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4) The Assurances component of the FEIS/FEIR is so vague as to be meaningless. Assurances is an essential component of the CALFED program. Without it there can be no trust in the appropriate implementation of any of the Alternatives. Without trust there will be no implementation, or at the least, many years of litigation before implementation can take place. Thus, the Assurances part of the FEIS/FEIR must receive a full and complete description even in a Programmatic Document. This has not been done. IP-1.1-2

To conclude, the FEIS/FEIR has too many problems to be next re-issued as a Final FEIS/FEIR. We believe that the document must be rewritten in order to correct the clear bias for the development of surface storage and diversion facilities. An Alternative that is based on water conservation and land retirement, and that solves water quality problems through technology rather than through increased diversions has not been presented despite the feasibility of such an Alternative. The FEIS/FEIR should be rewritten with such an Alternative included and hopefully as the Preferred Alternative. CR4 CR2 CR16 CR20

A revised draft FEIS/FEIR must include an analysis of the impacts of increased salinization on the unmanaged brackish marshes of Suisun Bay. The deceptive use of the term "saline emergent wetlands" must be corrected. Appropriate mitigations for those impacts must be provided. Such mitigations must include, we believe, a net increase of freshwater flows into Suisun Bay.

A detailed Assurances package must be presented rather than one that simply lists ideas.

Thank you for your attention to our concerns.

Sincerely yours,

Arthur Feinstein
Executive Director, Golden Gate Audubon
Board Member, Audubon-California

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PWA
PHILIP WILLIAMS & ASSOCIATES

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e-mail pfw@pwa-ltd.com

MEMORANDUM

DATE: February 16, 1999

TO: Arthur Feinstein, Golden Gate Audubon Society

FROM: Betty Andrews, P.E.

RE: Suisun Marsh and San Pablo Bay: Expected Salinity Levels Under the 1995 Water Quality Control Plan
(PWA Ref# 1309)

At your request, Philip Williams & Associates, Ltd. (PWA) has undertaken a brief review of the November 1997 Draft Environmental Impact Report (DEIR) for implementation of the 1995 Bay/Delta Water Quality Control Plan and its subsequent revisions through May, 1998. This memorandum is based primarily on review of that document.

PURPOSE

The primary goal of our review was to identify the salinity levels in Suisun Marsh and San Pablo Bay that could be expected from the implementation of the 1995 Bay/Delta Water Quality Control Plan (WQCP). The DEIR attempted to address this issue in its assessment of impacts of the WQCP.

FINDINGS

1. The DEIR makes no attempt to compare proposed salinity conditions to any baseline other than simulated No Project conditions and the conditions during the very recent 1984-1994 period.

2. No description is provided of any any ecosystem functions which require more than the presence of certain salinity levels at certain times of the year.

3. No justification for the objectives appears to be provided in the DEIR, though it may exist elsewhere. Similarly, no overarching goals for the amount of fresh, brackish, and salt marsh in Suisun are associated with the numeric objectives as presented in this document.

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4. The compliance locations included in the objectives do not address channel salinity concerns for most of the unmanaged brackish tidal marshes of Suisun, which lie at the perimeter of Suisun Bay, Grizzly Bay, and Honker Bay.

5. There does not appear to be information in the DEIR that allows conclusions to be directly drawn regarding expected salinities in Suisun Bay, Grizzly Bay, and Honker Bay. Instead, data is provided for stations to the east in the Delta and to the north in the interior of the Suisun Marsh. Data is provided on the average monthly X2 position; relative to existing conditions, it will move downstream for all alternative implementations of the flow objectives in the months of November and February through September, indicating a relative freshening of the area in these months on average. Increased salinities are typical in October and January. The greatest Delta outflow, and therefore the greatest reduction in salinities, would occur under Flow Alternative #5.

6. The operation of the SMSCG have had far more significant effect on interior Suisun Marsh salinities than any of the alternatives for implementing the WQCP will. However, implementation of the WQCP alone will significantly reduce salinities in the western interior marsh at station S-97 over existing conditions. Interior marsh salinities will primarily affect managed marshes (largely duck clubs).

7. The original D-1485 goal of providing full mitigation for CVP and SWP impacts on Suisun Marsh appears to have been abandoned.

WQCP OBJECTIVES FOR SUISUN MARSH

A discussion of the evolution of the standards is provided on pages VII-1 to 8.

Specific salinity objectives (expressed as EC, or electrical conductivity) are included in the WQCP for specific locations in the Eastern and Western portions of Suisun Marsh. (See Attachment A for the statement of the objectives.) Figure 1 shows the locations of the referenced stations. Three locations, identified as C-2, S-64, and S-49, are specified for the eastern marsh, and four locations, identified as S-21, S-42, S-97, and S-35, are specified for the western marsh. In addition, the western marsh also includes water supply intakes for waterflow management areas on Van Sickle and Chipps Islands, though no more specific location is identified. The objectives apply to the October - May period, and range from 8.0 (February - March only) - 19.0 (October only) mmhos/cm. The numeric objectives are described as the "maximum monthly average of both daily high tide EC values (mmhos/cm) or demonstrate that equivalent or better protection will

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be provided at the location" [emphasis added]. The eastern marsh objectives are the same under the WQCP as they were under the amended D-1485.

The "Brackish Tidal Marshes of Suisun Bay" are provided with a narrative objective given in footnote 10:

> Water quality conditions sufficient to support a natural gradient in species composition and wildlife habitat characteristic of a brackish marsh throughout all elevations of the tidal marshes bordering Suisun Bay shall be maintained. Water quality conditions shall be maintained so that none of the following occurs: (a) loss of diversity; (b) conversion of brackish marsh to salt marsh; (c) for animals, decreased population abundance of those species vulnerable to increased mortality and loss of habitat from increased water salinity; or (d) for plants, significant reduction in stature or percent cover from increased water or soil salinity or other water quality parameters.

According to the discussion on page VII-8, the narrative objective "is expected to be achieved through compliance with the year-round outflow objectives," and was included "to ensure that the tidal marshlands receive adequate protection."

It is important to note that all of the compliance stations identified are well inland of the bay edge, where many of the unmanaged tidal brackish marshes lie (see Figure 2). The compliance stations appear to be well-situated to address salinities affecting managed marshes, but not the preponderance of the unmanaged tidal brackish marshes of the region. These marshes will probably be most directly affected by the Delta outflow objectives, and are not addressed by the Suisun Marsh alternatives described below. Implementation of those objectives are evaluated by examining a number of different flow alternatives, which I will only generally discuss following the description of the Suisun Marsh Alternatives.

SUISUN MARSH ALTERNATIVES CONSIDERED

The DEIR is constructed in an unusual fashion: different sets of alternatives are considered to meet different sets of objectives under the WQCP. The set of six alternatives considered specifically to meet the Suisun Marsh Salinity Objectives are briefly described on pp. II-34 - II-36 and again in Chapter VII, the chapter describing the environmental effects of implementing the Suisun Marsh Salinity Objectives. Table VII-12 from page VII-65, which summarizes the alternatives, is included as Attachment B.

The first two alternatives are included for comparison as "No Project" alternatives; they assume D-1485 base hydrology, not WQCP flows. The others assume WQCP flows and different facilities construction plans and Green Valley Creek flow augmentation schedules. Each alternative assumes operation of the Suisun Marsh

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Salinity Control Gates (SMSCG) to meet the objectives to the extent possible. A discussion of each alternative follows.

Suisun Marsh Alternative 1 - Base Case and No Project Alternative A
Assumes D-1485 Delta outflow objectives. The State Water Project (SWP) and Central Valley Project (CVP) are responsible for meeting the Suisun Marsh objectives. No further actions are taken to meet the western marsh objectives, and the western marsh objectives are not met at some times. This is the alternative described by the DEIR as the *default* if no further action is taken by the SWRCB.

Suisun Marsh Alternative 2 - Cordelia-Goodyear Ditch: No Project Alternative B
Like Alternative 1 except that the Cordelia-Goodyear Ditch is constructed with two associated tide gates to meet objectives at S-35, and up to 80 cfs of flow augmentation occurs in Green Valley Creek to meet objectives at S-97. Figure 3 shows the assumed configuration of the Cordelia-Goodyear Ditch. This system would be used to move up to 225 cfs net flow over a tidal cycle of lower salinity water from Cordelia Slough to Goodyear Slough. A tide gate on the downstream (northern) end of Goodyear Slough would prevent higher salinity water from moving upstream during flood tide on Suisun Slough.

Suisun Marsh Alternative 3 - WQCP Only
Same as Alternative 1, but with WQCP outflow objectives in effect.

Suisun Marsh Alternative 4 - WQCP with Cordelia-Goodyear Ditch & Flow Augmentation
Same as Alternative 2, but with WQCP outflow objectives in effect.

Suisun Marsh Alternative 5 - WQCP with SMPA Amendment III Management Actions
This alternative assumes that WQCP outflow objectives in effect and a series of management actions, including both structural and nonstructural measures, are implemented. These measures are described in greater detail on pp. VII-22 and VII-24, 25, and are summarized below:

- institute a staffed *Water Management Program* to improve practices throughout the marsh;
- implement a *Joint-Use Facilities Program* to promote cooperative and efficient use of water delivery and leveling systems for managed wetlands;
- complete a project to *redirect Morrow Island Drainage* to Suisun Bay to reduce salinities in Goodyear Slough and on managed wetlands supplied from this source;
- institute a program to use 20 portable pumps to provide lower salinity water to managed wetlands during low tide diversions and better removal of soil salts during drainage;

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- prepare updated *Management Plans* to individual landowners to improve salinity conditions on their property;
- *fund the Fairfield-Suisun Sewer District - Green Valley Creek feature*; two alternative approaches to funding and facilities construction are considered; and
- *operate the SMSCG in September* to meet October salinity objectives when certain end of August salinity conditions exist.

The DEIR notes that some of these actions cannot be modeled. In particular, they note that the operation of portable pumps and other actions of the Water Manager are intended to reduce soil salinities as necessary to produce suitable vegetation for waterfowl. It is implied that success in achieving this goal will meet the criteria of demonstrating "equivalent or better protection [than the numerical objectives] is provided at the location." This alternative is identified as the environmentally preferred alternative (p. VII-66).

Suisun Marsh Alternative 6 - WQCP with Flow Augmentation
"Multiple parties are responsible for *full* implementation of the WQCP western marsh objectives through flow augmentation in Green Valley Creek." Sources will include:

- Fairfield-Suisun Sewer District;
- upstream reservoirs (Lake Madigan and Lake Frey);
- if needed, Lake Berryessa.

Pages VII-25, 26 include a discussion of what agreements and other actions would be necessary to effect this Alternative. Pages VII-58 to 60 provide a discussion of many fisheries-related concerns associated with flow augmentation of Green Valley Creek.

SUISUN MARSH ALTERNATIVES: EXPECTED EFFECTS ON SALINITY, HYDROLOGY, AQUATIC RESOURCES
The hydrodynamic and water quality model known as DWRDSM (Suisun Marsh Version) was used to simulate conditions under each of the alternatives for meeting the numerical objectives described above. The model simulates the average monthly high tide salinities for the 1922-1994 time period. Model results are provided at each of the 7 compliance stations identified in the objectives.

Hydrology Impacts
The DEIR discusses hydrologic changes as a result of implementing different alternatives only at the following locations or facilities: Green Valley Creek, Lake Madigan, Lake Frey, Sacramento River, the North Bay Aqueduct, Fairfield-Suisun Sewer District, Putah-South Canal, and Lake Berryessa. Since changes in

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these locations do not directly address changes in Suisun Marsh or San Pablo Bay, they are not summarized in this memorandum. They are discussed on pages VII-42 to 47.

The DEIR summarizes by saying "[t]he Suisun Marsh alternatives will result in channel water salinities slightly different from historic conditions" [emphasis added]. Salinities throughout the marsh are described as being lower under WQCP hydrology compared to D-1485 hydrology.

The WQCP salinity objectives are met in most months under all alternatives in the eastern and central marsh. Salinities at the western compliance stations, S-35 and S-97 are shown to often exceed the objectives; most of the discussion of impacts focuses on these two stations.

Salinity Impacts
The model assumes operation of the SMSCG as needed, based on salinities at S-21, S-35, S-49, and S-64 during the October - May control season. A separate assessment was made of the effect of the SMSCG on salinity under both D-1485 and WQCP hydrology. They were operated less frequently under WQCP hydrology as compared to D-1485 hydrology. The SMSCG were found to be highly effective in meeting salinity objectives in the eastern marsh and at S-42 and S-21 in the western marsh, with objectives being exceeded at these locations only occasionally (2 - 11% of the months) in only February and March under each of the Alternatives.[1] Operation of the gates was most often triggered by the western marsh stations S-35 and S-21. As control of the SMSCG rests with the Department of Water Resources and the US Bureau of Reclamation alone, the DEIR concludes that assessment of the alternatives should focus entirely on their ability to meet compliance at the stations identified as S-35 and S-97, in the western marsh.

