supply for the users of water in the Sacramento-San Joaquin Delta. If it is determined to be in the public interest to provide a substitute water supply to the users in said Delta in lieu of that which would be provided as a result of salinity control no added financial burden shall be placed upon said Delta water users solely by virtue of such substitution. Delivery of said substitute water supply shall be subject to the provisions of Section 10505 and Sections 11460 to 11463, inclusive, of this code. *(Added by Stats.1959, c. 1766, p. 4247, § 1.)*

§ 12203. Diversion of waters from channels of delta

It is hereby declared to be the policy of the State that no person, corporation or public or private agency or the State or the United States should divert water from the channels of the Sacramento-San Joaquin Delta to which the users within said Delta are entitled. *(Added by Stats.1959, c. 1766, p. 4249, § 1.)*

§ 12204. Exportation of water from delta

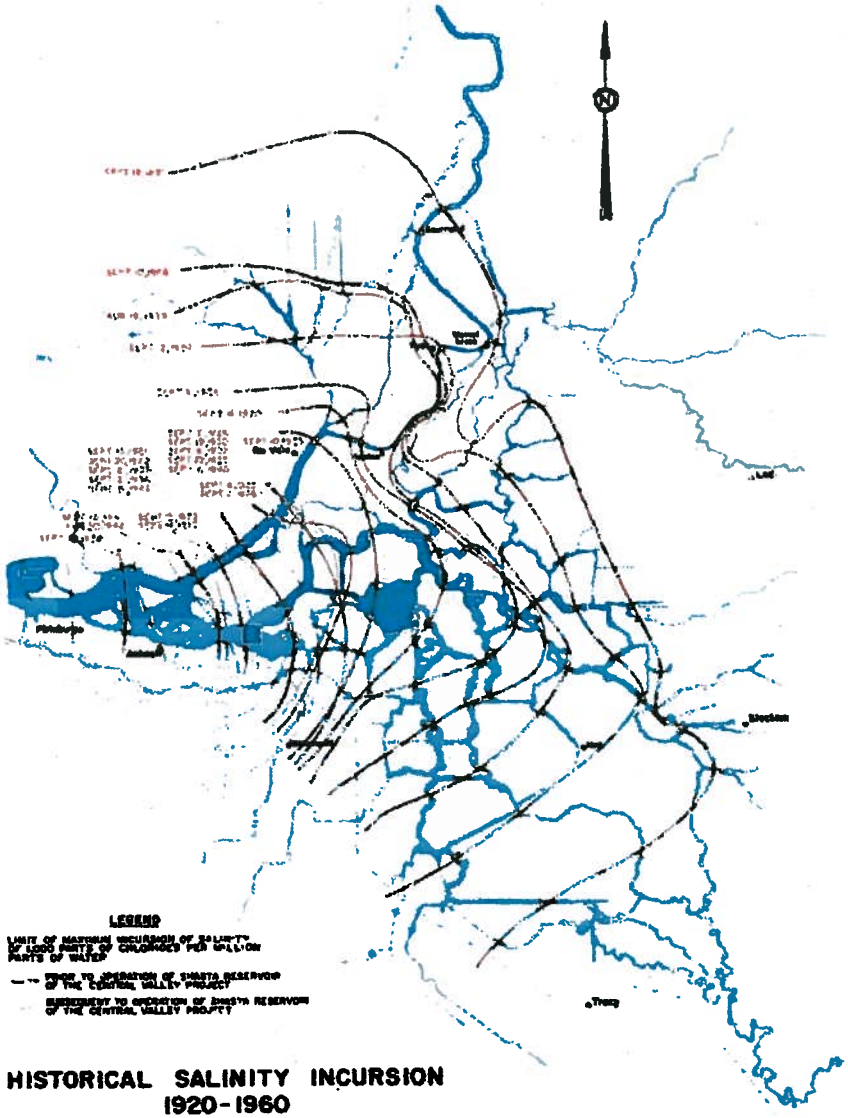
In determining the availability of water for export from the Sacramento-San Joaquin Delta no water shall be exported which is necessary to meet the requirements of Sections 12202 and 12203 of this chapter. *(Added by Stats.1959, c. 1766, p. 4249, § 1.)*

§ 12205. Storage of water; integration of operation and management of release of water

It is the policy of the State that the operation and management of releases from storage into the Sacramento-San Joaquin Delta of water for use outside the area in which such water originates shall be integrated to the maximum extent possible in order to permit the fulfillment of the objectives of this part. *(Added by Stats.1959, c. 1766, p. 4249, § 1.)*

EXHIBIT M

Delta Problems — salinity incursion and water supplies



HISTORICAL SALINITY INCURSION
1920-1960

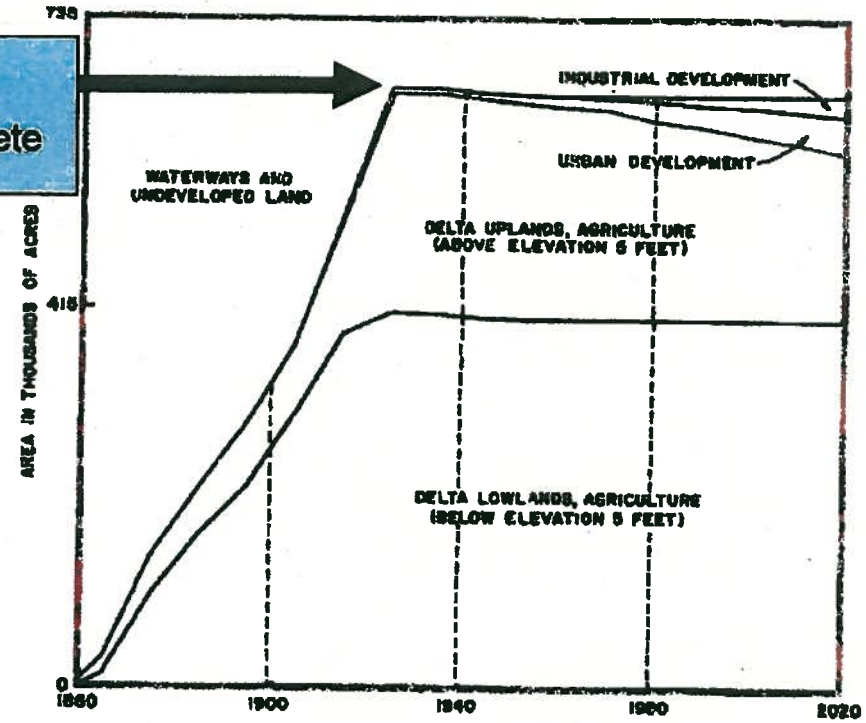
Salinity incursion into the Delta results from the flooding and ebbing of ocean tides through the San Francisco Bay and Delta system during periods when the fresh water outflow from the Delta is insufficient to repel the saline water. The natural fresh water outflow from the Central Valley was historically inadequate to repel salinity during summer months of some years. The first known record of salinity encroachment into the Delta was reported by Cmdr. Ringgold, U. S. Navy, in August 1841, whose party found the water at the site of the present city of Antioch very brackish and unfit for drinking. Since that time, and particularly after the turn of the century, with expanding upstream water use salinity incursion has become an increasingly greater problem in Delta water supplies. The maximum recorded extent of salinity incursion happened in 1931, when ocean salts reached Stockton. Since 1944 extensive incursion has been repulsed much of the time by fresh water releases from Central Valley Project storage in Shasta and Folsom Reservoirs. Without such releases, saline water would have spread through about 90 percent of the Delta channels in 1955 and 1959. Although upstream uses might not have reached present levels in the absence of the Central Valley Project, salinity problems would still have been very serious during most years.

Further increase in water use in areas tributary to the Delta will worsen the salinity incursion problem and complicate the already complex water rights situation. To maintain and expand the economy of the Delta, it will be necessary to provide an adequate supply of good quality water and protect the lands from the effects of salinity incursion. In 1959 the State Legislature directed that water shall not be diverted from the Delta for use elsewhere unless adequate supplies for the Delta are first provided.

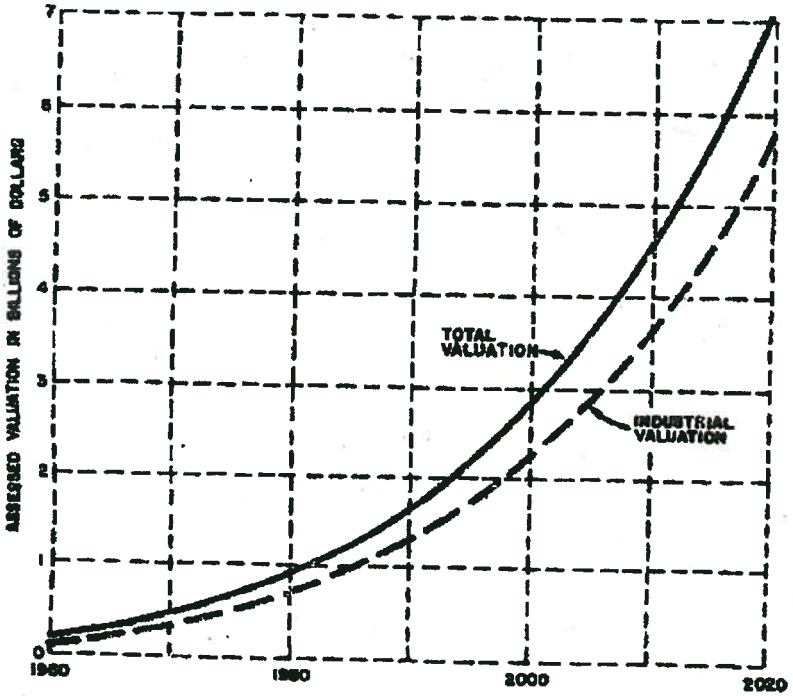
EXHIBIT N

Several towns and cities are located in the upland areas and an industrial complex is expanding in the Delta. Early industrial development cente kindred products, steel production, fibrebo building activity. Large water-using ind paper products, and chemicals, have deve area where water, rail, and highway transportation, coupled with water supplies, has stimulated growth. The manufacturing employment in this area was about 10,000 people in 1960.

1925 Delta Reclamation Complete



TRENDS IN LAND USE



PROJECTED ASSESSED VALUATIONS WITHIN THE WESTERN DELTA STUDY AREA

A deep-draft ship channel serving commercial and military installations terminates at Stockton, and another is being constructed to Sacramento. Water-borne shipments in the Delta amounted to about 6,000,000 tons annually in recent years.

The Delta encompasses one of California's most important high quality natural gas fields. Since 1941 the field has produced about 300,000,000 cubic feet of methane gas for use in the San Francisco Bay area.

With the growing significance of recreation, the Delta has blossomed into a major recreation area at the doorsteps of metropolitan development in the San Francisco Bay area, Sacramento, and Stockton. In 1960, nearly 2,800,000 recreation-days were enjoyed in this boating wonderland.

