TESTIMONY OF ALEX HILDEBRAND
HEARING ON PROPOSED CEASE AND DESIST ORDER TO DWR AND USBR

My name is Alex Hildebrand. I was a Director of the South Delta Water Agency (SDWA) for 30 years and am currently the engineer for that Agency. A copy of the Agency's boundaries is provided as Attachment "A." I have testified many times before this Board as well as other regulatory and legislative bodies and was qualified as an expert witness with regard to the water quality and flow issues affecting the South Delta.

A copy of my current statement of qualifications is attached hereto as Attachment "B." Briefly, I have a B.S. in physics with minors in chemistry and engineering, and worked for Chevron until I retired in engineering and technical capacities including Assistant Chief Engineer of the Richmond Refinery and Director of the La Habra Research Laboratory. Since that time I have farmed approximately 150 acres on the San Joaquin River about 12 miles by river downstream of Vernalis in the South Delta. For the past 30 years, I have been intimately involved in the discussions, negotiations, regulatory proceedings and litigation to protect its diverters from the adverse effects of SWP and CVP and to insure the area has an adequate supply of good quality water.

My testimony for this proceeding is divided into four parts following a discussion of background. The first part deals with how the DWR and USBR can meet current salinity standards while using temporary rock barriers. It has been argued that the 0.7 EC requirement in internal channels cannot be reasonably met even after implementation of the SDIP and that it is therefore unreasonable to require it now. That assertion is incorrect. The second deals with the numerous interrelated benefits which result from compliance with permit conditions. The third part explains how I and others are personally affected. And the last part addresses the reconsideration of the Water Quality Response Plan.

I. Background

1) Regulatory Background

As set forth in the 1991 and 1995 Water Quality Control Plans, the two San Joaquin River standards (at Brandt Bridge and Vernalis) were to be implemented promptly. The two Old River standards (Old River near Middle River and Old River at Tracy Road Bridge) were to be implemented no later than December 31, 1997 (see Attachment "C"). The 1995 Plan therefore recognized that the San Joaquin River standards would be addressed with good quality flows on the River, while the Old River standards required other actions such as barriers which could not be immediately implemented.

SDWA-2

In D-1641, the Board acknowledged that, "Construction of permanent barriers alone is not expected to result in attainment of the water quality objectives." The Board went on to note that the "objectives can be met consistently only by providing more dilution or by treatment." (See Attachment "D" D-1641 at page 88.)

Hence, in 2000, this Board recognized that permanent barrier installation and operation ***and*** other actions, including additional dilution flows, were necessary to meet the standards.

Since 1995 at the earliest, and 2000 at the latest, DWR and USBR have known that in order to meet the 0.7/1.0EC standards, they had to undertake actions ***in addition to the proposed barrier program.*** To my knowledge, DWR and USBR have undertaken no actions other than the barrier program.

As I understand the issues before the Board in this proceeding, the questions are first, whether a Cease and Desist Order should issue, and second, if so, what terms should be in such an order.

The answer to the first question is certainly "yes." Since DWR and USBR do not believe their current operations, including temporary barriers, will result in compliance with their permit terms, especially at the three interior South Delta stations, they should be ordered to comply. There appears to be no logical or practical reason for not requiring compliance with existing Water Quality Objectives and permit terms. This is especially true given that the Board determined over five years ago in D-1641 that compliance would indeed require additional dilution flows (or treatment). The fact that DWR and USBR knew the permanent operable barriers would not be built in the short term and did not undertake the necessary and anticipated other actions to secure and provide additional flows or treatment does not change the need for the objectives or the benefits therefrom.

I note that HR 2828 requires the USBR to develop a plan by the end of this year under which it will meet its water quality obligations on the San Joaquin River (see Attachment "E"). Since the Congress believes the Bureau should meet the objectives, one would think the SWRCB would too.

2) <u>Historical Background</u>

The changes in San Joaquin River flows and water quality pre-CVP and post CVP are set forth in the June 1980 Report entitled "*Effects of the CVP Upon the Southern Delta Water Supply Sacramento - San Joaquin River Delta, California.*" This Report and numerous other studies and investigations (including D-1641) have identified the operation of the CVP as the principle cause of the salinity problem in the lower San Joaquin River and Delta. However, the SWP's effects on flows in Delta channels and its joint efforts with the CVP in supplying export water to the San Joaquin Valley are significant contributory causes.