Focusing on these two stations, it is apparent that Alternative 6 does the best job of meeting the standard at the stations identified as S-35 and S-97, in the western marsh. Alternative 6 also results in the lowest overall salinity levels during the control season. Alternative 4 does as well as Alternative 6 in meeting the objective at S-97 (though with higher overall salinities than Alternative 6 during the control season), but it does less well than Alternative 6 in meeting the objective at S-35. The DEIR notes that the water cost under Alternative 6 is much greater than under Alternative 4. The DEIR further notes that a peak October augmentation rate of 900 cfs would be needed to meet the objectives at S-35. On average, Alternative 6 requires an additional

[1] Alternatives 4 and 6 have no occasions of exceeding the objectives at the stations in the eastern marsh and in the western marsh at S-42, S-21. Alternative 1 has the poorest compliance record at these same locations, though exceedance still occurs to only a very limited extent.

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15,200 acre-feet of water compared to Alternative 4, and this water can be considered the amount necessary to meet the objectives at S-35 (p. VII-41).

Alternative 5 could result in a slight increase in salinity in Boynton Slough due to redirection of treated wastewater from that waterway to Green Valley Creek. The frequency and magnitude of the resulting failure to meet the objective at S-40 are still very low.

The area-frequency plots from the DEIR provided here as Figures 4 and 5 provide a sense of the degree of influence of the Alternatives on salinity (relative to the numerical objective) at these two stations. The distance above or below the 0 line indicates the size of the difference from the numerical objective (above means salinity higher than the objective, below means salinity lower than the objective). The frequency of the condition is indicated by the horizontal or X-axis. Again, Alternatives 1 and 2 are the No Project alternatives, and show the salinity-lowering effect of the WQCP outflows compared to D1485 outflows. Alternatives 1A and 3A indicate the result of these alternatives without operation of the SMSCG.

Aquatic Habitat Impacts
A 1993 study of fish populations in the marsh over a 14-year period (Meng et al. 1993), 1979-1992, found that there were long-term declines in abundance and species diversity. These were generally correlated with decreases in outflow and increases in salinity.

The DEIR notes that while salinities throughout the marsh are expected to be *slightly* lower under the WQCP than under historic conditions, salinity is only one of several factors affect brackish marsh vegetation patterns. Other factors include depth and duration of flooding and plant competition. A report on this and related issues is expected from the Suisun Marsh Ecological Workgroup prior to the SWRCB triennial review.

Alternative 4 may significantly affect species requiring brackish or salt marsh habitat, because it will involve the introduction of substantial quantities of low salinity water to the northwestern marsh through Green Valley Creek and the construction of the Goodyear-Cordelia Ditch system.

Alternative 5 will result in more widely fluctuating channel water salinity conditions than Alternatives 2 and 4 due to the smaller amount of Green Valley Creek augmentation. Due to the limited availability of effluent from the Fairfield-Suisun Sewer District and its current discharge through nearby Boynton Slough, there is unlikely to be a major change in salinity at S-97 under this alternative. Salinities in Boynton Slough would be slightly higher.

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Depending on the water source and release regime, flow augmentation under Alternative 6 may result in a "slight freshening effect" at S-97 (p. VII-53). However, Alternative 6 is described elsewhere as creating "conditions at S-97 far less saline than the historic condition, or under any of the other alternatives. Aquatic species in the western marsh preferring brackish conditions would tend to be displaced in favor of freshwater species" (p. VII-62). Flow augmentation would have no effect at S-35.

DELTA OUTFLOW: ALTERNATIVES

Eight alternatives are considered for implementing the flow objectives of the WQCP, including the Delta outflow objective. As previously mentioned, this objective is the one most likely to affect salinities in Suisun Harbor, and Grizzly Bays, around which lie many unmanaged brackish tidal wetlands. It is also most likely to affect salinities downstream in San Pablo Bay.[2] Unfortunately, neither the objective nor the discussion of the results provides much direct information about the expected salinities in these waters. Salinity values are provided for stations in the Delta to the east, but only the relative location of X2 is provided for stations west of the Delta, including Suisun Bay. X2 is defined as the distance from the Golden Gate Bridge, in kilometers, of the 2 parts per thousand isohaline at one meter from the bottom of the channel. (This isohaline was agreed to be equivalent to a specific conductance of 2.64 mmhos/cm at the surface.) The simulation model DWRSIM was used to estimate the location of X2 under each of the alternatives.

In general, all of the flow alternatives considered have fairly similar effects on the movement of X2 relative to the base case. Data is provided on the average monthly X2 position; relative to existing conditions, it will move downstream for all alternative implementations of the flow objectives in the months of November and February through September, indicating a relative freshening of the area in these months on average under all of the flow alternatives. Increased salinities are typical in October and January. The greatest Delta outflow, and therefore the greatest reduction in salinities in Suisun Bay, would occur under Flow Alternative 5. According to Table VI-11 in the DEIR (p. VI-7), Alternative 5 would on average result in the greatest movement downstream of X2 in advancing months and the least movement upstream of X2 in retreating months of all the alternatives considered. It could therefore create the greatest reduction of salinities in Suisun Bay relative to the base case, though the expected salinities are not quantified.

The largest changes in X2 position compared to the base case would occur in the months of April - June, when X2 would move approximately 2 - 3 kilometers downstream on average for most of the flow alternatives considered.

[2] There does not appear to be any description in the DEIR *aside* from the discussion of X2 on the effect of the WQCP on salinities at locations downstream of the western Delta, including San Pablo Bay.

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Perhaps the most important period for reduced salinities in the estuary is the March - May period, when most of the flow alternatives would result in a downstream shift of X2 of approximately 1.5 - 3.4 kilometers compared to the base case. This size of shift could be expected to result in a reduction in Suisun Bay salinities of only a very minor amount, likely to be much less than 1 ppt. During the modeled critical drought period, however, most of the flow alternatives would shift the X2 position by approximately 6.7 kilometers in March, 3.9 kilometers in April, and approximately 5.5 kilometers in May. These changes could represent a significant shift in salinities during a key season in very dry periods.

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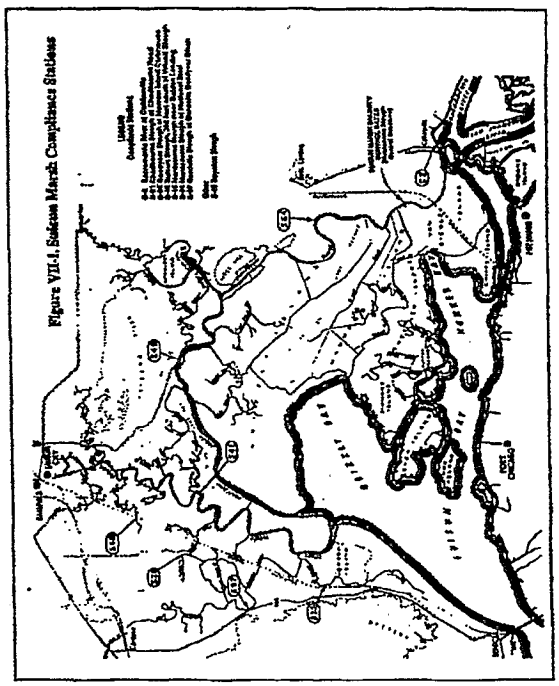

VII-2 FIGURE 1

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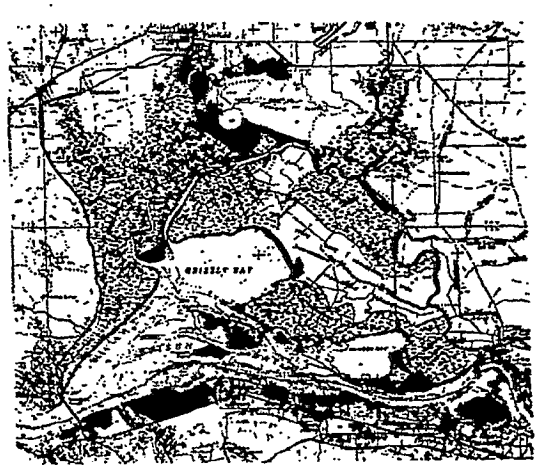

FIGURE 2:
DISTRIBUTION OF BRACKISH TIDAL MARSH IN SUISUN BAY

Philip Williams & Associates

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Figure VII-6. Cordelia-Goodyear Ditch and Goodyear Slough Tide Gate

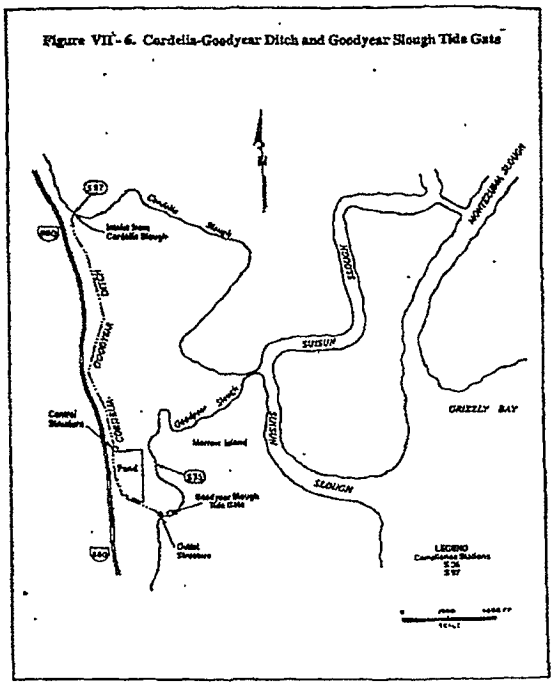

FIGURE 3

VII-23

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Figure VII-13
S36 GOODYEAR SLOUGH AT MORROW ISLAND CLUB HOUSE
SALINITY AREA-FREQUENCY ANALYSIS 1/
OCTOBER THROUGH MAY OF WATER YEARS 1922-1994

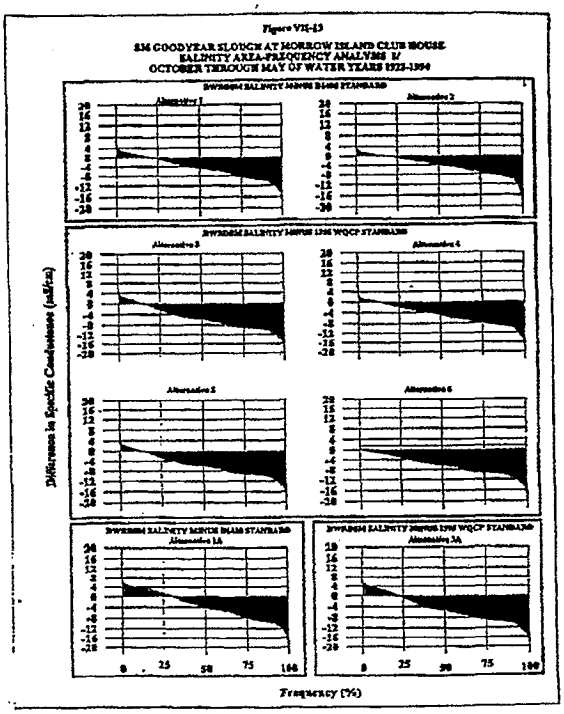

FIGURE 4

VII-36

SEP 23 1999 1098

SAN DIEGO BAYKEEPER

FAX TRANSMITTAL

OUR FAX NUMBER IS 619.299.4485

DATE: 9-22-99

TO: Lester Snow

FAX NUMBER:

RE:

FROM: San Diego BayKeeper

TOTAL PAGES INCLUDING FAX COVER SHEET: 3

COMMENTS:

San Diego BayKeeper, 1430 Harbor Island Drive, Suite 205, San Diego, CA 92101
619.299.4484 / FAX: 619.299.4485 / Pollution Hotline: 1.877.4CAC0688
Email: sdbaykeeper@aol.com / http://www.geocities.com/~baykeeper/
Member of the national WaterKeeper Alliance

1098

SAN DIEGO BAYKEEPER

September 21, 1999

Lester Snow
Executive Director
CalFed Bay/Delta Program
1416 Ninth Street, Suite 1155
Sacramento, CA 95814

Dear Mr. Snow:

On behalf of San Diego BayKeeper, a 501(c)(3) non-profit corporation dedicated to protecting and restoring San Diego Bay and surrounding watersheds, I wish to enter the following comments into the formal record for your Draft Programmatic Environmental Impact Report and Statement for the CALFED Bay/Delta Program. I join other members of the environmental community in asking that the Program be revised to:

- commit to building no new dams, reservoirs, or canals or expanding existing dams, reservoirs, or canals during CALFED's "Stage 1" (the first seven years of the program); CR4
- increase the CALFED Program's focus on pollution prevention and other environmentally superior alternatives; CR14
- increase investments in water conservation and efficiency, groundwater management, pollution prevention, and drinking water treatment; CR2

BayKeeper applauds CALFED's approach of developing a "Programmatic EIR" that provides the community with a basic understanding of what the long-term goals of the Program are. While supportive of this approach, its limitations are also apparent. A flexible and phased approach is necessarily not specific enough to allow adequate comments on program specifics. Additionally, even though CEQA and NEPA specifically require that projects not be bifurcated during the EIR/EIS process, the risk that CALFED will initiate activities in phase I that will be binding in the future is real.