EXHIBIT O

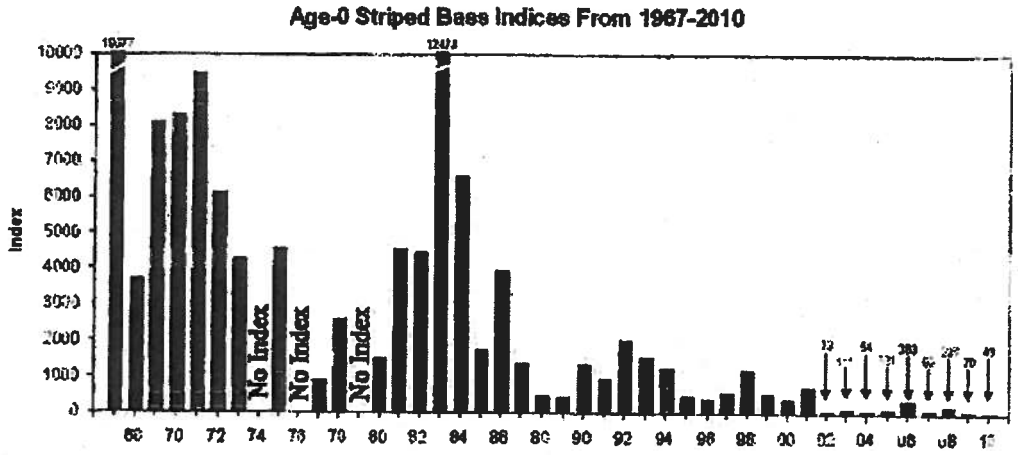
TABLE A-5
1976-77 Estimated Crop Et Values
Delta Service Area
(in inches)

Land Use Category	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Total Oct.76-Sep.77	Oct.77	Total Nov.77-Oct.77
Sacramento-San Joaquin Delta															
Irrigated Pasture	3.2	1.5	1.0	0.7	1.5	3.6	5.4	4.8	6.9	7.7	6.4	4.7	47.4	3.4	47.6
Alfalfa	3.2	1.5	1.0	0.7	1.5	3.2	4.9	4.4	6.5	7.5	6.5	4.9	45.8	3.4	46.0
Deciduous Orchard (Fruits & Nuts)	2.6	1.5	1.0	0.7	1.5	2.7	3.8	4.0	6.1	7.4	6.1	4.3	41.7	2.6	41.7
Tomatoes	2.4	1.5	1.0	0.7	1.5	1.9	2.2	2.6	4.0	8.2	6.0	2.3	34.3	1.9	33.8
Sugar Beets	2.4	1.5	1.0	0.7	1.5	1.9	2.2	3.7	7.6	8.3	6.4	4.4	41.6	2.4	41.6
Grain Sorghum (Milo)	2.4	1.5	1.0	0.7	1.5	1.9	2.2	2.0	5.9	7.3	4.3	2.5	33.2	1.9	32.7
Field Corn	2.4	1.5	1.0	0.7	1.5	1.9	2.2	2.3	5.7	6.9	5.1	2.6	33.8	1.9	33.3
Dry Beans	2.4	1.5	1.0	0.7	1.5	1.9	2.2	1.7	5.7	6.2	2.7	2.5	30.0	1.9	29.5
Safflower	2.4	1.5	1.0	0.7	1.5	1.9	2.5	4.8	8.7	7.7	4.4	2.5	39.6	1.9	39.1
Asparagus	2.4	1.5	1.0	0.7	1.5	1.9	2.2	1.0	3.5	7.7	6.4	4.7	34.5	2.4	34.5
Potatoes	2.4	1.5	1.0	0.7	1.5	1.9	2.2	1.7	4.3	7.4	5.5	2.8	32.9	1.9	32.4
Irrigated Grain	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	1.8	1.0	1.0	1.6	26.1	1.6	24.7
Vineyard	2.4	1.5	1.0	0.7	1.5	1.9	2.2	2.8	5.3	6.5	5.3	3.4	34.5	2.4	34.5
Rice	3.2	1.5	1.0	0.7	1.5	1.9	2.8	5.6	8.8	9.8	8.1	5.5	50.4	3.4	50.6
Sudan	2.4	1.5	1.0	0.7	2.0	4.3	5.7	4.8	6.9	7.7	4.9	4.7	46.6	2.4	46.6
Misc. Truck	2.4	1.5	1.0	0.7	1.5	1.9	3.2	4.6	6.7	7.4	5.2	3.7	39.8	1.9	39.3
Misc. Field	2.4	1.5	1.0	0.7	1.5	1.9	2.2	2.4	6.1	7.4	5.0	1.9	34.0	1.9	33.5
Double Cropped with Grain															
Sugar Beets	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	1.8	4.2	5.2	5.8	37.7	3.4	38.7
Field Corn	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	1.8	4.3	6.3	6.1	39.2	2.7	39.5
Grain Sorghum (Milo)	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	1.8	2.7	6.1	5.2	36.5	1.9	36.0
Sudan	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	3.6	7.7	4.9	4.7	41.6	1.9	41.1
Dry Beans	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	3.1	7.6	3.5	1.5	36.4	1.9	35.9
Tomatoes	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	2.3	6.6	6.0	5.2	40.8	1.9	40.3
Lettuce	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	4.1	7.4	5.3	4.9	42.4	2.4	42.4
Misc. Truck	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	2.3	6.6	6.0	5.2	40.8	2.4	40.8
Misc. Field	2.4	1.5	1.0	0.7	2.0	4.3	5.7	3.1	4.1	7.4	5.3	4.9	42.4	3.4	43.4
Fallow Lands 1/	2.4	1.5	1.0	0.7	1.4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	14.0	1.0	12.6
Native Vegetation 2/	2.4	1.5	1.0	0.7	1.4	3.7	3.8	2.1	2.3	2.6	2.3	2.0	25.8	1.6	25.0
Riparian Veg. & Water Surface	4.6	2.4	1.4	0.8	1.9	4.5	7.4	6.6	9.7	11.8	9.7	7.0	67.8	4.3	67.5
Urban	1.6	0.8	0.6	0.7	1.0	1.0	1.9	2.4	2.4	2.5	2.4	1.9	19.2	1.6	19.2

1/ Applies also to nonirrigated grain.
2/ Applies also to nonirrigated orchards and vineyards

Metric conversion: inches times 25.4 equals millimetres.

EXHIBIT P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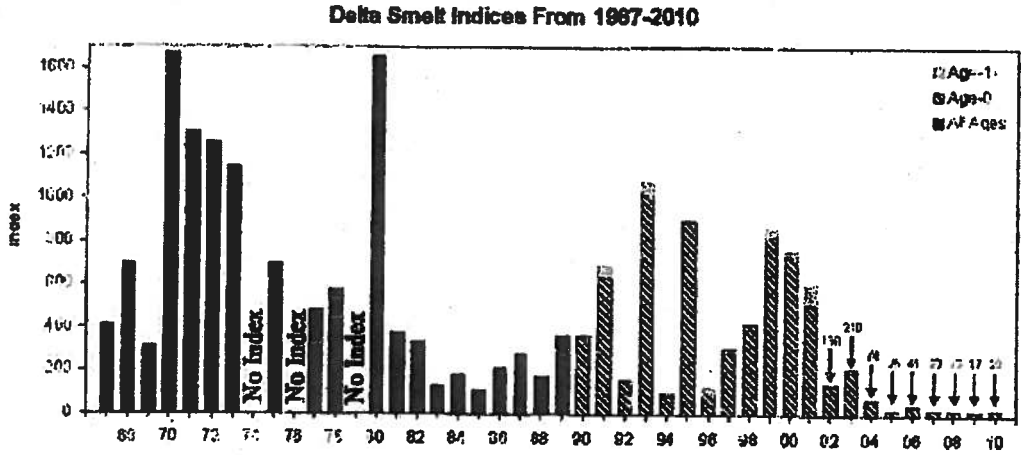
No Index


Delta Smelt Indices From 1967-2010
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Age-1+
Age-0
All Ages
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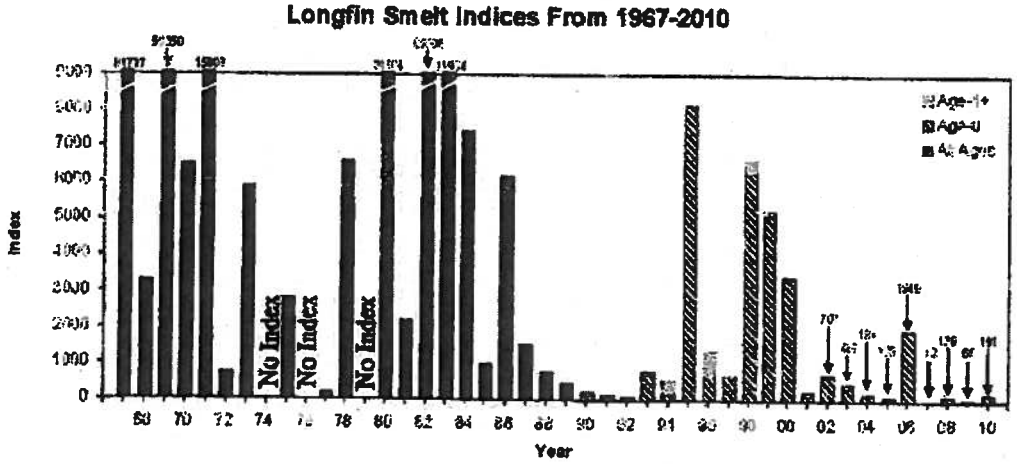
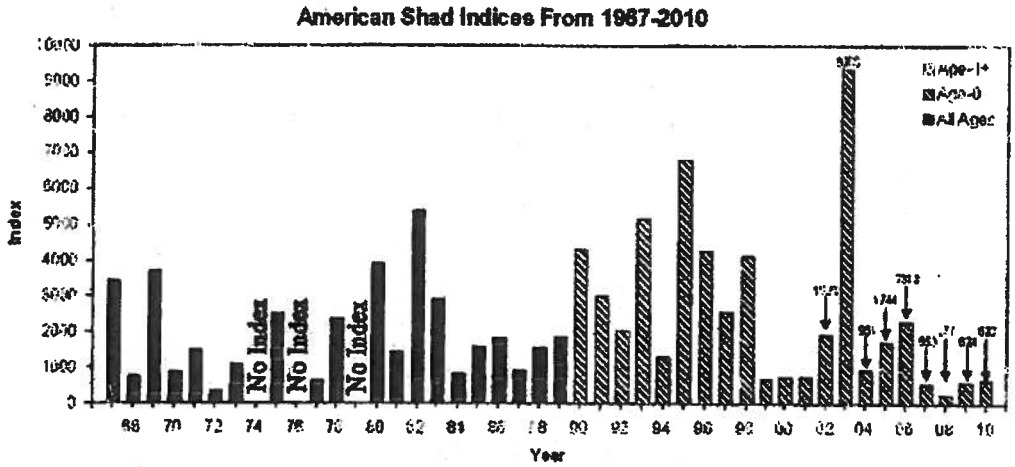

Longfin Smelt Indices From 1967-2010
Index
Year
Age-1+
Age-0
All Ages
No Index
No Index
No Index

EXHIBIT Q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Year
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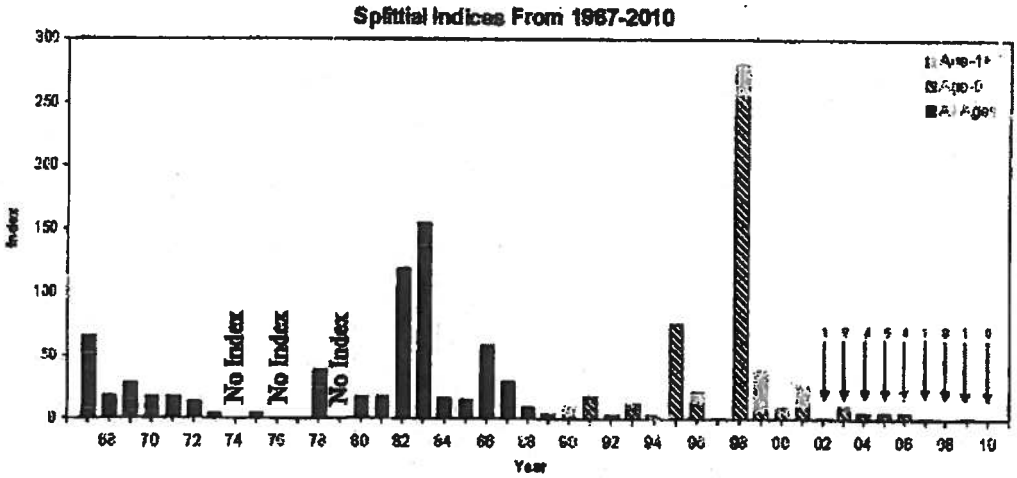
No Index
No Index
Age-1+
Age-0
All Ages


Splittail Indices From 1967-2010
Index
Year
No Index
No Index
No Index
Age-1+
Age-0
All Ages

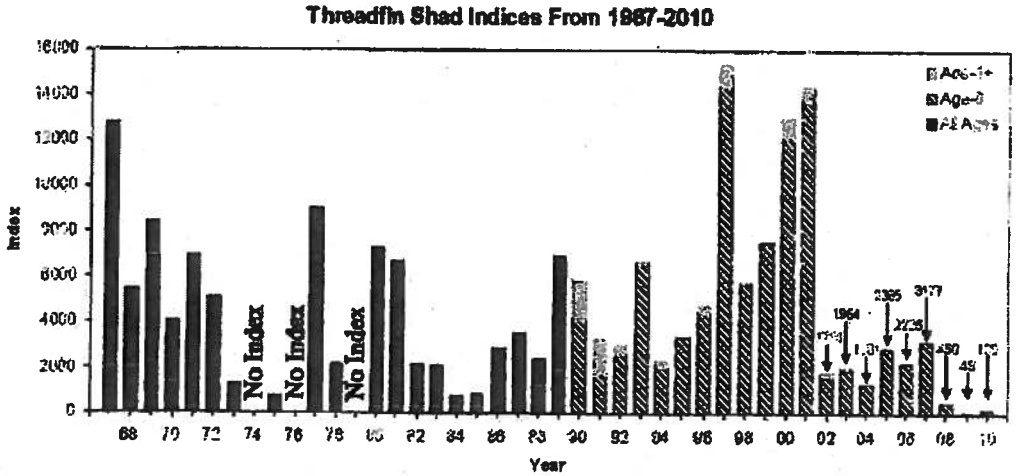

Threadfin Shad Indices From 1967-2010
Index
Year
No Index
No Index
No Index
Age-1+
Age-0
All Ages