As a consequence of this problem, the SWRCB slowly adopted and even more slowly implemented water quality objectives to protect agricultural beneficial uses. Currently, only dilution water is used to meet the Vernalis standard. The delay in implementing the other three standards has allowed DWR and USBR to avoid taking other actions. [Although temporary barriers do trap some good quality export water which improves water quality in portions of Middle River and Tracy Old River compliance stations, the net flow is back (downstream) over the barriers and the water quality does not approach the 0.7 EC standard.

The dilution water needed to comply with the current Vernalis salinity objectives is required because the westside wetlands and farm lands receive Delta Mendota Canal (DMC) water which contains a large salt load. That salt load is then concentrated by crop and wetland evaporation. Most of the salt then drains to the river where it must be diluted.

II. Compliance with the 0.7/1.0EC internal South Delta salinity standard with Temporary barriers

The subject Water Quality Objectives can be met and the in-channel water supply in internal South Delta channels can be maintained at 0.7 EC from April through August with very little water cost to the CVP and SWP. This is the case both before and after permanent barriers are installed and other concurrent measures are provided. While using temporary barriers the following salinity control measures and others should be utilized.

1) Dilution Needs.

A) As water passes Vernalis, it slowly degrades due to evaporation, consumptive uses and urban discharges. This degradation is reflected in field data which DWR has collected and which is set forth in Attachment "F." The increase in salinity during low flows can be .1 EC or more from Vernalis to Brandt Bridge. The amount of dilution water needed to offset this rise in salinity at Brandt Bridge or elsewhere depends on the quality of the dilution water and the amount of the flow from Vernalis to Brandt Bridge. Dilution provided upstream of Vernalis can be used to lower salinity below 0.7 EC at Vernalis so that it will not rise above 0.7 EC at downstream locations. Dilution with Middle River water can be used to restore salinity to 0.7 EC at the point of dilution. To offset a 0.1 EC rise in salinity would take about 250 cfs of 0.4 EC dilution water when the Vernalis base flow is 1000 cfs. The 0.4 EC is representative of DMC water quality. If the dilution flow was provided from one of the tributaries, less of that better quality water would be required.

2) Dilution Opportunities.

A) New Melones is currently the only reservoir used by the USBR to meet the Vernalis standard. Whatever additional measures are undertaken to meet the downstream South Delta standards, the New Melones releases that would be required in the absence of these measures to meet the Vernalis standard will continue to be required at least in the short term. Additional releases could also be made from this source to contribute to meeting the other South Delta standards. This year as of June, the Bureau has allocated 180,000 acre-feet of New Melones storage for water quality purposes, but has used none of this amount (see Attachment “G;” personal communication with USBR staff). Obviously, in the short term, water is available from New Melones.

B) Additional water from the tributaries to the San Joaquin River could be purchased for release during the April through August time frame. In the recent past, hundreds of thousands of acre-feet have been purchased from the tributaries for a variety of reasons. As stated above, it would take less of this high quality water to provide the needed dilution than is the case when DMC water is used.

C) Upstream exchanges could also be coordinated to provide dilution flows. Given the various connections of the SWP and CVP distribution systems, exchanges between water users could be made to provide additional flows on the San Joaquin River. For example, this year excess and flood flows from Friant were diverted at the Mendota Pool for delivery to Westlands Water District and others. Some of that water could have been allowed to flow downstream in exchange for other DMC, California Aqueduct, or San Luis Reservoir supplies.

D) Water can also be recirculated through the DMC using one of its wasteways to deliver the flows to the San Joaquin River. The Bureau conducted such a recirculation pilot project in 2004 using DMC water released from the Newman Wasteway. The releases during that project had a significant impact on San Joaquin River quality. (See Attachment “H”). The 250 CFS recirculation release from the Newman Wasteway decreased the EC in the River from 1,200 to 900 (or 1.2 to 0.9 using the same parameters as the 0.7 standard) at the Patterson Measurement Station and from 700 to 600 (or 0.7 to 0.6) at the Vernalis Station. [The differing changes are due to the differing amounts of flow in the River at the two locations.] I also note that D-1641 specifically required the Bureau to investigate the use of such recirculation to assist in meeting water quality standards. I believe the Bureau has failed to meet the deadlines required by D-1641.

E) Transfers for EWA or other purposes can be coordinated such that the transfer water could be released during the April - August time frame. The transfer water would provide dilution but would not be lost as San Joaquin River and South Delta diversion needs do not change with flow fluctuations.

F) As the Board knows, CVP permits in addition to New Melones are burdened with the requirement of meeting the salinity objectives. Hence, releases from Friant, Shasta, Folsom, or San Luis could be used to supplement San Joaquin River flows. For example, the high flows this year from Friant re-charged (to some degree) the groundwater in the area at and above Gravelly Ford on the San Joaquin. The Bureau missed a perfect opportunity to test how much water would be lost from additional summer releases once that groundwater had been re-charged.