Specifically, BayKeeper is concerned with the approach of pursuing a "test peripheral canal". To quote the San Joaquin DeltaKeeper's comments, "the rush to build projects before we have an adequate understanding of the biological complexity of this estuary or the fate, transport and effects of contaminants is a recipe for failure." More extensive study is needed for the first leg of the peripheral canal as even this segment could cause great harm to the environment and would not bring appreciable improvements in drinking water quality. Investing hundreds of millions of dollars in this first leg could also inevitably bind CALFED to pursue a full peripheral canal, which was not adequately addressed in the EIR/EIS. In order to be fiscally as well as environmentally prudent, we must understand the *full* environmental impacts of a *completed* peripheral canal before a "test canal" is implemented. CR16

Additionally, the resources allocated to pollution prevention, watershed management and other environmentally superior alternatives are insufficient when compared with the "build" alternatives. For example, $913 million is allocated to conveyance activities IPF 5.0-4

1430 Harbor Island Drive, Ste. 205 • San Diego, CA 92101
619-299-4484 / FAX 619-299-4485 / Pollution Hotline 1-888-HELP BAY
Email: SDBaykeeper@aol.com / Web Page: http://www.geocities.com/~baykeeper
A 501(c)(3) non-profit organization and member of the National Alliance of River, Bay and Baykeepers

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Figure VII-14

S97 CORDELIA SLOUGH AT CORDELIA-GOODYEAR DITCH
SALINITY AREA-FREQUENCY ANALYSIS 1/
OCTOBER THROUGH MAY OF WATER YEARS 1922-1994

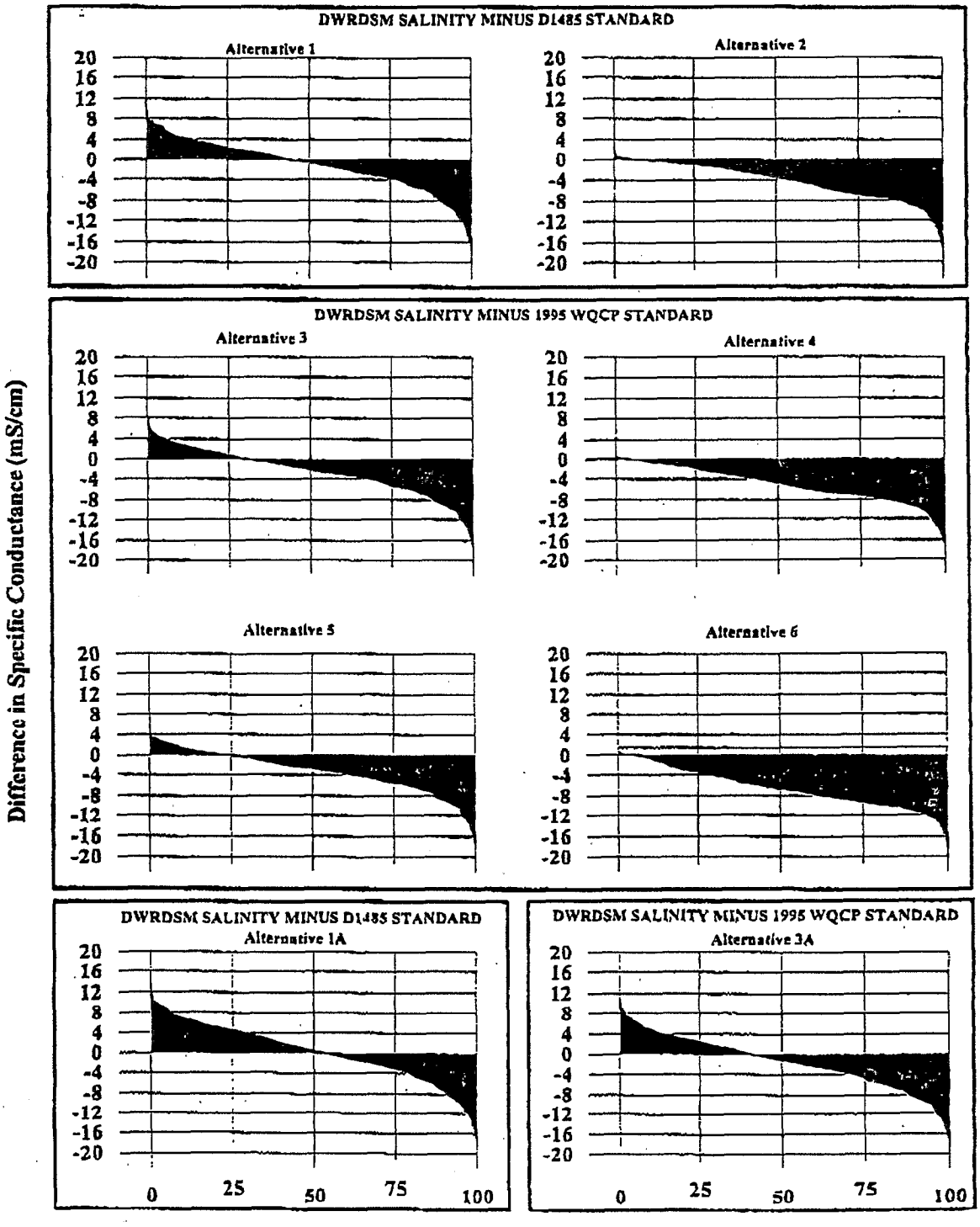

FIGURE 5

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ATTACHMENT A

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TABLE II-3 WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

COMPLIANCE LOCATION	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
DISSOLVED OXYGEN						
San Joaquin River between Turner Cut & Stockton	*(RSAN050-RSAN061)*	*Dissolved Oxygen (DO)*	*Minimum DO (mg/l)*	*All*	*Sep-Nov*	*6.0 [4]*
SALMON PROTECTION						
			narrative	*Water quality conditions shall be maintained, together with other measures in the watershed, sufficient to achieve a doubling of natural production of chinook salmon from the average production of 1967-1991, consistent with the provisions of State and federal law.*		
SAN JOAQUIN RIVER SALINITY						
San Joaquin River at and between Jersey Point and Prisoners Point [5]	*D-15 (RSAN018) -and- D-29 (RSAN038)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*	*W,AN,BN,D*	*Apr-May*	*0.44 [6]*
EASTERN SUISUN MARSH SALINITY						
Sacramento River at Collinsville -and- Montezuma Slough at National Steel -and- Montezuma Slough near Beldon Landing	*C-2 (RSAC081) S-64 (SLMZU25) S-49 (SLMZU11)*	*Electrical Conductivity (EC)*	*Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location.*	*All*	*Oct*	*19.0*
					Nov-Dec	*15.5*
					Jan	*12.5*
					Feb-Mar	*8.0*
					Apr-May	*11.0*
WESTERN SUISUN MARSH SALINITY						
Chadbourne Slough at Sunrise Duck Club -and- Suisun Slough, 300 feet south of Volanti Slough -and- Cordelia Slough at Ibis Club -and- Goodyear Slough at Morrow Island Clubhouse -and- Water supply intakes for waterfowl management areas on Van Sickle and Chipps islands	*S-21 [7] (SLCBN1) S-42 [8] (SLSUS12) S-97 [8] (SLCRD06) S-35 [8] (SLGYR03) No locations specified*	*Electrical Conductivity (EC)*	*Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location.*	*All but deficiency period*	*Oct*	*19.0*
					Nov	*16.5*
					Dec	*15.5*
					Jan	*12.5*
					Feb-Mar	*8.0*
					Apr-May	*11.0*
				Deficiency period [9]	*Oct*	*19.0*
					Nov	*16.5*
					Dec-Mar	*15.6*
					Apr	*14.0*
					May	*12.5*
BRACKISH TIDAL MARSHES OF SUISUN BAY						
			narrative			*[10]*

ATTACHMENT B

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Table VII-12
Summary of Suisun Marsh Alternatives

Alternative	Base Hydrology	New Facilities	Green Valley Creek Flow Augmentation	Other Actions
1	D-1485	None	None	None
2	D-1485	Cordelia-Goodyear Ditch and Goodyear Slough Tide Gate	Up to 80 cfs as needed from NBA to meet S-97	None
3	1995 Bay/Delta Plan	None	None	None
4	1995 Bay/Delta Plan	Cordelia-Goodyear Ditch and Goodyear Slough Tide Gate	Up to 80 cfs as needed from NBA to meet S-97	None
5	1995 Bay/Delta Plan	Minor construction to allow FSSD discharge in Goodyear Slough	Up to 20 cfs of treated effluent from FSSD when available	SMPA Amendment III Management Actions
6	1995 Bay/Delta Plan	Minor construction on Putah-South Canal and NBA	As needed from all sources until objectives are met at S-97 and S-35	None

2. The SMSCG operates significantly less frequently under alternatives with 1995 Bay/Delta Plan base hydrology. Therefore, impacts to anadromous fish passage related to gate operation should be reduced compared to Alternatives 1 and 2.

3. With SMSCG operation and 1995 Bay/Delta Plan outflow, objectives are very nearly met in all months at stations C-2, S-64 and S-49 in the eastern marsh and stations S-21 and S-42 in the western marsh. Objectives can not be met with 1995 Bay/Delta Plan outflow and SMSCG operation at stations S-35 and S-97.

4. Green Valley Creek flow augmentation is an effective means of controlling salinity in the northwestern marsh in the vicinity of S-97 under Alternatives 2 and 4. The Cordelia-Goodyear Ditch and the Goodyear Slough Tide Gates provide marginal benefits in the vicinity of S-35.

5. The frequency with which objectives are exceeded under Alternative 5 is midway between Alternatives 2 and 4. Many of the SMPA Amendment III management actions which are part of the alternative can not be modeled. Therefore, the modeling results understate the net benefit that may be expected from the alternative.

C-115864

Summary of Evidentiary Testimony to be Presented to the
State Water Resources Control Board

BAY-DELTA ESTUARY HEARING, PHASE I

Topic -- Bay-Delta Estuary Use: Wildlife
Dates -- September 8-10, 1987

Witness: Stephen L. Granholm, Ph.D.
Representing: Bay Area Audubon Council

Submitted July 7, 1987

KEY POINTS

- The remaining tidal brackish marshes surrounding Suisun Bay are a valuable natural resource because they represent the predominant natural wetland ecosystem of the Suisun Marsh, one of the largest and most important wetland wildlife habitats in California.

- Reductions in freshwater inflows would cause further degradation of these tidal brackish marshes and a corresponding decline in wildlife habitat value of the Suisun Marsh as a whole.

SUMMARY OF TESTIMONY

1. Study area. Wetland habitats surrounding Suisun Bay and its islands, from Benicia and Martinez on the west to Collinsville and Winter Island on the east. This is the largest brackish wetland system in the western United States. It consists of a unique diversity of habitats, including tidal wetlands, freshwater and riparian systems, seasonal wetlands, and lowland grasslands. Included within this wetland system are approximately 44,000 acres of managed wetlands (primarily managed for waterfowl) and 10,000 acres of brackish tidal marsh. The focus of our testimony is on this tidal marsh.

2. Mapping methods. We delineated the existing tidal marsh areas, based on U.S. Fish and Wildlife Service (FWS) National Wetland Inventory (NWI) maps and the FWS wetlands definitions (Cowardin et al. 1979). We corrected the NWI mapping of selected areas, based on observations and photographs (Exhibit 3) made during an overflight of the study area on June 24, 1987. We then calculated acreages for two categories of marsh:

   A. "Protected" tidal marsh refers to areas that would be

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protected by salinity standards established in Decision 1485 (as later modified to remove the S-36 standard). This includes most of the tidal areas adjacent to Montezuma and Suisun Sloughs and north of these sloughs.

B. "Unprotected" tidal marsh refers to areas that would not be protected by these standards, namely the tidal marshes bordering Grizzly Bay, Honker Bay, and other portions of Suisun Bay, including the southern end of Joice Island and the whole south shore of Suisun Bay.

3. Mapping results. Tidal marsh in the study area is almost exclusively brackish marsh; it includes several extensive marshes as well as many smaller remnant wetlands along sloughs and channels (see Exhibit 1). Acreages are as follows:

Unprotected marsh:	6,819 acres
Protected marsh:	3,265 acres
Total:	10,084 acres of tidal marsh

4. Tidal marsh vegetation. These brackish marshes consist primarily of tules and cattails, but significant portions of the higher marsh consist of pickleweed and saltgrass, probably due to increasing salinity in Suisun Marsh (Williams and Josselyn 1987).

5. Impacts on vegetation. Williams and Fishbain (1987) analyzed the Department of Water Resources (DWR) projections of future water diversions. Based on this analysis, Williams and Josselyn (1987) concluded that increasing salinity would lower the productivity of brackish tidal marsh species in Suisun Bay. In addition, the intertidal distribution of tules would be reduced, because higher salinity would lower their tolerance to submergence and their ability to grow in the higher intertidal elevations. At least 5,000 acres of unprotected tidal marsh would be adversely affected, primarily in western Suisun Bay, where salinities would be the greatest.

6. Impacts on wildlife: methods. I characterized existing wildlife use of the brackish tidal marshes, based on a literature review and discussions with local observers. I then assessed impacts on wildlife due to the projected changes in salinity and brackish marsh vegetation (see paragraph 5). The impact assessment was hampered by a lack of data on wildlife of the tidal marshes; most research on Suisun Bay wildlife has been in the managed marshes.

7. Special-status wildlife. Exhibit 4 lists 13 special-status wildlife species that are thought to occur regularly in tidal marshes of the study area. (The occurrence of one other, the salt marsh yellowthroat, is undetermined, due to uncertainty

about its subspecies identity.) These are species that are listed by the state or federal government as threatened, endangered, or of some other special status, due to their rarity or sensitivity to human disturbance.