EXHIBIT R

DRAFT 1 - 4 - 11

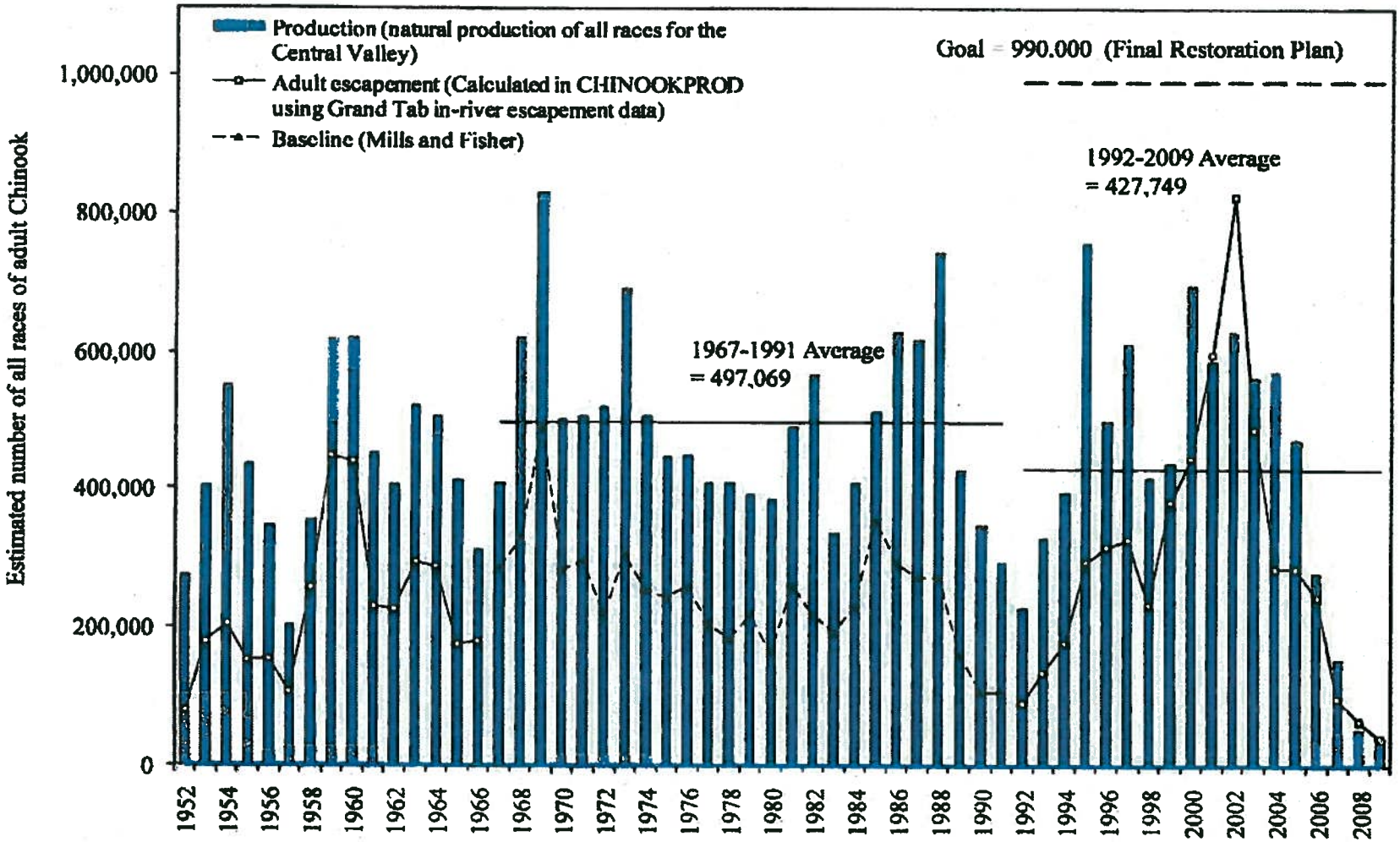


Figure 1. Estimated yearly natural production and in-river escapement of all races of adult Chinook Salmon in the Central Valley rivers and streams. 1952 - 1966 and 1992 - 2009 numbers are calculated in CHINOOKPROD using CDFG Grand Tab in-river escapement data (March 10, 2010). Baseline numbers (1967 - 1991) are from Mills and Fisher (CDFG, 1994).

EXHIBIT S

DRAFT 1 - 4 - 11

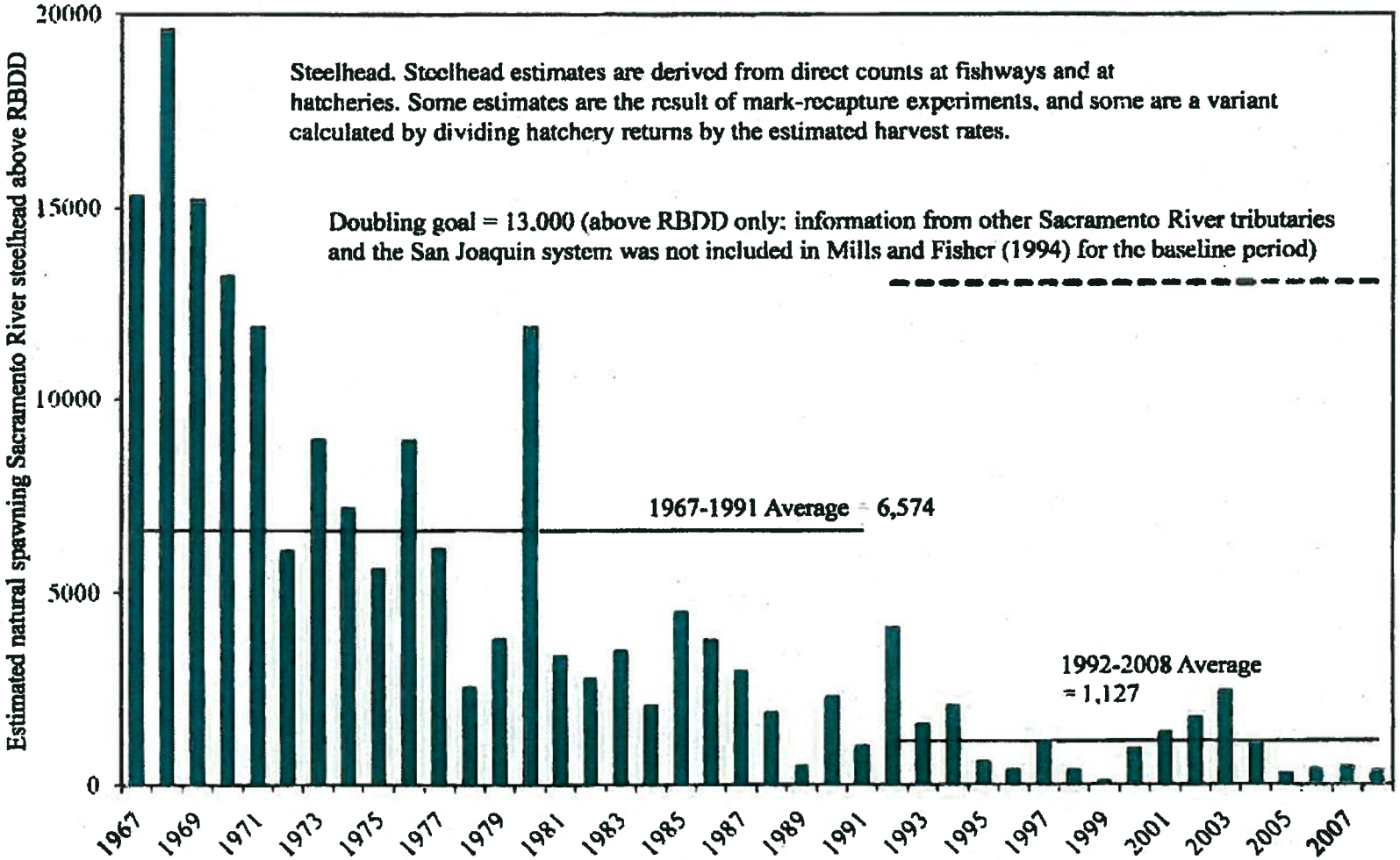


Figure 36. Estimated yearly number of natural spawning of steelhead on the Sacramento River, upstream of the RBDD (Mills and Fisher, 1994). Data for 1992-2008 is from CDFG, Red Bluff. 2008 sampling was curtailed in June due to high water temperatures.

EXHIBIT T

executed. The criteria in the draft agreement were recommended by Fish and Game and endorsed by the Department, and were extensively analyzed by the Board staff. Based on our most current assessment, the fishery standards provide significantly higher protection than existing basin plans. The Striped Bass Index is a measure of young bass survival through their first summer. The Striped Bass Index would be 71 under without project conditions (i.e., theoretical conditions which would exist today in the Delta and Marsh in the absence of the CVP and SWP), 63 under the existing basin plans, and about 79[3/] under this decision.

D 1485
1978

While the standards in this decision approach without project levels of protection for striped bass, there are many other species, such as white catfish, shad and salmon, which would not be protected to this level. To provide full mitigation of project impacts on all fishery species now would require the virtual shutting down of the project export pumps. The level of protection provided under this decision is nonetheless a reasonable level of protection until final determinations are made concerning a cross-Delta transfer facility or other means to mitigate project impacts.

3/ There is some indication that factors other than those considered in the Board's analysis of without project levels may also affect striped bass survival. The effects of these factors are such that the without project levels would be greater than 71. However, the magnitude of this impact is unknown and cannot be quantified at this time.

EXHIBIT U

D 1485
1978

051837

NOT PROVIDED

Suisun Marsh. Full protection of Suisun Marsh now could be accomplished only by requiring up to 2 million acre-feet of freshwater outflow in dry and critical years in addition to that required to meet other standards. This requirement would result in a one-third reduction in combined firm exportable yield of State and federal projects. In theory, the existing Basin 5B Plan purports to provide full protection to the Marsh. However, during the 1976-77 drought when the basin plan was in effect, the Marsh received little if any protection because the system almost ran out of water and emergency regulations had to be imposed. This decision balances the limitations of available water supplies against the mitigation responsibility of the projects. This balance is based on the constitutional mandate "...that the water resources of the State be put to beneficial use to the fullest extent of which they are capable..." and that unreasonable use and unreasonable diversion be prevented (Article 10, Section 2, California Constitution).

The Bureau, the Department, Fish and Game, and U. S. Fish and Wildlife Service are working together to develop alternative water supplies for the Marsh. Such alternative supplies appear to represent a feasible and reasonable method for protection of the Marsh and mitigation of the adverse impacts of the projects. Under this decision the Department and Bureau are required, in cooperation with other agencies, to develop a plan for Suisun Marsh by July 1, 1979. The Suisun Marsh plan should ensure that the