G) Temporary barrier operations result in net downstream flow back over the Middle River and Grant Line Canal barriers. Improved San Joaquin River water quality will also improve the Middle River and Grant Line quality. If this does not result in compliance at the Middle River and Old River Stations, other actions can be undertaken. The Middle River rock barrier can be improved to capture and retain more high tide water, and low lift pumps can be added at the barrier to increase the flow of high quality water up through Middle River and into Old River. This will maintain high quality water in Middle River, and the flow continuing into Old River will blend with the water flowing into the head of Old River. This will further reduce the salinity of the Old River water which is also reduced by the measures discussed above.

3) <u>Recovery of Dilution Flows.</u>

A) Any additional dilution flows added to the San Joaquin River are available for export as they pass through the South Delta. If the water cannot be currently pumped as additional exports, DWR and USBR could coordinate exchanges so that the water is pumped for such things as EWA purposes using the additional 500 CSF export authorization of the SWP or exchanged to replace or substitute for a transfer being accomplished under JPOD operations. Even if none of these authorizations were available, DWR and USBR could petition the Board for short term authorization to allow them to pump these additional dilution flows. One would assume the Board would look favorably upon such a request given that its underlying purpose is to meet existing Water Quality Objectives. Approval of such petition would be similar to D-1641's “no net loss” principle regarding fishery releases. In sum, all additional dilution flows would enter the South Delta and be available for export at the SWP and/or the CVP pumps. The losses should only be minimal. For example, the recirculation pilot program estimated the losses at less than 10%. I recall that carriage water losses for the DWR Dry Year Purchase Program were less than 5% in 2004.

It is important to note that the water deliveries of the CVP to its westside service area of the San Joaquin Valley, as assisted by the SWP, are the cause of the River’s salinity problems. As I understand it, other parties are asserting that the CVP and SWP should not be required to meet the standards if it adversely affects their deliveries or costs. It would be illogical and unfair to allow the continued delivery of the water which causes the salt problem, and yet not require that some of that delivered water be used to mitigate the salt problem.

III. Benefits Resulting From Compliance With The Salinity Objectives

I will now give an overview of the benefits from meeting the Water Quality Objectives which also addresses the question of whether a Cease and Desist Order should issue.

A) As the Board knows, the 0.7/1.0 EC standards were developed to protect agricultural beneficial uses. The voluminous studies, investigations, and testimony previously used by the Board in setting these standards was referenced in SDWA's presentation at the Periodic Review process workshops. Generally, EC's above 0.7 have an incremental adverse effect on crop production, which translates into a monetary damage to farmers.

B) To get a broad estimate of the damage that occurs as the EC of the water rises, I refer the Board to the previously submitted report of Dr. G. T. Orlob attached hereto as Attachment "I," and entitled "Impacts of San Joaquin River Quality On Crop Yields In The South Delta." Therein, Mr. Orlob calculated the crop damage in dollars between actual crop yields and the yields which would result if a standard of 500 TDS had been met. Using 1976 figures and dollars, the crop loss for the South Delta area was (15.70 - 8.64) $7.06 million. In 2005 dollars, it is approximately $24 million (using a CPI calculation at http://woodrow.mpls.frb.fed.us/research/data/us/calc/). This gives the Board a good idea of the scope of the crop damage if the EC downstream of Vernalis were allowed to exceed the current standard during the April through August time frame. The specific impacts on diverters is exemplified by the testimony of the other SDWA and CDWA witnesses.

C) We also know that virtually all of the San Joaquin River water ends up at the State and Federal pumps (see Testimony of Thomas Zuckerman, Exhibit No. CDWA-10). This is due to the fact that even with temporary barriers, the net flow is downstream over the Grant Line and Middle River barriers, and, that the water which continues down the mainstem of the River also mostly ends up at the pumps. Hence, the quality of export water is partially dependent on the quality of the San Joaquin River. Improving the River water quality in order to meet the standards will benefit export interests, especially municipal water users. Although I do not have the calculations, I understand that the Bureau has done investigations which determined the benefit to municipal water treatment plants resulting from improvements and source water quality.

D) The Board is also well aware of the dissolved oxygen (DO) problem in both the mainstem of the River, specifically in the Stockton Deep Water Ship Channel, and also generally throughout the South Delta. Two Basin Plan Objectives for DO apply to these waters. Additional good quality water added to the system for purpose of meeting the salinity standards will also help improve DO levels both because of the quality of the flows, and the additional flow/circulation they will provide.