8. Other typical wildlife species. Exhibit 5 lists 14 representative bird and mammal species of the tule- and cattail-dominated brackish tidal marshes of the study area.

9. Impacts on special-status species. Negative impacts on Suisun song sparrow and river otter are considered likely (see Exhibit 4). In addition, if further research demonstrates that snowy egrets, black-crowned night-herons, or salt marsh yellowthroats do breed in the tidal marshes, there would probably be adverse impacts. There could be positive impacts on salt marsh harvest mouse, Suisun shrew, and California black rail.

10. Impacts on typical wildlife. Negative impacts are considered likely for 8 species (Exhibit 5). If the other 6 species (indicated by a "?") breed in the tidal marshes, there would probably be adverse impacts.

11. Location of impacts. Impacts would be most severe in the unprotected marshes, but would also be felt in the protected marshes if the D1485 standards are relaxed or not enforced.

12. Recommendations

    a. The brackish tidal marshes of Suisun Bay are valuable wildlife habitats in their own right, and they also contribute significantly to the great habitat diversity of the Suisun Marsh complex. Because they represent the natural marsh ecosystem and have already been severely depleted, no more tidal marshes should be converted to managed marsh, salt marsh, or other uses in Suisun Bay.

    b. Salinity standards should be implemented to fully protect these brackish tidal marshes, as well as the managed marshes. To do so, the original D1485 salinity standards should be reinstated immediately and new salinity standards should be enacted at Martinez, as described by Williams and Josselyn (1987).

    c. Plans for monitoring the success of Suisun Marsh protection measures should include monitoring of tidal marshes. Indicator species (if used) should include representative plants and/or animals of the brackish tidal marshes.

    d. Potential benefits to certain salt marsh species do not justify negative impacts on a wide range of brackish marsh species. The management goal should be, to the

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degree possible, to return brackish tidal marshes to their pristine condition, or at least to prevent further degradation toward salt marsh habitat. Benefits to salt marsh species are best achieved in areas of historic salt marsh, within the species historic range, not by replacing tidal brackish marsh.

e. Further research should be funded to determine the wildlife habitat values of Suisun Bay tidal marshes, including their value to breeding waterfowl, Suisun song sparrows, and salt marsh yellowthroats. In addition, more research is needed on methods for restoring and maintaining the natural habitat values of these marshes.

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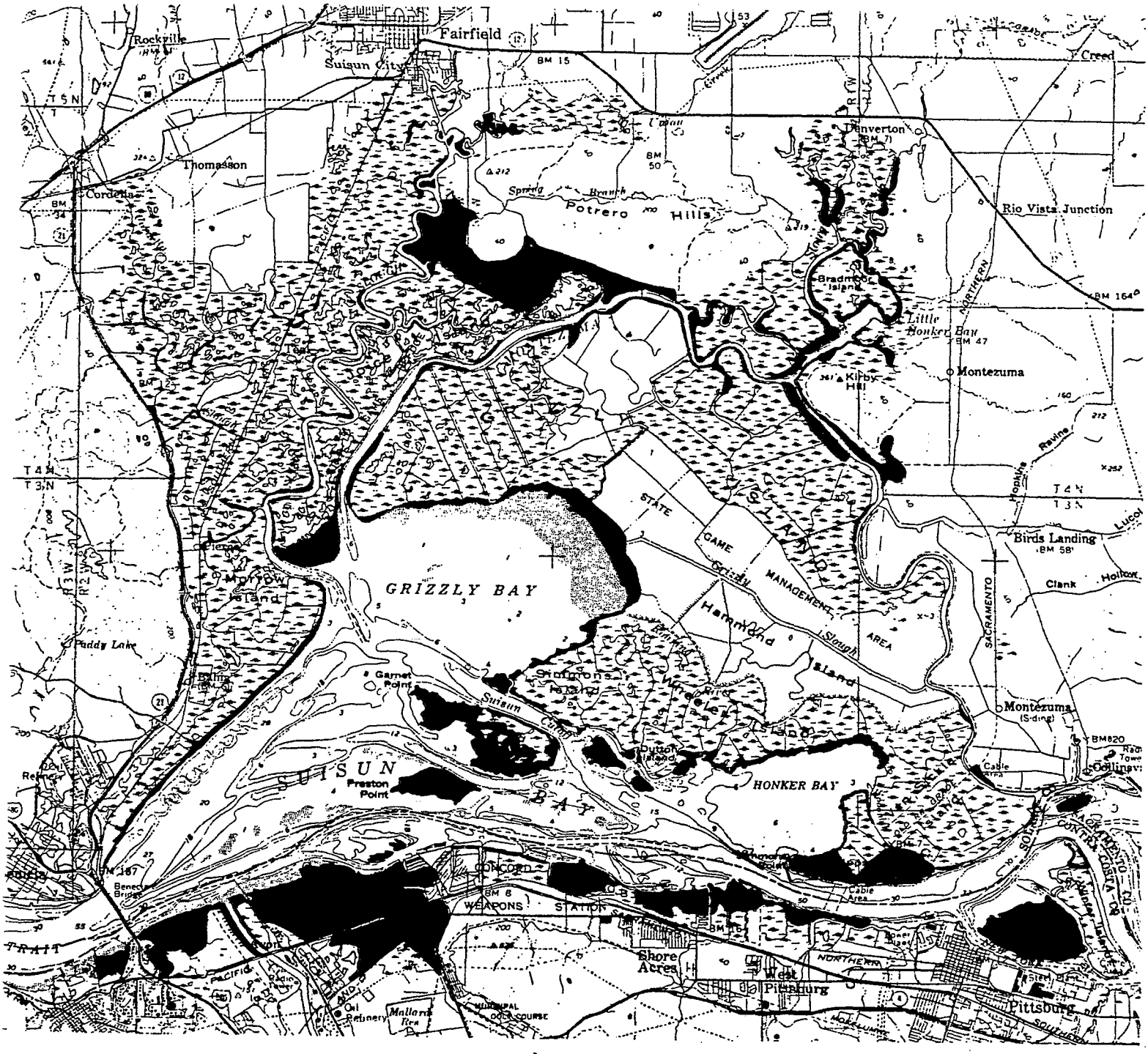

Exhibit 1. Tidal Wetlands of the Suisun Bay Study Area.

Tidal wetlands are shown in black. This map is based on U.S. Fish and Wildlife Service National Wetlands Inventory maps (1985 edition), but includes corrections where errors had occurred in interpreting the presence or absence of tidal marsh. Mapping by Dianne Kopec and Michael Josselyn.

Bay-Delta Hearings: Testimony of S. L. Granholm

EXHIBIT 2

TABLE OF TIDAL WETLAND ACREAGES BY TOPOGRAPHIC QUAD MAP. FROM US FISH AND WILDLIFE SERVICE WETLAND INVENTORY MAPPING (1985) AND AS REVISED AND VERIFIED BY AERIAL PHOTOGRAPHY IN 1987 BY BAY AREA AUDUBON SOCIETIES. PROTECTED REFERS TO SALINITY STANDARDS ESTABLISHED BY D-1485 (AS LATER MODIFIED TO REMOVE S-36 STANDARD) WHICH WOULD PROVIDE INCIDENTAL PROTECTION OF CURRENT BENEFICIAL USES WITHIN TIDAL WETLANDS.

QUAD MAP	TOTAL ACREAGE OF TIDAL MARSH	PROTECTED BY BY D-1485	UNPROTECTED BY D-1485
Port Chicago	3848	0	3848
Honker Bay	2021	0	2021
Antioch	715	0	715
Denverton	1463	1463	0
Fairfield South	2037	1802	235
Total	10,084	3,265	6,819

SOURCE: DIANNE KOPEC AND MICHAEL JOSSELYN, JULY 1986

Bay-Delta Hearings: Testimony of S. L. Granholm

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Exhibit 4. Special-Status Wildlife Species of the Suisun Bay Tidal Marshes, and Expected Impacts of Reduced Freshwater Inflows.

The table notes the official status of each species on various government lists[a], its occurrence in Suisun Bay tidal marshes, and the expected impact of reduced freshwater inflows to the Bay. The impact analysis assumes that future water diversions will increase as projected by the Department of Water Resources (as described by Williams and Josselyn 1987). The table excludes species for which these tidal marshes are not considered a major use-area.

Species (and Status[a])	Expected Impact[b]	Occurrence in Tidal Marshes and Explanation of Impacts[c]
MAMMALS		
Salt marsh harvest mouse *Reithrodontomys raviventris* (FE, CE, CP, SA)	+	Uncommon resident; strongly prefers high marshes of pickleweed (12), which would probably increase in vigor.
Suisun shrew *Sorex ornatus sinuosus* (SC, SA)	+	Occurs in pickleweed and other low-lying plants of high marsh (31); productivity of suitable habitat thus may increase.
River otter *Lutra canadensis* (PF)	–	Common in slough systems (7); needs fresh or slightly brackish aquatic habitats (15), which would decline in quality and habitat area.
BIRDS		
Double-crested cormorant *Phalacrocorax auritus* (SC2, SA)	0	Breeds in SM on pilings (26); typically nests in trees and on islands (16).
Great blue heron *Ardea herodias* (SA)	0	Breeds in SM in eucalyptus trees (26), which may not be affected
Great egret *Casmerodius albus* (SA)	0	Breeds in SM in eucalyptus trees (26), which may not be affected

Exhibit 4 (continued)

Species (and Status[a])	Expected Impact[b]	Occurrence in Tidal Marshes and Explanation of Impacts[c]
Snowy egret Egretta thula (SA)	- (?)	Present year-round in SM and may nest (20); typically nests in dense tule stands (16), which would decline in habitat area and vigor.
Black-crowned night-heron Nycticorax nycticorax (SA)	- (?)	Present year-round in SM and probably nests (26); typically nests in trees and tules (16), which would decline in vigor and habitat area.
Northern harrier Circus cyaneus (SC2, SA)	0	Breeds in SM, including tidal marshes (26); uses both brackish and salt marshes for feeding and nesting.
California black rail Laterallus jamaicensis coturniculus (CT, CP, FC2, SA)	+	Occurs in several tidal sloughs and apparently breeds (21); mainly occupies high marshes of dense pickleweed (21, 16), which would increase in vigor.
California clapper rail Rallus longirostris obsoletus (FE, CE, CP, SA)	0 (?)	Historically absent from SM (14) but now occurs year-round in Cutoff Slough area (12); SM habitat is tidal marsh dominated by tules (12); typically occurs in pickleweed or cordgrass salt marsh (14).
Short-eared owl Asio flammeus (SC2, SA)	0	Breeds in SM (26, 24); uses both brackish and salt marshes for feeding and nesting.
Salt marsh yellowthroat Geothlypis trichas sinuosa (FC2, SA)	?	G. trichas breeds in SM (8), probably including tidal marsh. Subsp. in SM may or may not be sinuosa (17); this subsp. nests commonly in bulrushes in brackish tidal marshes of south S.F. Bay, but seldom uses pickleweed (17); thus, if it nests in SM, it would probably decline due to habitat reduction.

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Exhibit 4 (continued)

Species (and Status[a])	Expected Impact[b]	Occurrence in Tidal Marshes and Explanation of Impacts[c]
Suisun song sparrow *Melospiza melodia maxillaris* (SA)	-	Fairly common year-round in brackish tidal marshes of tules and cattails (27, 22); would clearly decline, as it makes little of pickleweed habitat (26).

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[a] CE = California endangered list

CP = California fully protected list

CT = California threatened list

FC2 = Federal candidate species, category 2: listing as threatened or endangered may be warranted, but further data are needed to decide whether to list this species.

FE = Federal endangered list

PF = Protected furbearer in California (Gould 1977)

SA = Special animal list, maintained by the California Natural Diversity Data Base (CNDDB) at the Department of Fish and Game

SC = California species of special concern (CNDDB 1986)

SC1, SC2, SC3 = California bird species of special concern, highest priority, second priority, and third priority (Remsen 1980)

[b] + = Significant positive impact expected

- = Significant negative impact expected

0 = No significant impact expected

[c] Numbers in parentheses refer to the attached list of literature cited and personal communications. In addition, information on distribution and habitat of various species was drawn from the following exhibits: 7, 8, 10, 12, 16, 18, 19, and 28.

SM = Suisun Bay marshes, including managed and tidal marshes

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Exhibit 5. Expected Impacts of Reduced Freshwater Inflows on Representative Birds and Mammals of the Suisun Bay Tidal Marshes.

The species listed below are typical of tule- and cattail-dominated brackish tidal marshes in the study area (as are some of the special-status species listed in Exhibit 4) . The table describes each species' occurrence in this habitat and assesses impacts of the increased water diversions projected by the Department of Water Resources (as described by Williams and Josselyn 1987). Harvest species are denoted by "HA"; non-native species are omitted.