EXHIBIT V

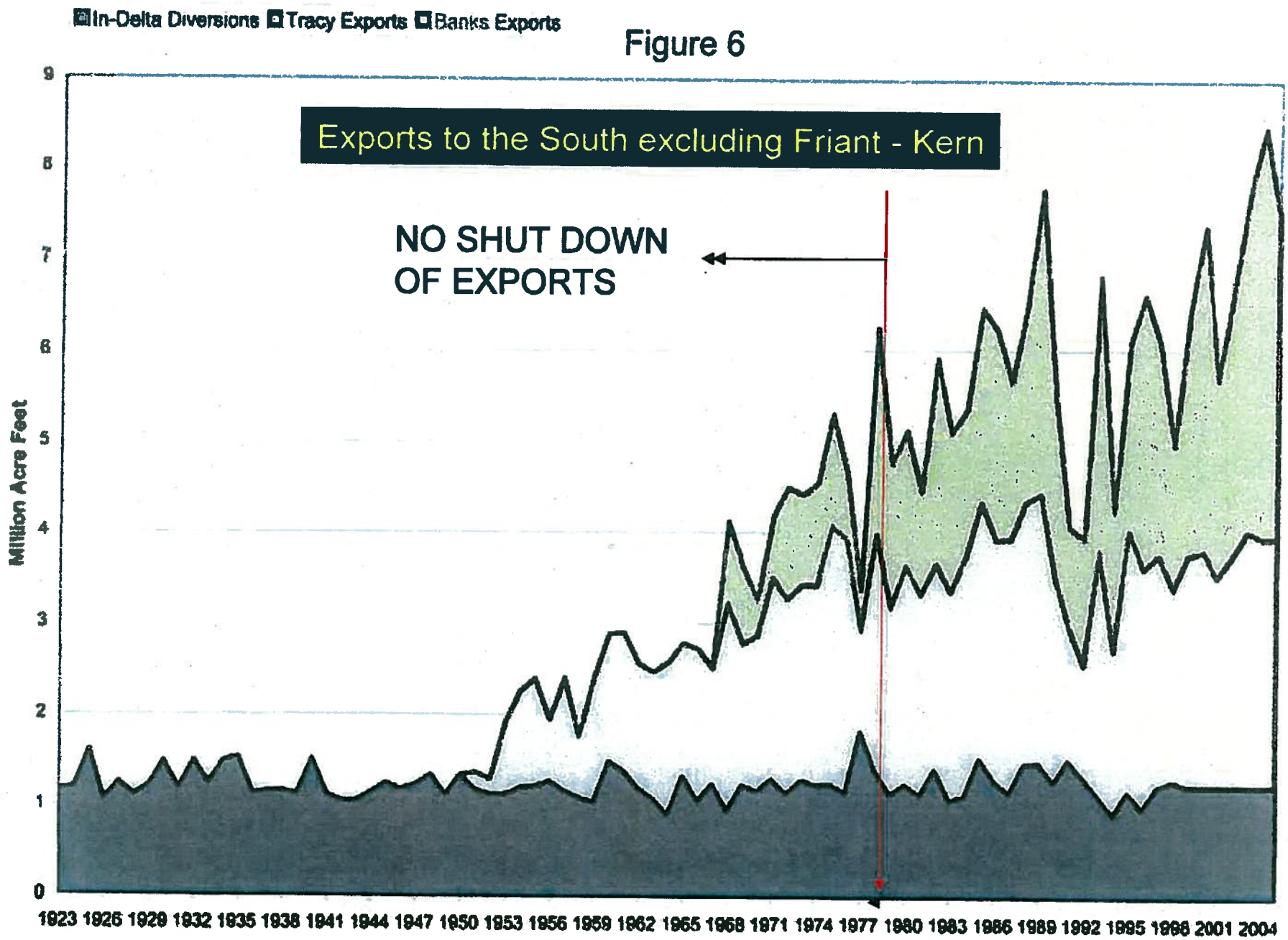

In-Delta Diversions
Tracy Exports
Banks Exports
Figure 6
Exports to the South excluding Friant - Kern
NO SHUT DOWN
OF EXPORTS
Million Acre Feet
0
1
2
3
4
5
6
7
8
9
1923 1926 1929 1932 1935 1938 1941 1944 1947 1950 1953 1956 1959 1962 1965 1968 1971 1974 1977 1980 1983 1986 1989 1992 1995 1998 2001 2004

EXHIBIT W

SACRAMENTO DELTA WATER SUPPLY AND REVIEW OF THE TIBURON REPORT

October 1987

Luna B. Leopold
Consulting Engineer

California must take heed of well documented experience in the Soviet Union where diversion of fresh water from the natural supply to an estuary has resulted in immense economic loss and the near destruction of an important estuary. Regulation of the Don River has resulted in an increase of salinity of the Azov Sea by a mere 7 percent and the result was to reduce total fish production from about 15 to 3 thousand tonnes annually. This has been documented in detail by Volovik (1986) and reviewed in the Tiburon report here being discussed. x)

The Tiburon report as it will here be called is a detailed study of the water situation in the Sacramento Delta. The reference is:

Rozengurt, M., Herz, M.J., and Feld, S.,1987, Analysis of the influence of water withdrawals on runoff to the Delta-SanFrancisco Bay ecosystem (1921-1983): Paul F. Romberg Tiburon Center for Environmental Studies, Tech. Rept. No 87-7.

This voluminous study cannot be either read or taken lightly for it is statistical, detailed, and in many places less than clear. Nevertheless the more one studies it the more impressive is the informational content. The present review deals only with the discussion and data dealing with annual flow data whereas the Tiburon report analyses both annual and monthly data.

The present discussion is an attempt to bring out those points that seem most significant and to present some reanalysis to clarify and emphasize some of the important conclusions.

The data base is reviewed in some detail. It appears that during the planning and construction stages of water development and diversion in the Sacramento system, two somewhat shortcut data compilations were used. The "Four River Index" is a data base that includes runoff from only 75 % of the total drainage area. A "modified method" had previously been employed also relecting less than the full runoff. Finally a compilation was made that estimated the runoff not only from the major rivers but included runoff from the foothill areas and is thought to represent a good approximation of the full runoff volume of 100% of the basin area. The Tiburon report shows that the planning done in the early years based on these less than full runoff volumes have given an over-optimistic picture of the water available for diversion from the Delta system.

x) emphasis added

EXHIBIT X
2 pages

Natural outflow less Regulated Outflow
average values in millions of acre feet

Time Period	Depletion
1921-1929	3.77
1930-1939	3.79
1940-1949	4.73
1950-1959	6.64
1960-1969	8.74
1970- 1979	10.94
1980-1982	12.70

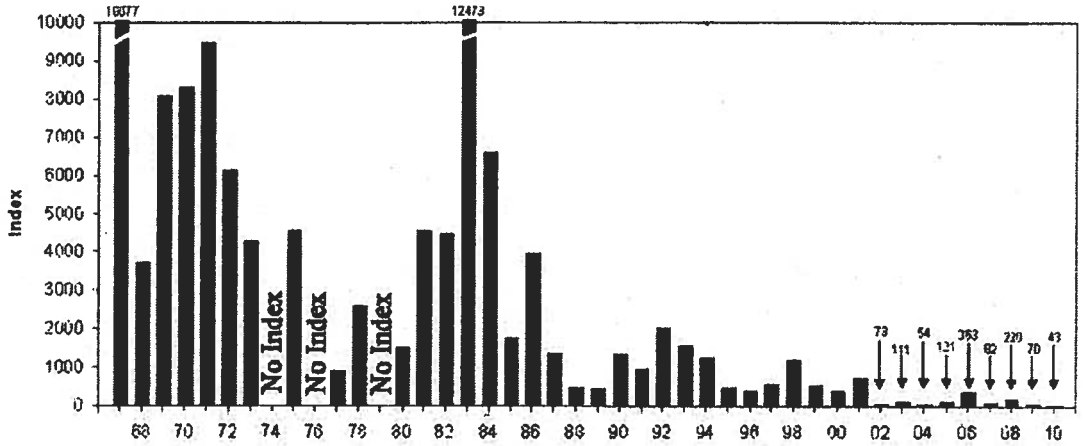
In conclusion, my studies confirm the general conclusions in the Tiburon report. The depletions have been massive and continue to increase. They have greatly increased the percentage of years of critical drought in the Delta and the Bay.

It is my professional opinion that no set of standards of water quality can be written that can have the practical effect of protecting the ecosystem from further degradation if diversions increase over the present level. Because forecasts of runoff are imperfect the effect of diversions in a year that turns out to be dry will already have taken its toll on the ecosystem before water quality measurements can compare the condition with the standards.

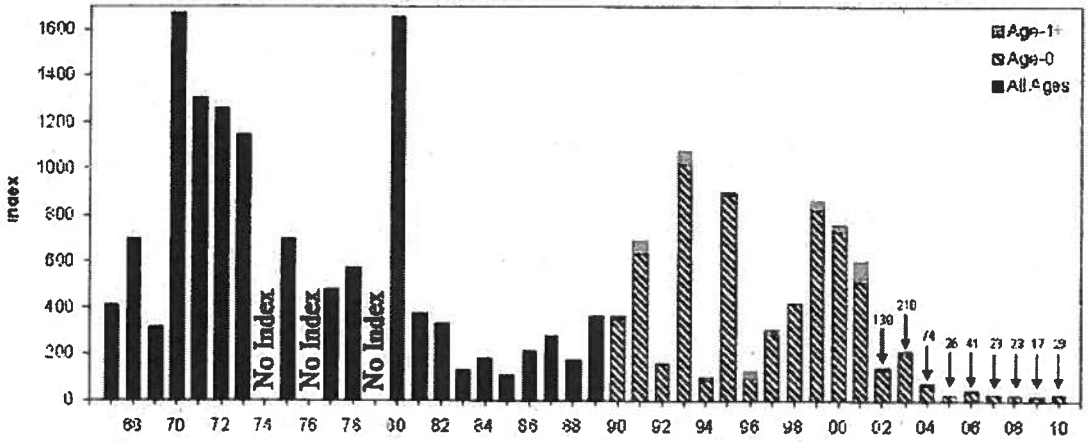
The logical and in my opinion the imperative step is to preclude henceforth any additional diversions of water from the Delta system.

Attachment D

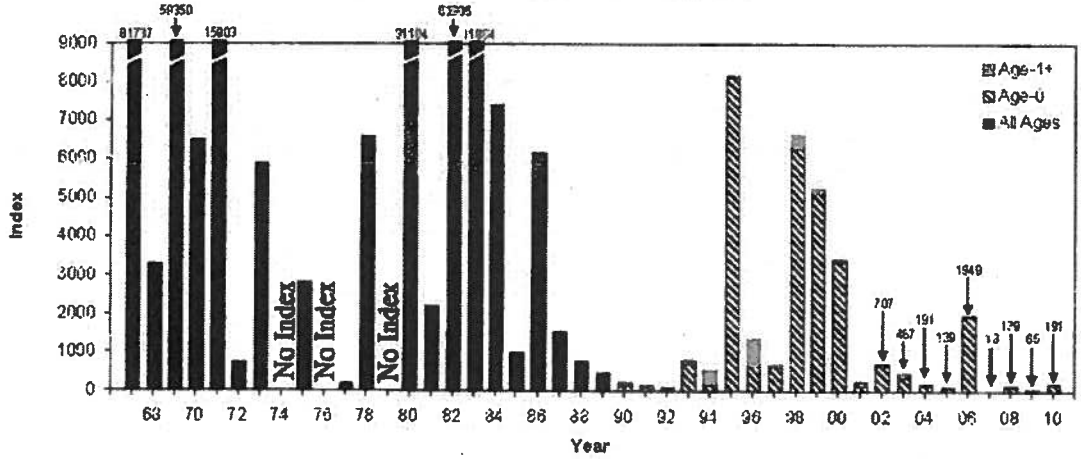
Age-0 Striped Bass Indices From 1967-2010