E) The additional flows would also provide benefits to the various fisheries. We know that out-migrating salmon smolts are traveling through the system even after the spring pulse flow has ended. These fish would be helped by the higher flows. Other species, such as steelhead and smelt may also be benefitted by the higher flows. Use of the additional flows for dilution would provide an opportunity for the fishery agencies to examine the effects.

IV. <u>Effects On Farming Operations</u>

As I referenced above, I am a farmer on the San Joaquin River. I divert under both appropriative rights (see Attachment “J”) and under my riparian rights (my chain of title documents are being introduced by a CDWA witness as Exhibit No. CDWA-6). I have personally experienced the adverse impacts of the SWP and CVP, and other upstream projects. I have had reduced crop yields due to high salinity of the River water. I have been unable to divert from the River due to decreased upstream flows and the destruction of the high tide which previously extend to the portion of the River I abut. Requiring the DWR and USBR to meet the previously established Water Quality Objectives which are contained in their permits would not only protect me, but also numerous other beneficial users of water. Farmers further downstream have experienced more loss due to salinity because salinity rises above the Vernalis standard as water flows downstream as previously discussed.

Finally, for clarification, the draft Cease and Desist Order states the temporary barriers are installed to mitigate the adverse effects of the HOR fish barrier. This is misleading. Although the federal funding for the temporary barriers was previously linked in CVPIA to the funding for the HOR fish barrier as mitigation of that barrier, that does not accurately describe why the other three tidal barriers are installed. It is my understanding that DWR now shoulders all of the costs of the temporary barrier program, though there may be some arrangement whereby USBR will pay its share in some other way. The temporary tidal barriers are installed to partially mitigate the adverse effects on water levels, quality, and quantity resulting from the operations of the CVP and SWP. At this date, the SWRCB should not be trying to avoid describing the true state of affairs in the South Delta. There is no disagreement that the projects lower water levels, decrease flows, reverse channel flows, cause stagnant zones and worsen water quality. The temporary tidal barriers are one of the preliminary steps in correcting these problems.

V. Water Quality Response Plan

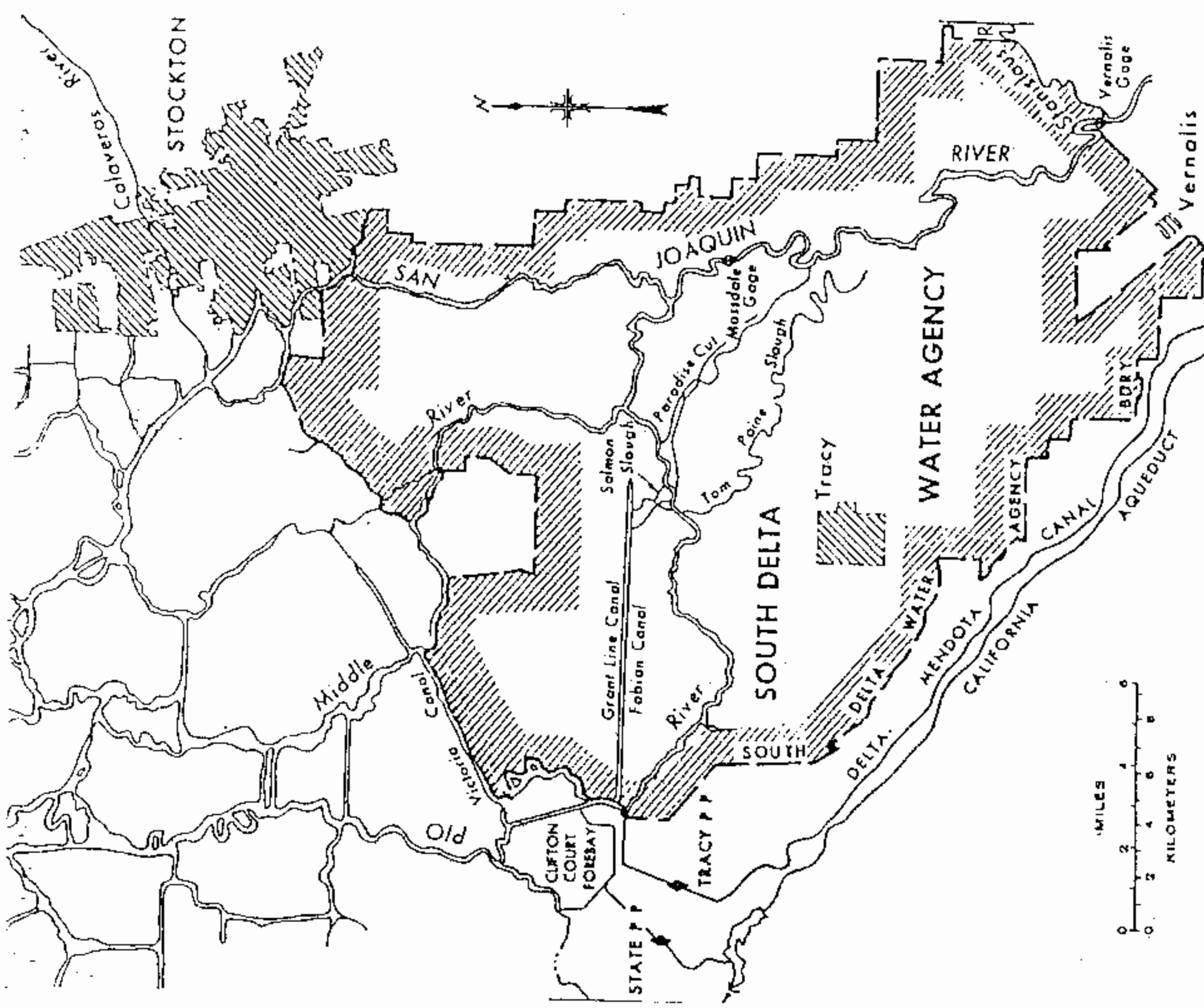
Finally, I will address this Board's reconsideration of the Chief of the Division of Water Rights approval of the current Water Quality Response Plan for Joint Point of Diversion. In approving the current Response Plan, the Division Chief waived compliance with the currently existing Water Quality Objectives for Agricultural Beneficial Uses at the Brandt Bridge, Old River near Middle River and Old River at Tracy Road (sic) Bridge. This would appear to be not only beyond the Division Chief's authority and contrary to D-1641, but also directly contrary to the purpose of the Water Quality Response Plan.