Species	Expected Impact[a]	Occurrence in Tidal Marshes and Explanation of Impacts[b]
MAMMALS		
Beaver Castor canadensis (HA)	-	Occurs mainly in eastern part of SM, where water is freshest (7); a freshwater species that would probably decline with salt water intrusion.
Mink Mustela vison (HA)	-	Occurs in tidal slough systems of SM (7); a freshwater species that would probably decline with salt water intrusion.
BIRDS[c]		
American bittern	-	Common year-round in SM, and nests there (7, 8); in Calif., nests and feeds mainly in tules and rushes (10, 16), which would decline in vigor and habitat area.
Mallard (HA)	-	These 6 species of ducks (and probably others) nest in SM (6, 8). Extent of waterfowl use of tidal areas is poorly documented (24, 30); some mallards and cinnamon teal nest there (30), and various species may rear broods there (24). Mallard ducklings exhibit moderate mortality with 1% salinity drinking water and 100% mortality with 1.5% salinity (23); increased salt intrusion could thus be detrimental to waterfowl breeding in SM tidal marshes.
Northern pintail (HA)	- (?)	
Cinnamon teal (HA)	-	
Northern shoveler (HA)	- (?)	
Gadwall (HA)	- (?)	
Ruddy duck (HA)	- (?)	

Exhibit 5 (continued)

Species	Expected Impact[a]	Occurrence in Tidal Marshes and Explanation of Impacts[b]
Virginia rail	-	Both of these rail species nest only in fresh and brackish marshes (13, 16, 19). Both nest at SM (8) and occur year-round, presumably nesting, at Peytonia Marsh (tidal) (20). Nesting would likely decline due to loss of habitat.
Sora	-	
Common moorhen (HA)	- (?)	Uncommon in SM, and nests (8); status in tidal marshes unknown, but nests only in brackish (19) or freshwater marshes, typically in tules (16). Any nesting that does occur in tidal marsh would thus decline.
Marsh wren	-	Abundant year-round in SM, and nests there (8). Nests in fresh or brackish marshes of bulrushes or cattails (16); also nests in lower density in cordgrass (13). Probably nests in tidal parts of SM (20, 26). Would decline due to loss of habitat.
Common yellowthroat[d]	-	Breeds in SM (8), but status in tidal marshes is uncertain. Nests commonly in bulrushes in brackish tidal marshes of south S.F. Bay, but seldom uses pickleweed (17); thus, any nesting that does occur in SM tidal marshes would probably decline due to loss of habitat.

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[a] + = Significant positive impact expected

\- = Significant negative impact expected

0 = No significant impact expected

[b] Numbers in parentheses refer to the attached list of literature and personal communications cited.

SM = Suisun Bay marshes, including managed and tidal marshes.

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Exhibit 5 (continued)

[c] No scientific names are given, as the common names are standardized, following the Sixth AOU Checklist.

[d] The subspecies occurring in the study area may be the salt marsh yellowthroat, a special-status species (see Exhibit 4).

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Golden Gate Audubon Society

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Americans Committed to Conservation • A Chapter of the National Audubon Society

September 21, 1999

Mr. Rick Breitenbach and Mr. Lester Snow
CALFED Bay/Delta Program
1416 Ninth Street, Suite 1155
Sacramento, CA 95814

Dear Mr. Breitenbach and Mr. Snow:

The following are the comments of the Golden Gate Audubon Society and Audubon-California on the Programmatic Environmental Impact Statement /Environmental Impact Report (PEIS/PEIR), CALFED Bay-Delta Program.

We believe that this document is fundamentally flawed for the many reasons cited below.

1) CALFED boasts that the Estuary's environmental problems will be solved through adaptive management. However, CALFED has removed from the adaptive management toolbox the basic tool of water.

Almost all agree that the Estuary's basic problem has been twofold, water diversions and habitat loss. Yet in the adaptive management toolbox CALFED only provides for habitat restoration. CALFED quite clearly states that there will be no increase in freshwater flow water into the Estuary. In fact, there may even be a net decrease in total flows through the Golden Gate. While some may believe that the CALFED prescription of increased short-duration "pulse" flows is the solution for declining fisheries, we suspect that it is not the answer. If it is not, adaptive management will be a useless tool for solving the problem if it cannot call upon increased water flows as a management option.

Since CALFED does not provide for the potential for net increased freshwater flows, it is disingenuous to proclaim that adaptive management can be used to solve the Estuary's problems.

Simply put, since increased freshwater flows into the Estuary may be an essential element for restoring the Estuary and since the "adaptive management" toolbox does not include such increased flows, it is dishonest to claim that adaptive management can be used to solve the Estuary's problems.

Since adaptive management is, in a real sense, the linchpin of CALFED claims to resolving environmental problems ("Central features of the Program are...adaptive management; (pg. 9-3)", and is a core component of the PEIS/PEIR this flaw undermines the entire foundation of this PEIS/PEIR and invalidates the document.

We believe that in a revised PEIS/PEIR it must be made clear that increased flows to the Delta and through the Golden Gate will be available for the adaptive management process.

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Furthermore, even the amount of restoration proposed in the ERPP is, we believe, grossly inadequate to the needs of restoring the Estuary. Especially glaring is the lack of attention to the restoration needs of San Francisco Bay itself. This has been an ongoing flaw in the CALFED process. The ERPP is described as a process to restore the San Francisco Estuary, yet San Francisco Bay itself receives scant mention in the document and its restoration needs are simply not addressed. Leaving restoration planning to ill-defined "watershed planning" leaves the public in the dark as to what is exactly proposed for restoration.

2) The PEIS/PEIR is flawed in its use of the term "saline emergent wetlands".

"Table 10. Continued
Ecosystem Habitat
Element Basis for Selection as an Ecosystem Element
Saline emergent wetland habitats, including brackish and saline wetlands, are important habitat-use areas for fish and wildlife dependent on marshes and tidal shallows in the Bay-Delta and support several special-status plant species. "
Volume t Ecosystem Restoration Program Plan
L PROGW Infroducfion to Hahitsr Visions
104 June ,1999"

While the term "saline emergent wetlands" may be technically accurate in describing wetlands that are either salt or brackish, it is an inappropriate term to use in the context of the San Francisco Estuary which contains tidal brackish marshes that provide a habitat type that is distinct from that provided by tidal salt marshes. These brackish marshes provide habitat for a suite of species distinctly different from those inhabiting the Estuary's tidal salt marshes.

This has all been documented previously during the Bay/Delta Hearings. At those hearings, our consultant, Steven Granholm, provided detailed analysis of the species dependent upon the approximately 5000 acres of brackish unmanaged marshes of Suisun Bay (see enclosed and see Bay/Delta records of September 8-10, 1987, Bay/Delta Estuary Uses: Wildlife). These include such species as the Suisun song sparrow and river otter and many species of ducks such as the mallard, ruddy duck, Northern Pintail, etc. Dr. Granholm further stated that the alteration of these brackish marshes into salt marshes would lead to a decline and probable disappearance of these species and thus a decline in the wildlife values and diversity of the Suisun marshes. The California Native Plant Society, also in the Hearings, indicated that several listed plants, Masons lilaeopsis for one, are also dependent upon the brackish nature of these marshes and are also threatened by increasing salinization of Suisun Bay.

From this testimony it is clear that there is a very real distinction between the brackish and salt marshes of San Francisco Estuary. Lumping both types of marshes under one classification, saline emergent wetlands, is thus completely deceptive, inappropriate and inaccurate.

By combining these wetland types into one classification the PEIS/PEIR erroneously suggests that restoring any of the categories of saline emergent wetlands will suffice for all species found in saline emergent wetlands. Furthermore, by using this single category it is impossible to tell whether mitigation proposals are appropriate.

For example, to mitigate for declining Suisun Marsh species the PEIS/PEIR proposes to increase "saline emergent habitat" (Table B: Bay Region: Proposed CALFED

C-115878

Actions Evaluated in the MSCS, page 2 of 11, Multi-Species Conservation Strategy). From such a statement it is impossible to tell whether this means to increase brackish marsh habitat (which will be true mitigation) or salt marsh habitat (which will not help the species under discussion).

An analysis, *Suisun Marsh and San Pablo Bay: Expected Salinity Levels Under the 1995 Water Quality Control Plan* (see enclosed), prepared for us by Philip Williams and Associates indicates that under the 1985 Water Quality Control Plan the unmanaged brackish marshes of Suisun and San Pablo Bays will turn increasingly saline. This in turn will result in the probable extirpation of species as described above (Granholm).

CALFED does not apparently intend to remedy this situation. No actual increase of flows into Suisun is proposed by CALFED. CALFED only proposes larger pulses of water at certain times of the year. The overall effect of these pulse flows is nullified by greater water exports at other times of the year resulting in potentially even less net flows into Suisun Bay. As a result, the extirpation (or, regarding the plants species, extinction) of species in Suisun Bay's brackish unmanaged marshes is a likelihood that is not addressed by the PEIS/PEIR.

The PEIS/PEIR does not address this issue and does not propose mitigation for the impacts of this increased salinization of Suisun's brackish unmanaged marshes other than proposing to increase saline emergent habitat which, as we have shown above, is a misleading and deceptive term. Since CALFED proposes to increase saline emergent wetlands but does not provide increased flows to ensure that these saline emergent wetlands are brackish, one must assume they will be salt marsh. Increasing saline emergent tidal salt marshes will not improve conditions for saline emergent brackish marsh dependent species.

The PEIS/PEIUR must be rewritten so as to provide true mitigation for these significant impacts.

3) The PEIS/PEIR alternatives are evidently designed to result in the need for dams, surface storage and diversion facilities. Because the PEIS/PEIR fails to adequately address reasonable and achievable means of conserving water and means to improve water quality that do not entail the construction of new dams and diversion facilities, such facilities become inevitable. For example, the PEIS/PEIR fails to include a significant "land-retirement" alternative although a study prepared for BDAC clearly indicated that the retirement of marginal and unproductive farm land could result in the conserving of over 1 million acre feet of water per year. The PEIS/PEIR fails to adequately address the use of new treatment plants for improved water quality, thus forcing an unreasonable time schedule for improving Delta water quality or for developing a peripheral canal.

The PEIR/PEIS must be redone so as to provide a viable Alternative that adequately includes land retirement and other **enforceable** water conservation mechanisms, and water quality mechanisms other than diversions. Such an Alternative is feasible and if appropriately developed will eliminate the need for surface storage and diversion facilities.

The North Delta diversion proposal should be deleted from the document. This puts the whole program on an absurd timetable and does not give alternative water quality programs a chance to work.

C-115879

4) The Assurances component of the PEIS/PEIR is so vague as to be meaningless. Assurances is an essential component of the CALFED program. Without it there can be no trust in the appropriate implementation of any of the Alternatives. Without trust there will be no implementation, or at the least, many years of litigation before implementation can take place. Thus, the Assurances part of the PEIS/PEIR must receive a full and complete description even in a Programmatic Document. This has not been done.

To conclude, the PEIS/PEIR has too many problems to be next re-issued as a Final PEIS/PEIR. We believe that the document must be rewritten in order to correct the clear bias for the development of surface storage and diversion facilities. An Alternative that is based on water conservation and land retirement, and that solves water quality problems through technology rather than through increased diversions has not been presented despite the feasibility of such an Alternative. The PEIS/PEIR should be rewritten with such an Alternative included and hopefully as the Preferred Alternative.

A revised draft PEIS/PEIR must include an analysis of the impacts of increased salinization on the unmanaged brackish marshes of Suisun Bay. The deceptive use of the term "saline emergent wetlands" must be corrected. Appropriate mitigations for those impacts must be provided. Such mitigations must include, we believe, a net increase of freshwater flows into Suisun Bay.

A detailed Assurances package must be presented rather than one that simply lists ideas.

Thank you for your attention to our concerns.

Sincerely yours,

Arthur Feinstein
Executive Director, Golden Gate Audubon
Board Member, Audubon-California

C-115880

PWA
PHILIP WILLIAMS & ASSOCIATES
CONSULTANTS IN HYDROLOGY

MEMORANDUM

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DATE: February 16, 1999

TO: Arthur Feinstein, Golden Gate Audubon Society

FROM: Betty Andrews, P.E.

RE: Suisun Marsh and San Pablo Bay: Expected Salinity Levels Under the 1995 Water Quality Control Plan
(PWA Ref # 1309)

At your request, Philip Williams & Associates, Ltd. (PWA) has undertaken a brief review of the November 1997 Draft Environmental Impact Report (DEIR) for Implementation of the 1995 Bay/Delta Water Quality Control Plan and its subsequent revisions through May, 1998. This memorandum is based primarily on review of that document.

PURPOSE

The primary goal of our review was to identify the salinity levels in Suisun Marsh and San Pablo Bay that could be expected from the implementation of the 1995 Bay/Delta Water Quality Control Plan (WQCP). The DEIR attempted to address this issue in its assessment of impacts of the WQCP.

FINDINGS

1. The DEIR makes no attempt to compare proposed salinity conditions to any baseline other than simulated No Project conditions and the conditions during the very recent 1984-1994 period.

2. No description is provided of any any ecosystem functions which require more than the presence of certain salinity levels at certain times of the year.

3. No justification for the objectives appears to be provided in the DEIR, though it may exist elsewhere. Similarly, no overarching goals for the amount of fresh, brackish, and salt marsh in Suisun are associated with the numeric objectives as presented in this document.

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4. The compliance locations included in the objectives do not address channel salinity concerns for most of the unmanaged brackish tidal marshes of Suisun, which lie at the perimeter of Suisun Bay, Grizzly Bay, and Honker Bay.