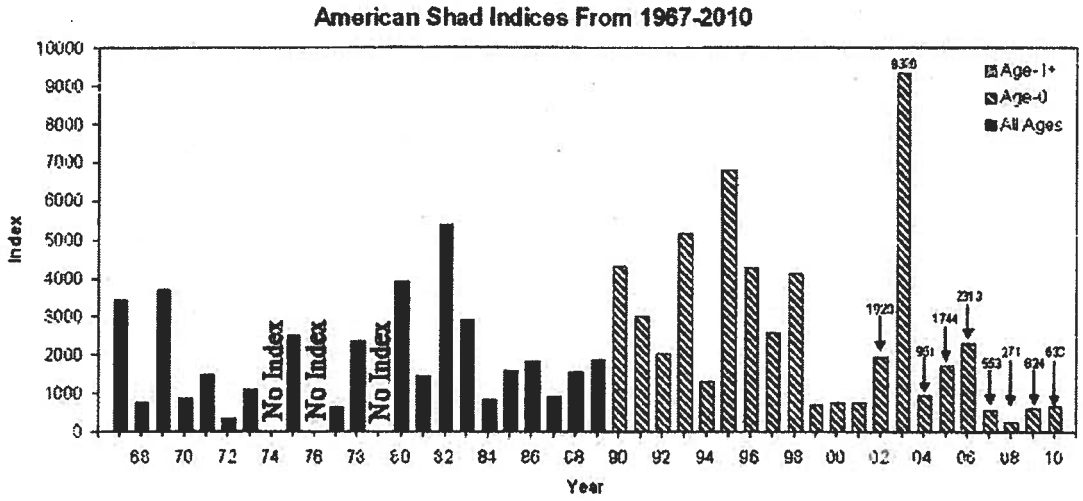


Delta Smelt Indices From 1967-2010



Longfin Smelt Indices From 1967-2010




American Shad Indices From 1967-2010
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Year
Age-1+
Age-0
All Ages
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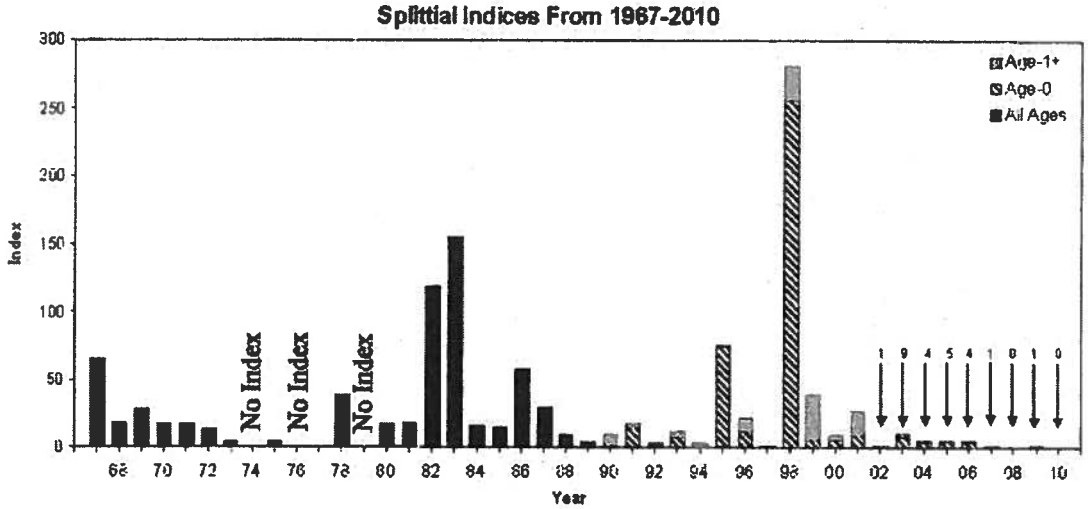
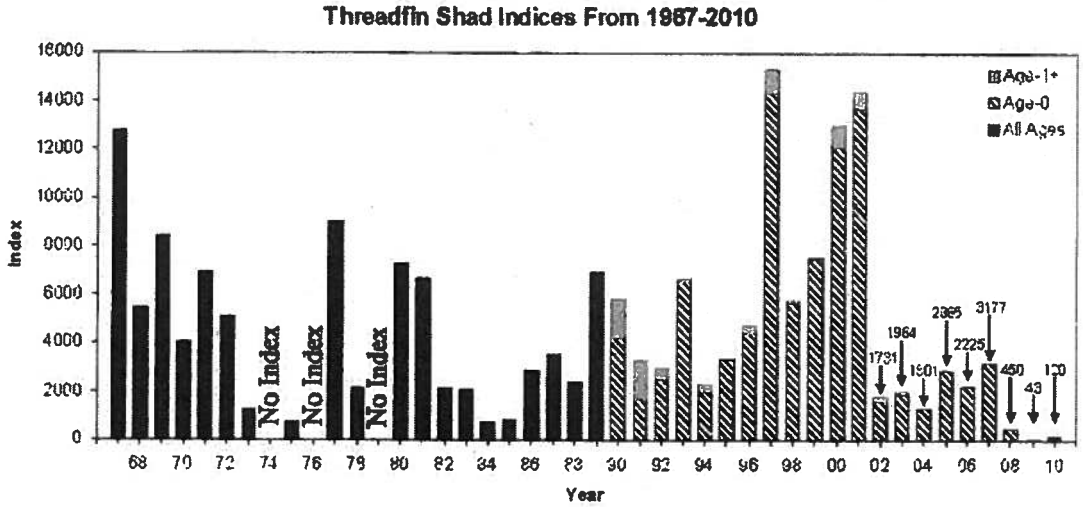
No Index
No Index
1744
2313
271
624


Splittial Indices From 1967-2010
Index
Year
Age-1+
Age-0
All Ages
No Index
No Index
No Index


Threadfin Shad Indices From 1967-2010
Index
Year
Age-1+
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1964
2365
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43

DRAFT 1 - 4 - 11

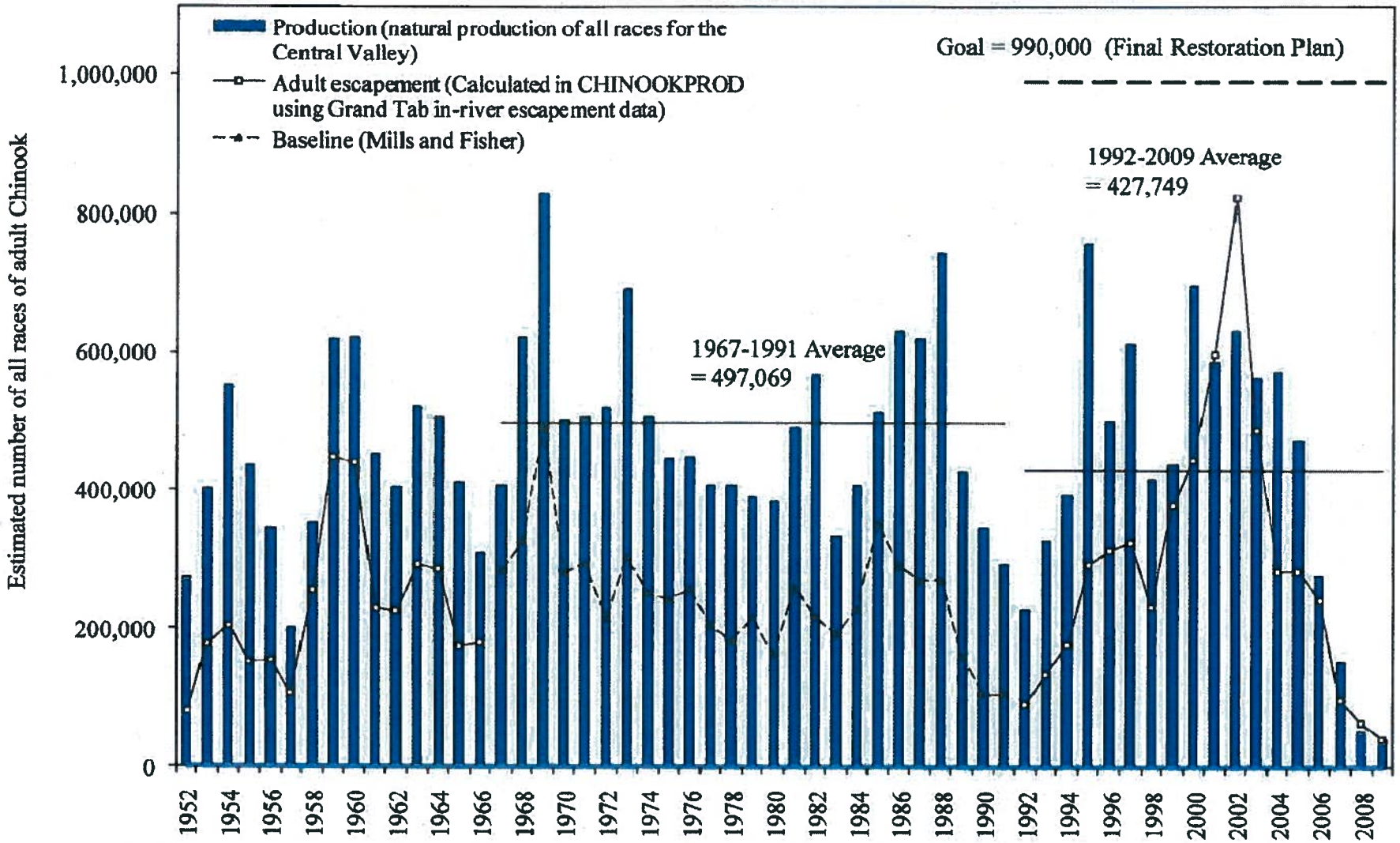


Figure 1. Estimated yearly natural production and in-river escapement of all races of adult Chinook Salmon in the Central Valley rivers and streams. 1952 - 1966 and 1992 - 2009 numbers are calculated in CHINOOKPROD using CDFG Grand Tab in-river escapement data (March 10, 2010). Baseline numbers (1967 - 1991) are from Mills and Fisher (CDFG, 1994).

DRAFT 1 - 4 - 11

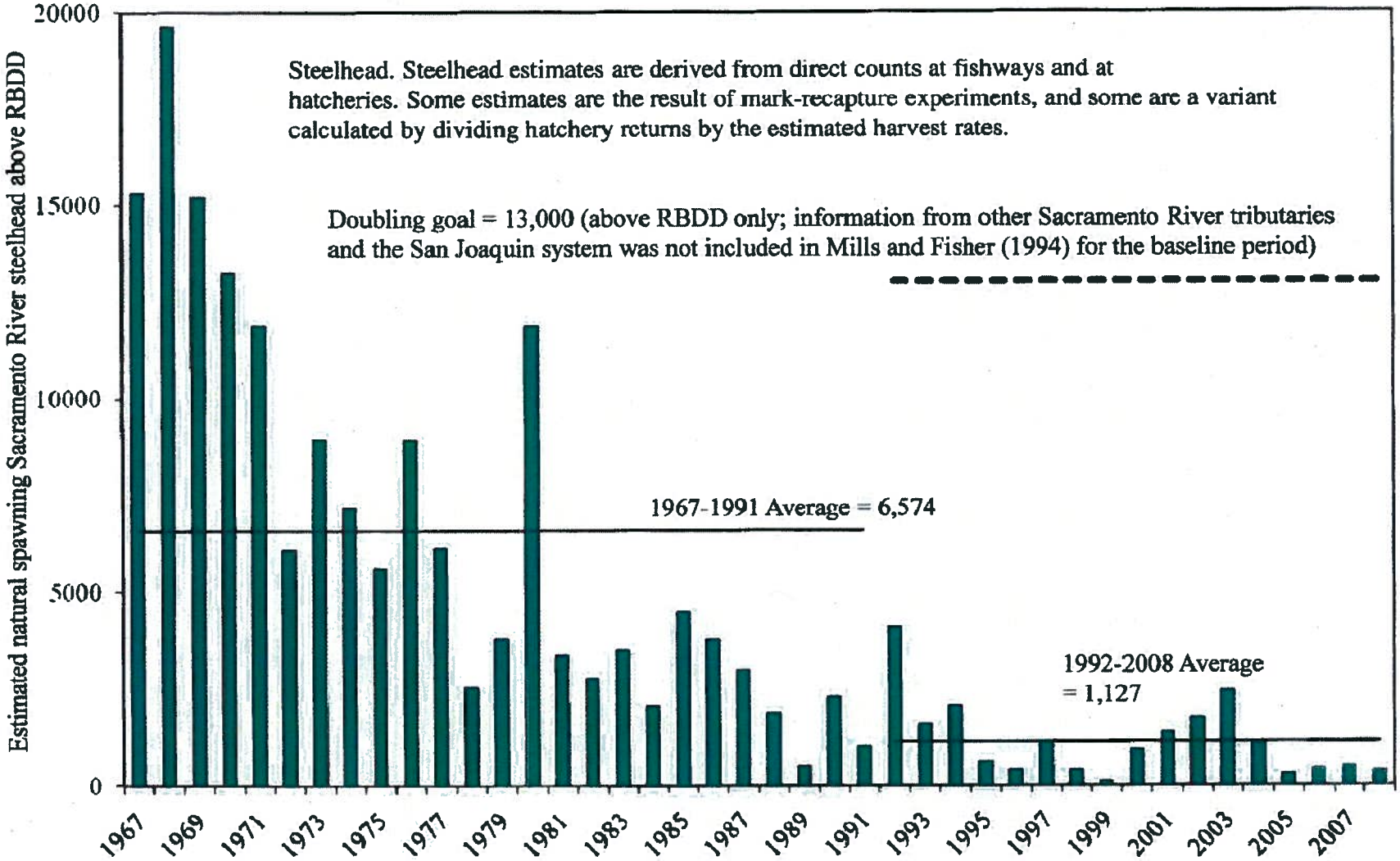
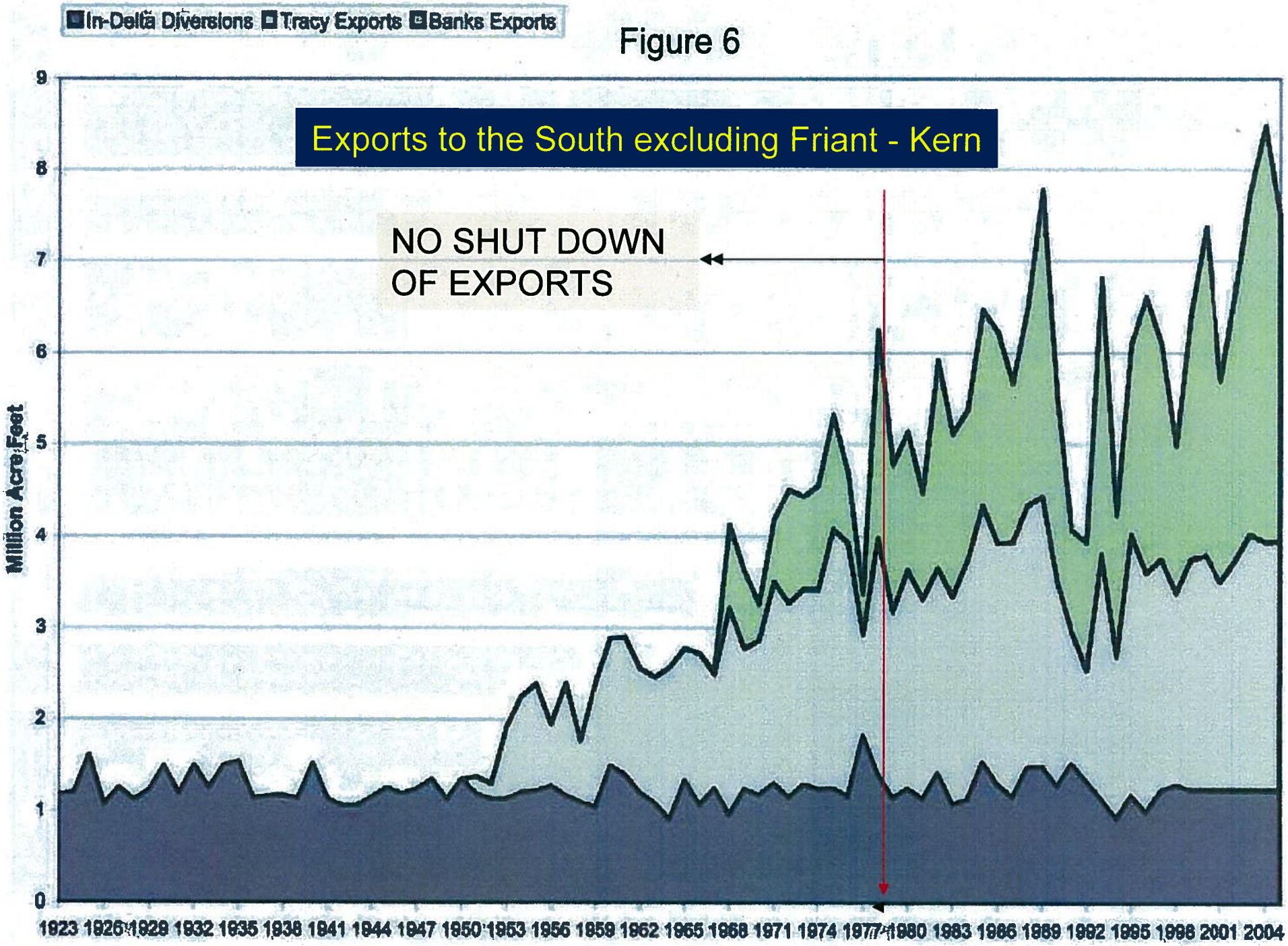