5. There does not appear to be information in the DEIR that allows conclusions to be directly drawn regarding expected salinities in Suisun Bay, Grizzly Bay, and Honker Bay. Instead, data is provided for stations to the east in the Delta and to the north in the interior of the Suisun Marsh. Data is provided on the average monthly X2 position; relative to existing conditions, it will move downstream for all alternative implementations of the flow objectives in the months of November and February through September, indicating a relative freshening of the area in these months on average. Increased salinities are typical in October and January. The greatest Delta outflow, and therefore the greatest reduction in salinities, would occur under Flow Alternative #5.

6. The operation of the SMSCG have had far more significant effect on interior Suisun Marsh salinities than any of the alternatives for implementing the WQCP will. However, implementation of the WQCP alone will significantly reduce salinities in the western interior marsh at station S-97 over existing conditions. Interior marsh salinities will primarily affect managed marshes (largely duck clubs).

7. The original D-1485 goal of providing full mitigation for CVP and SWP impacts on Suisun Marsh appears to have been abandoned.

WQCP OBJECTIVES FOR SUISUN MARSH

A discussion of the evolution of the standards is provided on pages VII-1 to 8.

Specific salinity objectives (expressed as EC, or electrical conductivity) are included in the WQCP for specific locations in the Eastern and Western portions of Suisun Marsh. (See Attachment A for the statement of the objectives.) Figure 1 shows the locations of the referenced stations. Three locations, identified as C-2, S-64, and S-49, are specified for the eastern marsh, and four locations, identified as S-21, S-42, S-97, and S-35, are specified for the western marsh. In addition, the western marsh also includes water supply intakes for waterflow management areas on Van Sickle and Chipps Islands, though no more specific location is identified. The objectives apply to the October - May period, and range from 8.0 (February - March only) - 19.0 (October only) mmhos/cm. The numeric objectives are described as the "maximum monthly average of both daily high tide EC values (mmhos/cm) **or demonstrate that equivalent or better protection will**

be provided at the location" [emphasis added]. The eastern marsh objectives are the same under the WQCP as they were under the amended D-1485.

The "Brackish Tidal Marshes of Suisun Bay" are provided with a narrative objective given in footnote 10:

> Water quality conditions sufficient to support a natural gradient in species composition and wildlife habitat characteristic of a brackish marsh throughout all elevations of the tidal marshes bordering Suisun Bay shall be maintained. Water quality conditions shall be maintained so that none of the following occurs: (a) loss of diversity; (b) conversion of brackish marsh to salt marsh; (c) for animals, decreased population abundance of those species vulnerable to increased mortality and loss of habitat from increased water salinity; or (d) for plants, significant reduction in stature or percent cover from increased water or soil salinity or other water quality parameters.

According to the discussion on page VII-8, the narrative objective "is expected to be achieved through compliance with the year-round outflow objectives," and was included "to ensure that the tidal marshlands receive adequate protection."

It is important to note that all of the compliance stations identified are well inland of the bay edge, where many of the unmanaged tidal brackish marshes lie (see Figure 2). The compliance stations appear to be well-situated to address salinities affecting managed marshes, but not the preponderance of the unmanaged tidal brackish marshes of the region. These marshes will probably be most directly affected by the Delta outflow objectives, and are not addressed by the Suisun Marsh alternatives described below. Implementation of those objectives are evaluated by examining a number of different flow alternatives, which I will only generally discuss following the description of the Suisun Marsh Alternatives.

SUISUN MARSH ALTERNATIVES CONSIDERED

The DEIR is constructed in an unusual fashion: different sets of alternatives are considered to meet different sets of objectives under the WQCP. The set of six alternatives considered specifically to meet the Suisun Marsh Salinity Objectives are briefly described on pp. II-34 - II-36 and again in Chapter VII, the chapter describing the environmental effects of implementing the Suisun Marsh Salinity Objectives. Table VII-12 from page VII-65, which summarizes the alternatives, is included as Attachment B.

The first two alternatives are included for comparison as "No Project" alternatives; they assume D-1485 base hydrology, not WQCP flows. The others assume WQCP flows and different facilities construction plans and Green Valley Creek flow augmentation schedules. Each alternative assumes operation of the Suisun Marsh

Salinity Control Gates (SMSCG) to meet the objectives to the extent possible. A discussion of each alternative follows.

Suisun Marsh Alternative 1 - Base Case and No Project Alternative A
Assumes D-1485 Delta outflow objectives. The State Water Project (SWP) and Central Valley Project (CVP) are responsible for meeting the Suisun Marsh objectives. No further actions are taken to meet the western marsh objectives, and the western marsh objectives are not met at some times. This is the alternative described by the DEIR as the default if no further action is taken by the SWRCB.

Suisun Marsh Alternative 2 - Cordelia-Goodyear Ditch: No Project Alternative B
Like Alternative 1 except that the Cordelia-Goodyear Ditch is constructed with two associated tide gates to meet objectives at S-35, and up to 80 cfs of flow augmentation occurs in Green Valley Creek to meet objectives at S-97. Figure 3 shows the assumed configuration of the Cordelia-Goodyear Ditch. This system would be used to move up to 225 cfs net flow over a tidal cycle of lower salinity water from Cordelia Slough to Goodyear Slough. A tide gate on the downstream (northern) end of Goodyear Slough would prevent higher salinity water from moving upstream during flood tide on Suisun Slough.

Suisun Marsh Alternative 3 - WQCP Only
Same as Alternative 1, but with WQCP outflow objectives in effect.

Suisun Marsh Alternative 4 - WQCP with Cordelia-Goodyear Ditch & Flow Augmentation
Same as Alternative 2, but with WQCP outflow objectives in effect.

Suisun Marsh Alternative 5 - WQCP with SMPA Amendment III Management Actions
This alternative assumes that WQCP outflow objectives in effect and a series of management actions, including both structural and nonstructural measures, are implemented. These measures are described in greater detail on pp. VII-22 and VII-24, 25, and are summarized below:

- institute a staffed *Water Management Program* to improve practices throughout the marsh;
- implement a *Joint-Use Facilities Program* to promote cooperative and efficient use of water delivery and leaching systems for managed wetlands;
- complete a project to *redirect Morrow Island Drainage* to Suisun Bay to reduce salinities in Goodyear Slough and on managed wetlands supplied from this source;
- institute a program to use 20 portable pumps to provide lower salinity water to managed wetlands during low tide diversions and better removal of soil salts during drainage;

- prepare updated *Management Plans* to individual landowners to improve salinity conditions on their property;
- fund the *Fairfield-Suisun Sewer District - Green Valley Creek Intertie*; two alternative approaches to funding and facilities construction are considered; and
- *operate the SMSCG in September* to meet October salinity objectives when certain end of August salinity conditions exist.

The DEIR notes that some of these actions cannot be modeled. In particular, they note that the operation of portable pumps and other actions of the Water Manager are intended to reduce soil salinities as necessary to produce suitable vegetation for waterfowl. It is implied that success in achieving this goal will meet the criteria of demonstrating "equivalent or better protection [than the numerical objectives] is provided at the location." This alternative is identified as the environmentally preferred alternative (p. VII-66).

Suisun Marsh Alternative 6 - WQCP with Flow Augmentation

"Multiple parties are responsible for full implementation of the WQCP western marsh objectives through flow augmentation in Green Valley Creek." Sources will include:

- Fairfield-Suisun Sewer District;
- upstream reservoirs (Lake Madigan and Lake Frey);
- if needed, Lake Berryessa.

Pages VII-25, 26 include a discussion of what agreements and other actions would be necessary to effect this Alternative. Pages VII-58 to 60 provide a discussion of many fisheries-related concerns associated with flow augmentation of Green Valley Creek.

SUISUN MARSH ALTERNATIVES: EXPECTED EFFECTS ON SALINITY, HYDROLOGY, AQUATIC RESOURCES

The hydrodynamic and water quality model known as DWRDSM (Suisun Marsh Version) was used to simulate conditions under each of the alternatives for meeting the numerical objectives described above. The model simulates the average monthly high tide salinities for the 1922-1994 time period. Model results are provided at each of the 7 compliance stations identified in the objectives.

Hydrology Impacts

The DEIR discusses hydrologic changes as a result of implementing different alternatives only at the following locations or facilities: Green Valley Creek, Lake Madigan, Lake Frey, Sacramento River, the North Bay Aqueduct, Fairfield-Suisun Sewer District, Putah-South Canal, and Lake Berryessa. Since changes in

these locations do not directly address changes in Suisun Marsh or San Pablo Bay, they are not summarized in this memorandum. They are discussed on pages VII-42 to 47.

The DEIR summarizes by saying "[t]he Suisun Marsh alternatives will result in channel water salinities **slightly different** from historic conditions" [emphasis added]. Salinities throughout the marsh are described as being lower under WQCP hydrology compared to D-1485 hydrology.

The WQCP salinity objectives are met in most months under all alternatives in the eastern and central marsh. Salinities at the western compliance stations, S-35 and S-97 are shown to often exceed the objectives; most of the discussion of impacts focuses on these two stations.

Salinity Impacts

The model assumes operation of the SMSCG as needed, based on salinities at S-21, S-35, S-49, and S-64 during the October - May control season. A separate assessment was made of the effect of the SMSCG on salinity under both D-1485 and WQCP hydrology. They were operated less frequently under WQCP hydrology as compared to D-1485 hydrology. The SMSCG were found to be highly effective in meeting salinity objectives in the eastern marsh and at S-42 and S-21 in the western marsh, with objectives being exceeded at these locations only occasionally (0 - 11% of the months) in only February and March under each of the Alternatives.[1] Operation of the gates was most often triggered by the western marsh stations S-35 and S-21. As control of the SMSCG rests with the Department of Water Resources and the US Bureau of Reclamation alone, the DEIR concludes that assessment of the alternatives should focus entirely on their ability to meet compliance at the stations identified as S-35 and S-97, in the western marsh.

Focusing on these two stations, it is apparent that Alternative 6 does the best job of meeting the standard at the stations identified as S-35 and S-97, in the western marsh. Alternative 6 also results in the lowest overall salinity levels during the control season. Alternative 4 does as well as Alternative 6 in meeting the objective at S-97 (though with higher overall salinities than Alternative 6 during the control season), but it does less well than Alternative 6 at meeting the objective at S-35. The DEIR notes that the water cost under Alternative 6 is much greater than under Alternative 4. The DEIR further notes that a peak October augmentation rate of 900 cfs would be needed to meet the objectives at S-35. On average, Alternative 6 requires an additional

[1] Alternatives 4 and 6 have no occasions of exceeding the objectives at the stations in the eastern marsh and in the western marsh at S-42, S-21. Alternative 1 has the poorest compliance record at these same locations, though exceedance still occurs to only a very limited extent.

15, 200 acre-feet of water compared to Alternative 4, and this water can be considered the amount necessary to meet the objectives at S-35 (p. VII-41).

Alternative 5 could result in a slight increase in salinity in Boynton Slough due to redirection of treated waterwater from that waterway to Green Valley Creek. The frequency and magnitude of the resulting failure to meet the objective at S-40 are still very low.

The area-frequency plots from the DEIR provided here as Figures 4 and 5 provide a sense of the degree of influence of the Alternatives on salinity (relative to the numerical objective) at these two stations. The distance above or below the 0 line indicates the size of the difference from the numerical objective (above means salinity higher than the objective, below means salinity lower than the objective). The frequency of the condition is indicated by the horizontal or X-axis. Again, Alternatives 1 and 2 are the No Project alternatives, and show the salinity-lowering effect of the WQCP outflows compared to D1485 outflows. Alternatives 1A and 3A indicate the result of these alternatives without operation of the SMSCG.

Aquatic Habitat Impacts

A 1993 study of fish populations in the marsh over a 14-year period (Meng et al. 1993), 1979-1992, found that there were long-term declines in abundance and species diversity. These were generally correlated with decreases in outflow and increases in salinity.

The DEIR notes that while salinities throughout the marsh are expected to be slightly lower under the WQCP than under historic conditions, salinity is only one of several factors affect brackish marsh vegetation patterns. Other factors include depth and duration of flooding and plant competition. A report on this and related issues is expected from the Suisun Marsh Ecological Workgroup prior to the SWRCB triennial review.

Alternative 4 may significantly affect species requiring brackish or salt marsh habitat, because it will involve the introduction of substantial quantities of low salinity water to the northwestern marsh through Green Valley Creek and the construction of the Goodyear-Cordelia Ditch system.

Alternative 5 will result in more widely fluctuating channel water salinity conditions than Alternatives 2 and 4 due to the smaller amount of Green Valley Creek augmentation. Due to the limited availability of effluent from the Fairfield-Suisun Sewer District and its current discharge through nearby Boynton Slough, there is unlikely to be a major change in salinity at S-97 under this alternative. Salinities in Boynton Slough would be slightly higher.

Depending on the water source and release regime, flow augmentation under Alternative 6 may result in a "slight freshening effect" at S-97 (p. VII-53). However, Alternative 6 is described elsewhere as creating "conditions at S-97 far less saline than the historic condition, or under any of the other alternatives. Aquatic species in the western marsh preferring brackish conditions would tend to be displaced in favor of freshwater species" (p. VII-62). Flow augmentation would have no effect at S-35.

DELTA OUTFLOW: ALTERNATIVES

Eight alternatives are considered for implementing the flow objectives of the WQCP, including the Delta outflow objective. As previously mentioned, this objective is the one most likely to affect salinities in Suisun Honker, and Grizzly Bays, around which lie many unmanaged brackish tidal wetlands. It is also most likely to affect salinities downstream in San Pablo Bay.[2] Unfortunately, neither the objective nor the discussion of the results provides much direct information about the expected salinities in these waters. Salinity values are provided for stations in the Delta to the east, but only the relative location of X2 is provided for stations west of the Delta, including Suisun Bay. X2 is defined as the distance from the Golden Gate Bridge, in kilometers, of the 2 parts per thousand isohaline at one meter from the bottom of the channel. (This isohaline was agreed to be equivalent to a specific conductance of 2.64 mmhos/cm at the surface.) The simulation model DWRSIM was used to estimate the location of X2 under each of the alternatives.

In general, all of the flow alternatives considered have fairly similar effects on the movement of X2 relative to the base case. Data is provided on the average monthly X2 position; relative to existing conditions, it will move downstream for all alternative implementations of the flow objectives in the months of November and February through September, indicating a relative freshening of the area in these months on average under all of the flow alternatives. Increased salinities are typical in October and January. The greatest Delta outflow, and therefore the greatest reduction in salinities in Suisun Bay, would occur under Flow Alternative 5. According to Table VI-11 in the DEIR (p. VI-7), Alternative 5 would on average result in the greatest movement downstream of X2 in advancing months and the least movement upstream of X2 in retreating months of all the alternatives considered. It could therefore create the greatest reduction of salinities in Suisun Bay relative to the base case, though the expected salinties are not quantified.

The largest changes in X2 position compared to the base case would occur in the months of April - June, when X2 would move approximately 2 - 3 kilometers downstream on average for most of the flow alternatives considered.

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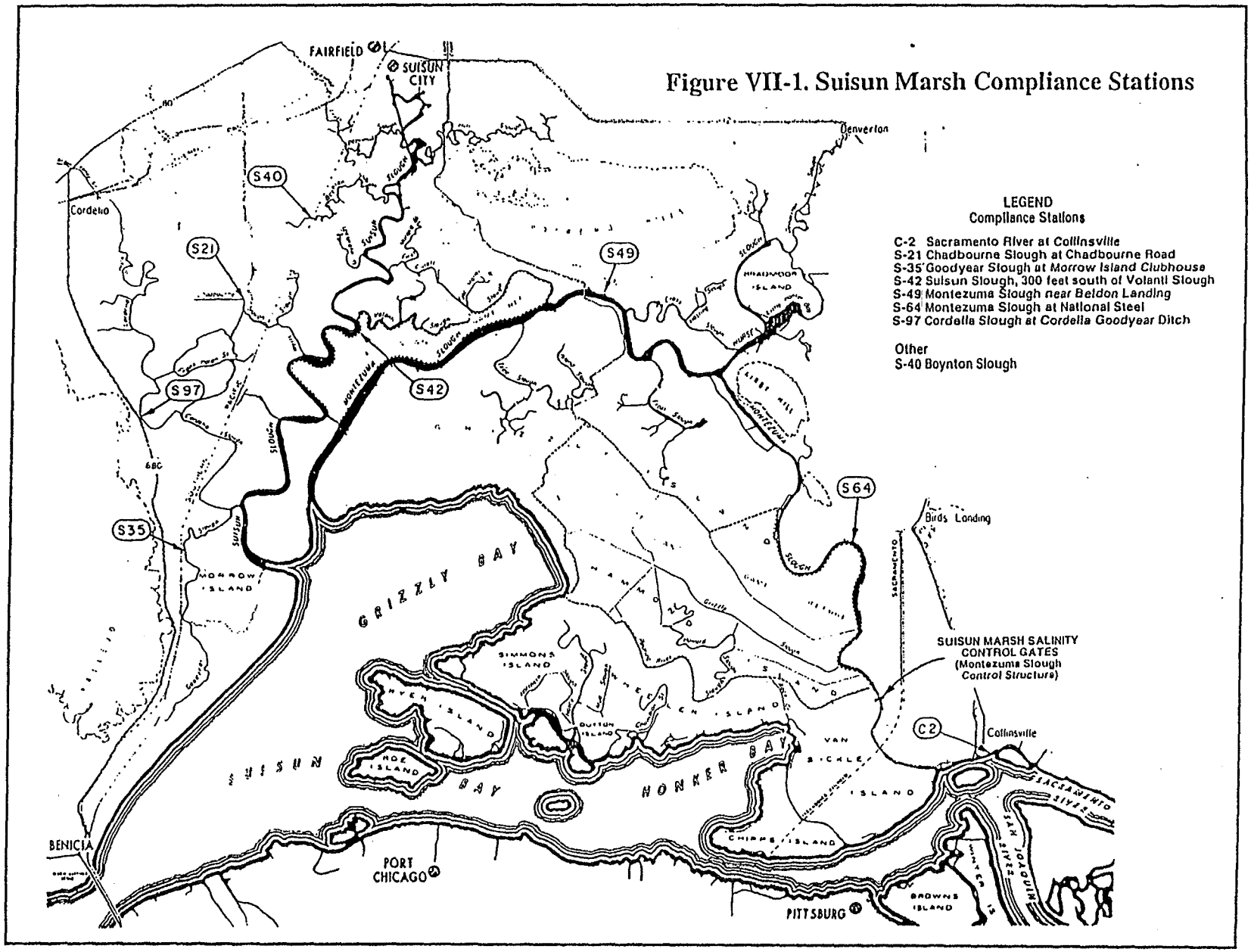
[2] There does not appear to be any description in the DEIR *aside* from the discussion of X2 on the effect of the WQCP on salinities at locations downstream of the western Delta, including San Pablo Bay.

Perhaps the most important period for reduced salinities in the estuary is the March - May period, when most of the flow alternatives would result in a downstream shift of X2 of approximately 1.5 - 3.4 kilometers compared to the base case. This size of shift could be expected to result in a reduction in Suisun Bay salinities of only a very minor amount, likely to be much less than 1 ppt. During the modeled critical drought period, however, most of the flow alternatives would shift the X2 position by approximately 6.7 kilometers in March, 3.9 kilometers in April, and approximately 5.5 kilometers in May. These changes could represent a significant shift in salinities during a key season in very dry periods.



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VII-2

FIGURE 1

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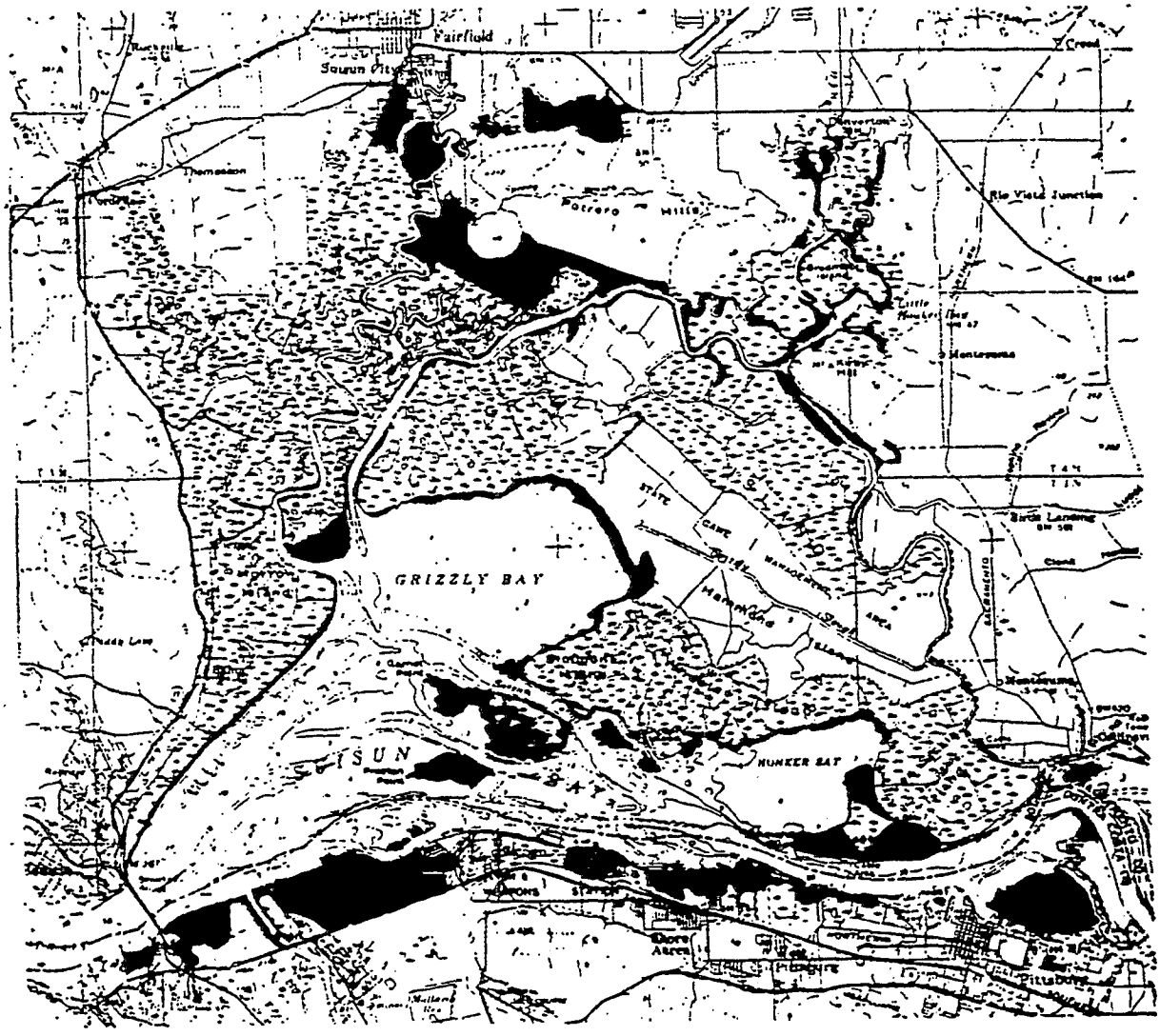

FIGURE 2:

DISTRIBUTION OF BRACKISH TIDAL MARSH IN SUISUN BAY

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Figure VII - 6. Cordelia-Goodyear Ditch and Goodyear Slough Tide Gate

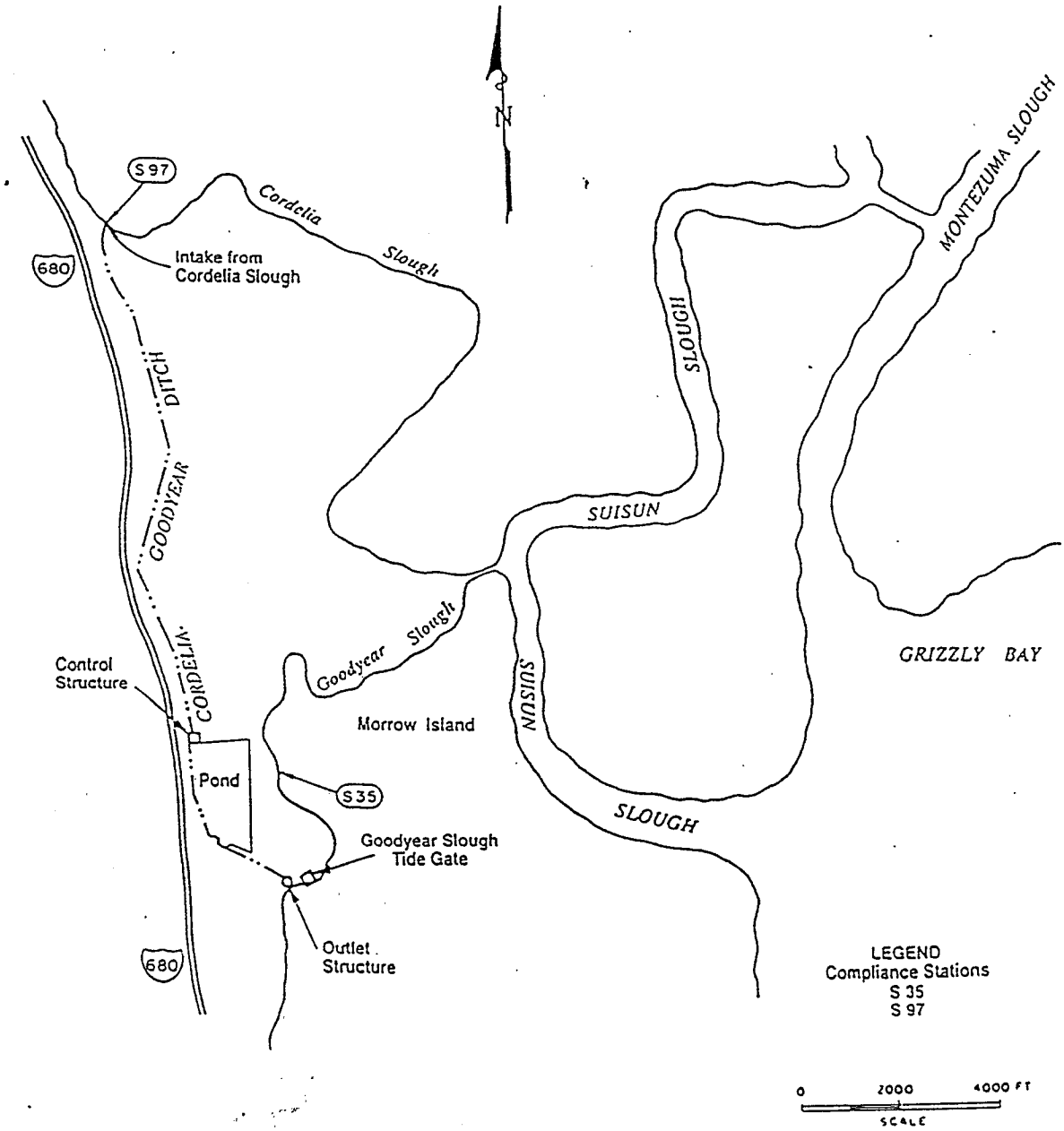

FIGURE 3

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Figure VII-13

S35 GOODYEAR SLOUGH AT MORROW ISLAND CLUB HOUSE
SALINITY AREA-FREQUENCY ANALYSIS 1/
OCTOBER THROUGH MAY OF WATER YEARS 1922-1994