Figure 36. Estimated yearly number of natural spawning of steelhead on the Sacramento River, upstream of the RBDD (Mills and Fisher, 1994). Data for 1992-2008 is from CDFG, Red Bluff. 2008 sampling was curtailed in June due to high water temperatures.

Figure 6


In-Delta Diversions
Tracy Exports
Banks Exports
Exports to the South excluding Friant - Kern
NO SHUT DOWN
OF EXPORTS
Million Acre Feet
0
1
2
3
4
5
6
7
8
9
1923 1926 1929 1932 1935 1938 1941 1944 1947 1950 1953 1956 1959 1962 1965 1968 1971 1974 1977 1980 1983 1986 1989 1992 1995 1998 2001 2004

executed. The criteria in the draft agreement were recommended by Fish and Game and endorsed by the Department, and were extensively analyzed by the Board staff. Based on our most current assessment, the fishery standards provide significantly higher protection than existing basin plans. The Striped Bass Index is a measure of young bass survival through their first summer. The Striped Bass Index would be 71 under without project conditions (i.e., theoretical conditions which would exist today in the Delta and Marsh in the absence of the CVP and SWP), 63 under the existing basin plans, and about 79[3/] under this decision.

D 1485
1978

While the standards in this decision approach without project levels of protection for striped bass, there are many other species, such as white catfish, shad and salmon, which would not be protected to this level. To provide full mitigation of project impacts on all fishery species now would require the virtual shutting down of the project export pumps. The level of protection provided under this decision is nonetheless a reasonable level of protection until final determinations are made concerning a cross-Delta transfer facility or other means to mitigate project impacts.

NO SHUT DOWN
INSTEAD
INCREASED EXPORT

3/ There is some indication that factors other than those considered in the Board's analysis of without project levels may also affect striped bass survival. The effects of these factors are such that the without project levels would be greater than 71. However, the magnitude of this impact is unknown and cannot be quantified at this time.

D 1485
1978

051837

NOT PROVIDED

Suisun Marsh. Full protection of Suisun Marsh now could be accomplished only by requiring up to 2 million acre-feet of freshwater outflow in dry and critical years in addition to that required to meet other standards. This requirement would result in a one-third reduction in combined firm exportable yield of State and federal projects. In theory, the existing Basin 5B Plan purports to provide full protection to the Marsh. However, during the 1976-77 drought when the basin plan was in effect, the Marsh received little if any protection because the system almost ran out of water and emergency regulations had to be imposed. This decision balances the limitations of available water supplies against the mitigation responsibility of the projects. This balance is based on the constitutional mandate "...that the water resources of the State be put to beneficial use to the fullest extent of which they are capable..." and that unreasonable use and unreasonable diversion be prevented (Article 10, Section 2, California Constitution).

The Bureau, the Department, Fish and Game, and U. S. Fish and Wildlife Service are working together to develop alternative water supplies for the Marsh. Such alternative supplies appear to represent a feasible and reasonable method for protection of the Marsh and mitigation of the adverse impacts of the projects. Under this decision the Department and Bureau are required, in cooperation with other agencies, to develop a plan for Suisun Marsh by July 1, 1979. The Suisun Marsh plan should ensure that the

Attachment E

CENTRAL DELTA WATER AGENCY
235 East Weber Avenue • P.O. Box 1461 • Stockton, CA 95201
Phone 209/465-5883 • Fax 209/465-3956

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COUNSEL
Dante John Nomellini
Dante John Nomellini, Jr.

July 9, 2008

Via email mikemi@water.ca.gov

Mike Mirmazaheri
Program Manager
Delta Levee Program
Department of Water Resources
1416 Ninth Street
Sacramento, CA 94236

Re: Five (5) Year Levee Plan

Dear Mr. Mirmazaheri:

Thank you for the opportunity to provide a suggested five (5) year levee plan. This submittal is intended to provide the overarching plan within which Districts would submit five (5) year plans outlining the intended levee work categories with rough estimates of cost. These work plans will necessarily change with conditions in the field and progress of work. The five (5) years included are 2009-10, 2010-11, 2011-12, 2012-13 and 2013-14. For 2008-09 we suggest the same priorities. For Delta Levees Proposition 84 provided $275 Million and Proposition 1E $500 Million for a total of $775 Million. For the five years it is assumed that at least $100 Million will be available each year.

Our view of the need to preserve Delta levees extends to all of the present levee systems. The inter-relationship of the various islands and tracts due to seepage, wind wave generation and as habitat for both local and migratory fish and wildlife mandates that the plan should attempt to preserve all levee systems with due consideration of the Legislature's concern that preservation of all may not be economically justifiable. Outlined herein are the priorities and constraints which will provide economic support with appropriate justification.

The Legislature's findings and declarations in Water Code sections 12981 and 12982 provide the guidance in which we concur.

"§ 12981. Unique resources with statewide significance; preservation

(a) The Legislature finds and declares that the delta is endowed with many invaluable and unique resources and that these resources are of major statewide significance.

(b) The Legislature further finds and declares that the delta's uniqueness is particularly characterized by its hundreds of miles of meandering waterways and the many islands adjacent thereto; that, in order to preserve the delta's invaluable resources, which include highly productive agriculture, recreational assets, fisheries, and wildlife environment, the physical characteristics of the delta should be preserved essentially in their present form; and that the key to preserving the delta's physical characteristics is the system of levees defining the waterways and producing the adjacent islands. However, the Legislature recognizes that it may not be economically justifiable to maintain all delta islands.

(c) The Legislature further finds and declares that funds necessary to maintain and improve the delta's levees to protect the delta's physical characteristics should be used to fund levee work that would promote agricultural and habitat uses in the delta consistent with the purpose of preserving the delta's invaluable resources."

"§ 12982. Public benefit from privately maintained levees

The Legislature further finds and declares that while most of the delta's levees are privately owned and maintained they are being subjected to varied multiple uses and serve to benefit many varied segments and interests of the public at large, and that as a result of the varied multiple uses of such levees, added maintenance costs are being borne by adjacent landowners."

Although the smallest of islands may at first blush appear to be expendable, the habitat value (which in many cases is supported with private funds) would be lost. Such habitat value is extremely difficult to replace especially in terms of supporting habitat for waterfowl in the Pacific Flyway and providing meandering shoreline. With increasing development along the entire west coast of the United States, the opportunity to preserve supporting habitat for the Pacific Flyway is greatly diminishing. It is also extremely difficult to replace the meandering shoreline habitat and meandering waterway recreational opportunity provided by even the smallest levee systems. The impacts of seepage and wind-generated waves on surrounding levees and lands are assumed to be less critical with the flooding of smaller islands however, significant impacts can still result. Scour in adjoining channels resulting from levee breaks or even from the ongoing tidal flow of water in and out of the flooded area, scour from rerouting of channel flow (including the flow of water to the export pumps) and changes to the land surface such as from oxidation of organic soils can result in major long lasting adverse impacts to adjoining areas.

Limited Ability to Generate Local Revenue for Cost Share and Project Funding

The limited ability to generate revenue from local assessments to meet cost-sharing requirements and to fund the levee work in advance of reimbursement is a primary constraint under the Levee Subvention Program. Local assessments are based on allocations of the benefits derived from the levee-related services provided by the local levee maintaining districts. In most cases these are reclamation districts. Pursuant to California Constitution Article XIII D increases in assessments must be submitted to an assessment ballot proceeding where a majority protest based on the maximum dollar amounts to be assessed will stop the assessment. The benefit allocations are typically based on land use where the ratios for allocation from one use to another are fairly well bracketed and the constraint is the agricultural use ability to pay. Further consideration of ability to pay for districts which have significant agricultural use is unnecessary as the limitations are clearly demonstrated by previous analysis. As to urban levee systems, it is important to continue to recognize that State funding is intended to provide contribution from beneficiaries of the levee system other than the landowners within a particular district and to in part compensate for damages to the levee system caused by users of the Delta other than the landowners. We believe the funding priorities and cost shares set forth herein adequately account for ability to pay for all eligible districts including those with urban levee systems.

As presently structured, the Delta Levee Subvention portion of the Delta Levee Program cannot facilitate timely completion of urgently needed levee work. The substantial under-funding of the Delta Levee Subvention Program in recent years coupled with substantially increased cost of meeting regulatory requirements has left most participating districts with very little capability to fund additional levee work.

FEMA Eligibility

FEMA is applying a very rigid interpretation of the requirements under the so-called Delta Hazard Mitigation Plan (HMP). Instead of the good faith progress approach applied in previous years, FEMA has denied eligibility if any part of a levee system fails to meet HMP requirements. For the 2005/06 flood event, the one (1) foot above the 100 year flood elevation requirement was the greatest constraint. Portions of the Delta levees are settling and can be expected to continue settling for many years to come. The crowns of levees on which county roads and State highways are located are typically raised less frequently to reduce disturbance of costly road surfacing. Changes in historical benchmark elevations have added to the non-compliance. Although federal funding has not been made available to support the Delta levee programs, federal Disaster Assistance has at times been substantial. Priority funding is needed to re-establish and maintain HMP compliance to help assure future FEMA assistance. HMP compliance with a robust levee program should demonstrate a good faith effort on the part of the State and locals towards reasonably reducing the threat of future flooding. We would expect such effort to be recognized by FEMA.

HMP is not an acceptable levee standard but rather a means of measuring progress to satisfy FEMA. The PL 84-99 agricultural standard is viewed as the minimum acceptable level of protection against failure due to flooding. Any other higher levels of protection should be determined and prioritized by DRMS, Delta Vision, etc. and funding for those more expensive fixes would be expected to come from other sources of state money and other beneficiaries.

5-Year Plan

Definitions - Urban Islands and Tracts are those with levee systems which protect areas with existing and ongoing urban development where the levees have at one time been accredited or are in the process of being accredited as meeting FEMA requirements for urban development.

Non-Urban Islands and Tracts are those other than Urban Island and Tracts.

Project levee and non-project levee shall be as defined in WC 12980.

Special Project Program - The Special Project portion of the Delta Levee Program should incorporate broader funding of needed levee work throughout the Delta. We suggest that the Special Levee Project program be separated into two parts: State Special Projects and Local Special Projects.

The State Special Projects would continue the past practice with emphasis for the eight (8) western Delta islands thought to be most important to restrain salinity intrusions, assistance for levees protecting the towns of Thornton and Walnut Grove and for other levee projects. For the 5 year planning period, the expenditures should be focused on levee improvement. Other expenditures including habitat enhancement should not exceed ten (10) percent of the amount of funding for the State Special Projects.

The Local Special Projects would be applied throughout the Delta to the non-project , non-urban islands and tracts other than the eight (8) western Delta islands. The first priority for the local special projects should be funding of work necessary to achieve and maintain HMP requirements on the non-project, non-urban islands and tracts and achieving and maintaining minimum project levee standards on project levees. This work should be funded 100% by the State. The non-project levee work should be designed to raise crown elevations to one (1) foot above the 100 year flood elevation plus an additional one-half (1/2) foot to account for periodic levee settlement. For areas with public roadways the design should include the one (1) foot above the 100 year flood elevation plus an additional one (1) foot. For non-project levees, the crown width should at a minimum meet the HMP required sixteen (16) feet but should seek to achieve a minimum of twenty-two (22) feet on levees without public roadways and the then current crown width or twenty-eight (28) feet (whichever is greater) for levees with such roadways. The HMP required all weather road on the levee crown must be included. The second

priority should be funding ninety percent (90%) of the cost of habitat mitigation related to non-urban islands and tracts for all priorities of work including PL 84-99 and DWR Bulletin 192-82 agricultural standards. The third priority should be funding ninety percent (90%) of the cost of work on non-project, non-urban islands and tracts to reach the PL- 84-99 or DWR Bul. 192-82 agricultural standard with a height of eighteen (18) inches above the 100 year flood elevation plus one-half (1/2) foot of additional elevation for levees without public roadways and one (1) foot of additional elevation for levees with public roadways. Crown width should be twenty (20) feet on levees without public roadways and the then current crown width or twenty-four (24) feet (whichever is greater) for levees with such public roadways.

Levee Subvention Program

$1,000.00 per mile deductible.

First Priority - 75% reimbursement up to $20,000.00 per mile for annual levee maintenance.

Second Priority - 75% reimbursement for habitat mitigation.

Third Priority - 75% reimbursement for all levee work in excess of First Priority work up to an additional $20,000.00 per mile including HMP work and work to meet the PL 84-99 or DWR Bul. 192-82 agricultural standards with an additional one-half (1/2) foot of crown elevation to account for periodic settlement on levees without public roadways and an additional one (1) foot on levees with public roadways. Crown width should be twenty-two (22) feet on levees without public roadways and the then current width or twenty-eight (28) feet (whichever is greater) for levees with such public roadways.

Fourth Priority - Third priority work in excess of $20,000.00 per mile.

District Five Year Plans

Each participating district should provide a five year plan setting forth the general description and estimated dollar amount of work proposed for each of the categories set forth above assuming advances for the Subvention Program as currently applicable and payments by the State for Special Projects as invoices are received. Special State Projects and Special Local Projects will require specific plans and project review consistent with current practice. Local district development of plans, conduct of soil investigations and preparation of project documents will be funded through the Local Special Projects at a cost share of 90% State, 10% Local.

Additional Priorities Established Through the Annual Allocation of Funding to the Following Categories: (assumes One Hundred Million Dollars per year)

Delta Levee Subventions	12 million
State Special Projects	44 million
Local Special Projects	44 million

If funding is insufficient to fund all acceptable projects in the Delta Levee Subvention and/or the Local Special Projects Categories for the particular fiscal year, the funding will be allocated within each category first, based on the specific priorities and second, prorated within the underfunded priority to fully fund a segment of qualifying work in each applying District. The proration will be based on the total lineal feet of acceptable levee work within the underfunded priority which is included in the application of a particular district as compared to the total lineal feet of acceptable levee work included in all applications for the particular fiscal year in the specific priority. The District may elect to receive the funding available to provide maximum State cost share for a segment of the work and defer the remainder of the work in the priority to a subsequent year. Any excess of funds within the Delta Levee Subventions or Special Local Projects Categories shall be applied first to fund any shortfall in the other category within the particular fiscal year and second to supplement funding in the particular category in the subsequent fiscal year.

DANTE JOHN NOMELLINI
Manager and Co-Counsel

DJN:ju
cc: David Mraz via dmraz@water.ca.gov
Locals

Attachment F

sea level trends

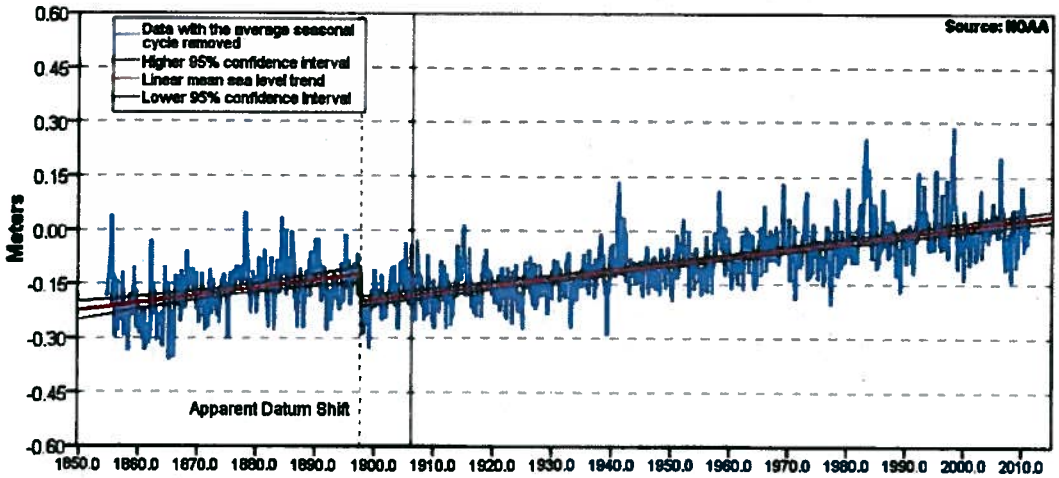
Alabama
Alaska
California
Connecticut
Delaware
Florida
Georgia
Hawaii
Louisiana
Maine
Maryland
Massachusetts
New Jersey
New York
North Carolina
Oregon
Pennsylvania
Rhode Island
South Carolina
Texas
Virginia
Washington
Washington DC
Island Stations

Global Stations

main page

Mean Sea Level Trend
9414290 San Francisco, California

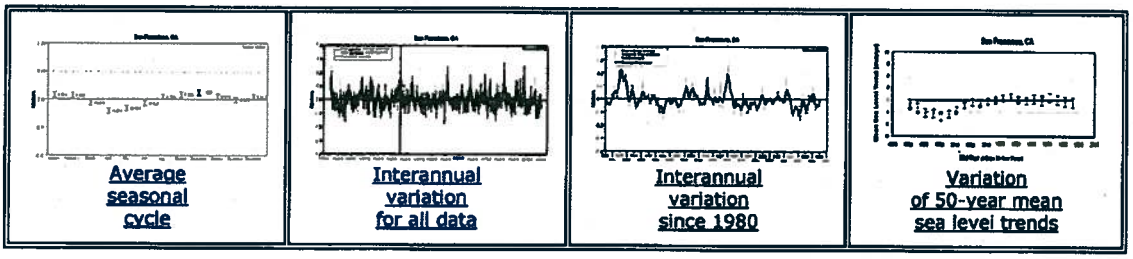
San Francisco, CA 2.01 +/- 0.21 mm/yr



The mean sea level trend is 2.01 millimeters/year with a 95% confidence interval of +/- 0.21 mm/yr based on monthly mean sea level data from 1897 to 2006 which is equivalent to a change of 0.66 feet in 100 years.

The plot shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The long-term linear trend is also shown, including its 95% confidence interval. The plotted values are relative to the most recent Mean Sea Level datum established by CO-OPS. The calculated trends for all stations are available as a table in millimeters/year or a table in feet/century (0.3 meters = 1 foot).

If present, solid vertical lines indicate times of any major earthquakes in the vicinity of the station and dashed vertical lines bracket any periods of questionable data.



Average seasonal cycle | Interannual variation for all data | Interannual variation since 1980 | Variation of 50-year mean sea level trends

Frequently Asked Questions:

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What does Sea Level have to do with Climate?

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sea level trends

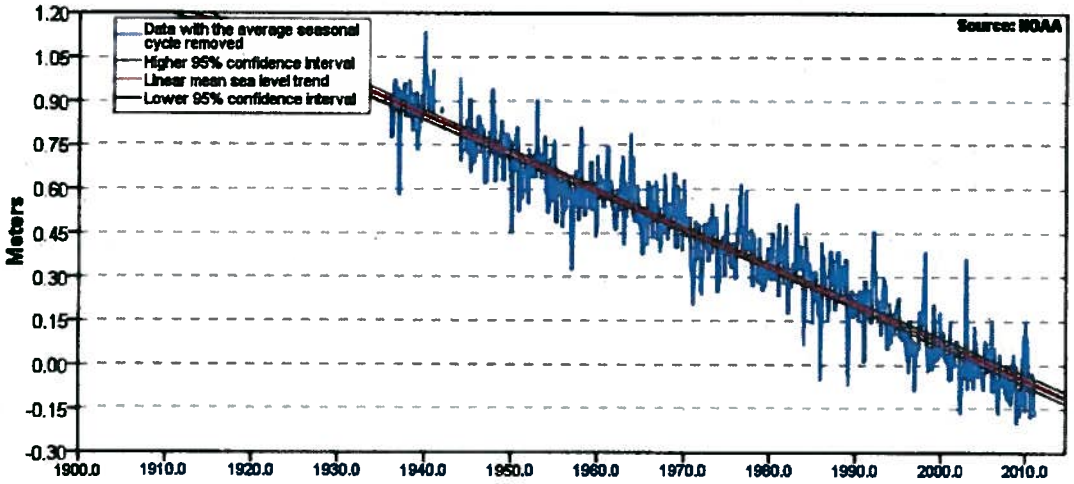
Alabama
Alaska
California
Connecticut
Delaware
Florida
Georgia
Hawaii
Louisiana
Maine
Maryland
Massachusetts
New Jersey
New York
North Carolina
Oregon
Pennsylvania
Rhode Island
South Carolina
Texas
Virginia
Washington
Washington DC
Island Stations

Global Stations

main page

Mean Sea Level Trend
9452210 Juneau, Alaska

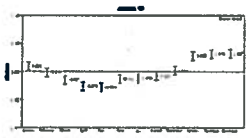
Juneau, AK - 12.92 +/- 0.43 mm/yr



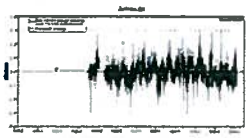
The mean sea level trend is -12.92 millimeters/year with a 95% confidence interval of +/- 0.43 mm/yr based on monthly mean sea level data from 1936 to 2006 which is equivalent to a change of -4.24 feet in 100 years.

The plot shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The long-term linear trend is also shown, including its 95% confidence interval. The plotted values are relative to the most recent Mean Sea Level datum established by CO-OPS. The calculated trends for all stations are available as a table in millimeters/year or a table in feet/century (0.3 meters = 1 foot).

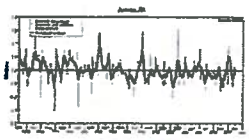
If present, solid vertical lines indicate times of any major earthquakes in the vicinity of the station and dashed vertical lines bracket any periods of questionable data.