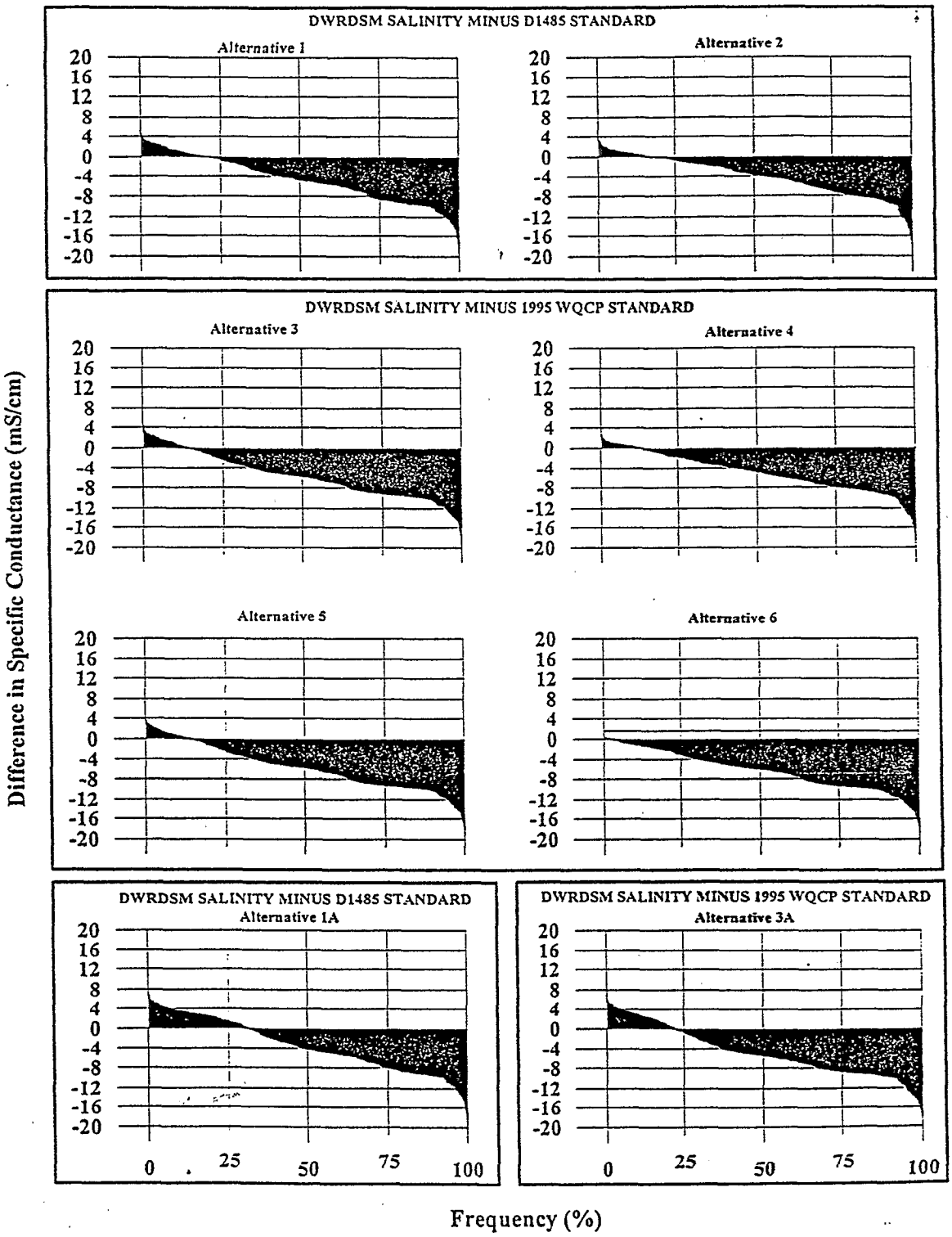

FIGURE 4

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Figure VII-14

S97 CORDELIA SLOUGH AT CORDELIA-GOODYEAR DITCH
SALINITY AREA-FREQUENCY ANALYSIS 1/
OCTOBER THROUGH MAY OF WATER YEARS 1922-1994

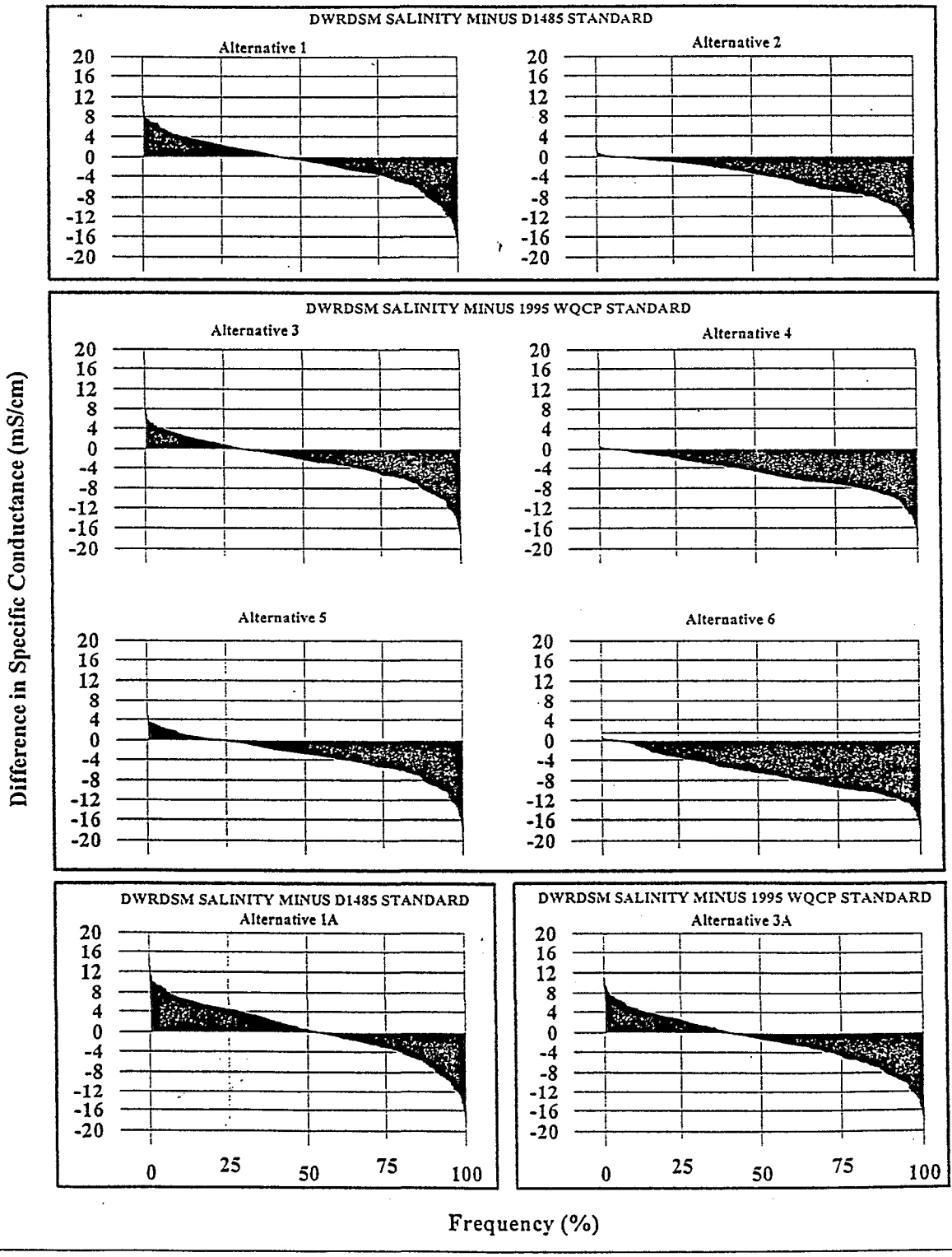

FIGURE 5

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ATTACHMENT A

TABLE II-3
WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

COMPLIANCE LOCATION	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
DISSOLVED OXYGEN						
San Joaquin River between Turner Cut & Stockton	*(RSAN050-RSAN061)*	*Dissolved Oxygen (DO)*	*Minimum DO (mg/l)*	*All*	*Sep-Nov*	*6.0 [4]*
SALMON PROTECTION						
			narrative	*Water quality conditions shall be maintained, together with other measures in the watershed, sufficient to achieve a doubling of natural production of chinook salmon from the average production of 1967-1991, consistent with the provisions of State and federal law.*		
SAN JOAQUIN RIVER SALINITY						
San Joaquin River at and between Jersey Point and Prisoners Point [5]	*D-15 (RSAN018) -and- D-29 (RSAN038)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*	*W,AN,BN,D*	*Apr-May*	*0.44 [6]*
EASTERN SUISUN MARSH SALINITY						
Sacramento River at Collinsville -and- Montezuma Slough at National Steel -and- Montezuma Slough near Beldon Landing	*C-2 (RSAC081)* *S-64 (SLMZU25)* *S-49 (SLMZU11)*	*Electrical Conductivity (EC)*	*Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location.*	*All*	*Oct* *Nov-Dec* *Jan* *Feb-Mar* *Apr-May*	*19.0* *15.5* *12.5* *8.0* *11.0*
WESTERN SUISUN MARSH SALINITY						
Chadbourne Slough at Sunrise Duck Club -and- Suisun Slough, 300 feet south of Volanti Slough -and- Cordelia Slough at Ibis Club -and- Goodyear Slough at Morrow Island Clubhouse -and- Water supply intakes for waterfowl management areas on Van Sickle and Chipps islands	*S-21 [7] (SLCBN1)* *S-42 [8] (SLSUS12)* *S-97 [8] (SLCRD06)* *S-35 [8] (SLGYR03)* *No locations specified*	*Electrical Conductivity (EC)*	*Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location.*	*All but deficiency period*	*Oct* *Nov* *Dec* *Jan* *Feb-Mar* *Apr-May*	*19.0* *16.5* *15.5* *12.5* *8.0* *11.0*
				Deficiency period [9]	*Oct* *Nov* *Dec-Mar* *Apr* *May*	*19.0* *16.5* *15.6* *14.0* *12.5*
BRACKISH TIDAL MARSHES OF SUISUN BAY						
			narrative			*[10]*

ATTACHMENT B

Table VII-12
Summary of Suisun Marsh Alternatives

Alternative	Base Hydrology	New Facilities	Green Valley Creek Flow Augmentation	Other Actions
1	D-1485	None	None	None
2	D-1485	Cordelia-Goodyear Ditch and Goodyear Slough Tide Gate	Up to 80 cfs as needed from NBA to meet S-97	None
3	1995 Bay/Delta Plan	None	None	None
4	1995 Bay/Delta Plan	Cordelia-Goodyear Ditch and Goodyear Slough Tide Gate	Up to 80 cfs as needed from NBA to meet S-97	None
5	1995 Bay/Delta Plan	Minor construction to allow FSSD discharge in Goodyear Slough	Up to 20 cfs of treated effluent from FSSD when available	SMPA Amendment III Management Actions
6	1995 Bay/Delta Plan	Minor construction on Putah-South Canal and NBA	As needed from all sources until objectives are met at S-97 and S-35	None

2. The SMSCG operates significantly less frequently under alternatives with 1995 Bay/Delta Plan base hydrology. Therefore, impacts to anadromous fish passage related to gate operation should be reduced compared to Alternatives 1 and 2.

3. With SMSCG operation and 1995 Bay/Delta Plan outflow, objectives are very nearly met in all months at stations C-2, S-64 and S-49 in the eastern marsh and stations S-21 and S-42 in the western marsh. Objectives can not be met with 1995 Bay/Delta Plan outflow and SMSCG operation at stations S-35 and S-97.

4. Green Valley Creek flow augmentation is an effective means of controlling salinity in the northwestern marsh in the vicinity of S-97 under Alternatives 2 and 4. The Cordelia-Goodyear Ditch and the Goodyear Slough Tide Gates provide marginal benefits in the vicinity of S-35.

5. The frequency with which objectives are exceeded under Alternative 5 is midway between Alternatives 2 and 4. Many of the SMPA Amendment III management actions which are part of the alternative can not be modeled. Therefore, the modeling results understate the net benefit that may be expected from the alternative.

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