Average seasonal cycle



Interannual variation for all data



Interannual variation since 1980

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sea level trends

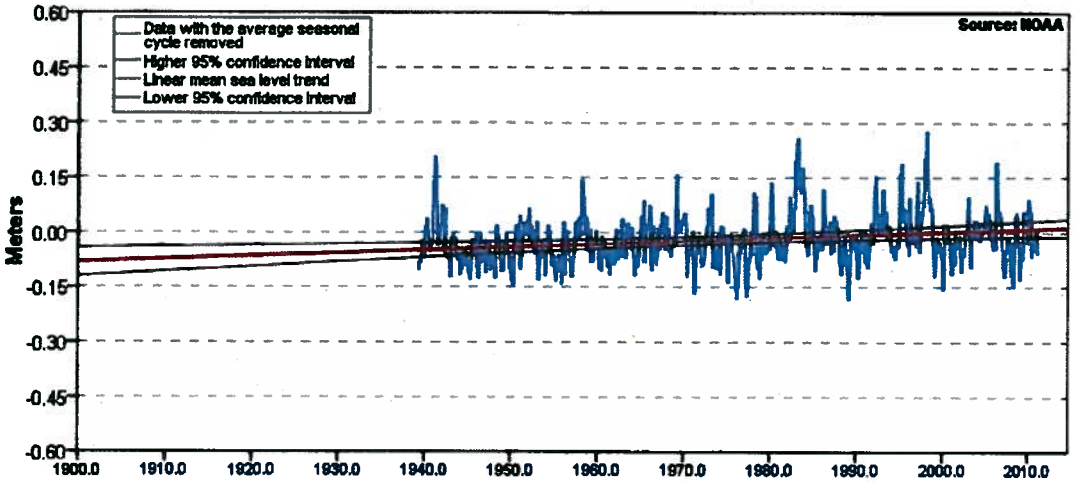
Alabama
Alaska
California
Connecticut
Delaware
Florida
Georgia
Hawaii
Louisiana
Maine
Maryland
Massachusetts
New Jersey
New York
North Carolina
Oregon
Pennsylvania
Rhode Island
South Carolina
Texas
Virginia
Washington
Washington DC
Island Stations

Global Stations

main page

Mean Sea Level Trend
9414750 Alameda, California

Alameda, CA 0.82 +/- 0.51 mm/yr



The mean sea level trend is 0.82 millimeters/year with a 95% confidence interval of +/- 0.51 mm/yr based on monthly mean sea level data from 1939 to 2006 which is equivalent to a change of 0.27 feet in 100 years.

The plot shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The long-term linear trend is also shown, including its 95% confidence interval. The plotted values are relative to the most recent Mean Sea Level datum established by CO-OPS. The calculated trends for all stations are available as a table in millimeters/year or a table in feet/century (0.3 meters = 1 foot).

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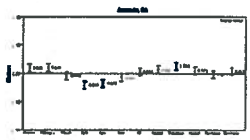
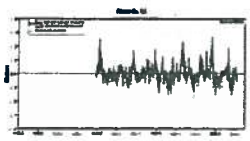
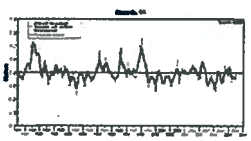


Average seasonal cycle



Interannual variation for all data



Interannual variation since 1980

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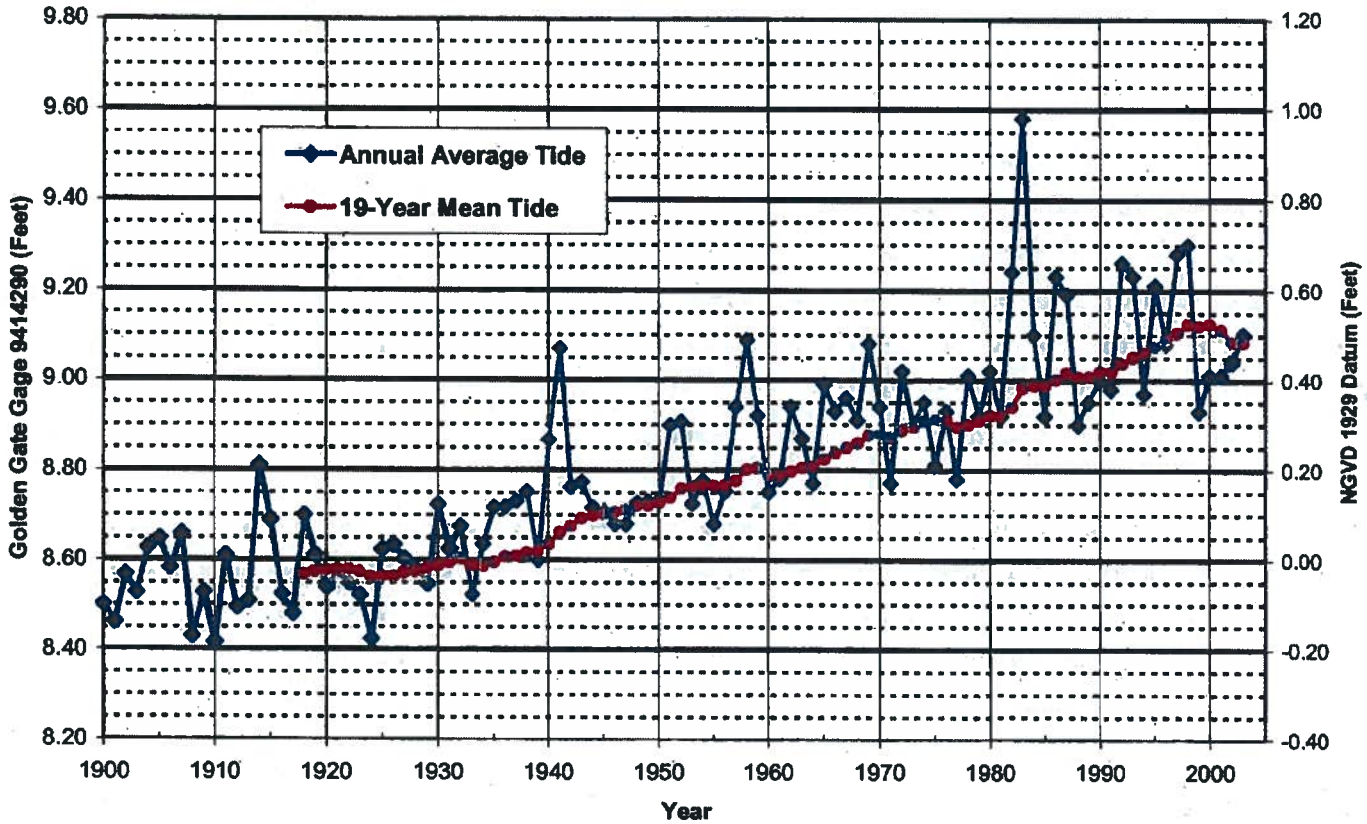
Exhibit 6-20. Changes in relative sea level along U.S. coasts, 1958-2008
Millimeters per year

Location name	Latitude	Longitude	Mean relative sea level change
Nawiliwili, Hawaii	21.96	-159.36	1.3361
Honolulu, Hawaii	21.31	-157.87	1.2621
Kahului, Hawaii	20.90	-156.47	1.8835
Hilo, Hawaii	19.73	-155.06	2.6532
Johnston Atoll	16.74	-169.53	0.5723
Sand Island, Midway Is.	28.21	-177.36	1.395
Guam, Marianas Is.	13.44	144.65	2.6003
Pago Pago, American Samoa	-14.28	-170.69	2.2878
Kwajalein, Marshall Is.	8.74	167.74	2.087
Wake Island	19.29	166.62	2.0405
Bermuda	32.37	-64.70	1.5085
Eastport, Maine	44.90	-66.99	0.9659
Bar Harbor, Maine	44.39	-68.21	1.5721
Portland, Maine	43.66	-70.25	1.0163
Boston, Massachusetts	42.36	-71.05	2.2047
Woods Hole, Massachusetts	41.52	-70.67	2.3719
Nantucket Island, Massachusetts	41.29	-70.10	2.9368
Newport, Rhode Island	41.51	-71.33	2.4958
Providence, Rhode Island	41.81	-71.40	1.9739
New London, Connecticut	41.36	-72.09	2.4164
Bridgeport, Connecticut	41.17	-73.18	2.3146
Montauk, New York	41.05	-71.96	2.7699
Kings Point, New York	40.81	-73.77	2.0713
The Battery, New York	40.70	-74.02	2.7292
Sandy Hook, New Jersey	40.47	-74.01	3.58
Atlantic City, New Jersey	39.36	-74.42	4.3522
Philadelphia, Pennsylvania	39.93	-75.14	3.5187
Lewes, Delaware	38.78	-75.12	3.2052
Baltimore, Maryland	39.27	-76.58	2.8429
Annapolis, Maryland	38.98	-76.48	2.991
Solomons Island, Maryland	38.32	-76.45	3.7482
Washington, DC	38.87	-77.02	2.9554
Kiptopeke, Virginia	37.17	-75.99	3.4554
Gloucester Point, Virginia	37.25	-76.50	3.958
Sewells Point, Virginia	36.95	-76.33	4.6204
Beaufort, North Carolina	34.72	-76.67	2.832
Wilmington, North Carolina	34.23	-77.95	2.198
Charleston, South Carolina	32.78	-79.93	2.9447
Fort Pulaski, Georgia	32.03	-80.90	3.2904
Fernandina Beach, Florida	30.67	-81.47	2.4199
Mayport, Florida	30.40	-81.43	2.5459
Key West, Florida	24.55	-81.81	2.517
Naples, Florida	26.13	-81.81	2.027
Fort Myers, Florida	26.65	-81.87	2.229
St. Petersburg, Florida	27.76	-82.63	2.6246
Cedar Key, Florida	29.14	-83.03	1.7058
Pensacola, Florida	30.40	-87.21	2.0069

Grand Isle, Louisiana	29.26	-89.96	9.2911
Galveston Pier 21, Texas	29.31	-94.79	6.5704
Galveston Pleasure Pier, Texas	29.29	-94.79	6.9176
Freeport, Texas	28.95	-95.31	8.4887
Rockport, Texas	28.02	-97.05	6.1652
Port Isabel, Texas	26.06	-97.22	4.407
San Diego, California	32.71	-117.17	1.7841
La Jolla, California	32.87	-117.26	1.9505
Los Angeles, California	33.72	-118.27	0.9553
Santa Monica, California	34.01	-118.50	0.8125
Port San Luis, California	35.18	-120.76	0.2763
San Francisco, California	37.81	-122.47	1.579
Alameda, California	37.77	-122.30	0.5961
Crescent City, California	41.75	-124.18	-0.8903
South Beach, Oregon	44.63	-124.04	2.3148
Astoria, Oregon	46.21	-123.77	-0.3775
Neah Bay, Washington	48.37	-124.62	-2.3007
Seattle, Washington	47.61	-122.34	1.7332
Friday Harbor, Washington	48.55	-123.01	0.9287
Ketchikan, Alaska	55.33	-131.63	-0.4991
Sitka, Alaska	57.05	-135.34	-2.0497
Juneau, Alaska	58.30	-134.41	-13.5467
Yakutat, Alaska	59.55	-139.74	-8.3745
Cordova, Alaska	60.56	-145.75	4.9718
Seward, Alaska	60.12	-149.43	6.9319
Seldovia, Alaska	59.44	-151.72	-9.5183
Adak Island, Alaska	51.86	-176.63	-2.8201
Unalaska, Alaska	53.88	-166.54	-5.3827
Magueyes Island, Puerto Rico	17.97	-67.05	1.3208

Figure 3:

Golden Gate Annual Average and 19-Year Mean Tide Levels



Note: This figure was updated 12/08/04

Attachment G

EXTRACTS OF USACE MAY 23, 2007 COMMENTS

The assumption that the 23 large watershed's 100-year flows can be added together to produce the 100-year Delta flow is invalid.

The assumption that failures in a levee system will not significantly reduce stage elevations along channel is questionable.

Annual mean number for seismic levee failures is 3.41 . . . . 341 failures per 100 years which is 341 more than observed in the past 100+ years . . . . Surely, these numbers cannot be credible results.

The average of 7.35 flood failures per year is three times the (undocumented) 2.60 number and nearly 6 times the observed flood failure rate from 1950 to 2006. Thus, as with the seismic failure number above, this flood number simply appears way outside the bounds of credibility.

Return periods of 2.7 or 5 years for many levees just seem incorrect and incompatible with decades of recent data.

Overall, the seismic fragilities simply appear unrealistic - with far too many breaks to be credible.

Figure 6-40 implies that for a M 7.5 event this type of levee has a 10% chance of displacing 10 ft. at all PGAs > 0.10. This seems Really Extreme.

Conclusion that 40% of historical failures (2.6) are from through seepage results in over 1.0 per year is different than historical rate and needs to be explained.

At first glance, the calculated annual number of failures is, to be polite, "extraordinary" albeit not as extreme as the seismic results above.

The estimated 30 or more island breaches in the next 25 years due to flood events seem too high/pessimistic.

The BAU assumption that levee crest elevations will not be raised in response to increased tidal and flood elevations is not realistic.
1 ft easy, 3 ft maybe doable for 100 years of effort.