D-1641 requires as a condition to JPOD that the DWR and USBR "develop a response plan to ensure that the water quality in the southern and central Delta will not be significantly degraded through operations of the Joint Point of diversion to the injury of water users in the southern and central Delta" (see for example page 150-151 of D-1641). Approval of the plan was to come from the Division Chief.

The purpose of the plan is to ensure that the incremental affects on water quality resulting from JPOD do not injure other users. Inexplicably, the Division Chief decided that while she was protecting the Delta users from the incremental effects of JPOD on water quality, she would relax the existing Water Quality Objectives. In other words, she allowed a greater impact to water quality than she was protecting through the plan.

This bizarre decision by the Division Chief cannot stand and should be forthwith revoked. No further evidence is necessary to undo such an act which is not only beyond her authority but directly contrary to the explicit and implicit purposes of the Water Quality Response Plan. This Board will consider changes to the 1995 Water Quality Control Plan through the Periodic Review process and perhaps through the process resulting from DWR and USBR's Petition to delay implementation of their permit terms. The Response Plan process did not give any party notice that such a significant change was pending and so it would be unfair and wrong to allow it. Similarly, we belief a change in the standards would require new environmental evaluation.

SDWA requests that the Water Quality Response Plan not include the Division Chief's wrongful waiver of existing standards.



NOTE: Minor sloughs and oxbows are not shown on this Figure.

SOUTH DELTA WATER AGENCY

Attachment "A"

STATEMENT OF QUALIFICATIONS OF
ALEX HILDEBRAND

Agriculturally Related Qualifications

° Past Director and Secretary of South Delta Water Agency for 30 years

° President of Delta Water Users Association

° President of McMullin Reclamation District No. 2075

° President of San Joaquin River Water Users Company (non-profit water distributor within District #2075)

° Director of California Central Valley Flood Control Association

° President of San Joaquin River Flood Control Association

° Director (and member of Water Committee) of San Joaquin County Farm Bureau

° Member of California Farm Bureau Water Advisory Committee

° Owner (since 1944) and resident operator (since 1963) of 150-acre farm (in District #2075). Have made observations for several years of the depth of water percolation in two of my fields by use of Tensiometers, and have observed over many years the dramatic effect of variation in applied water salinity on the production and quality of produce from our family produce plot.

° Participated in development of South Delta Barrier Program

° Active participant in San Joaquin River Management Plan

° Expert witness in numerous hearings before the State Water Resources Control Board

° Member CalFed Bay/Delta Advisory Council

Professional Qualifications

° Honors Degree in Physics from U.C. Berkeley

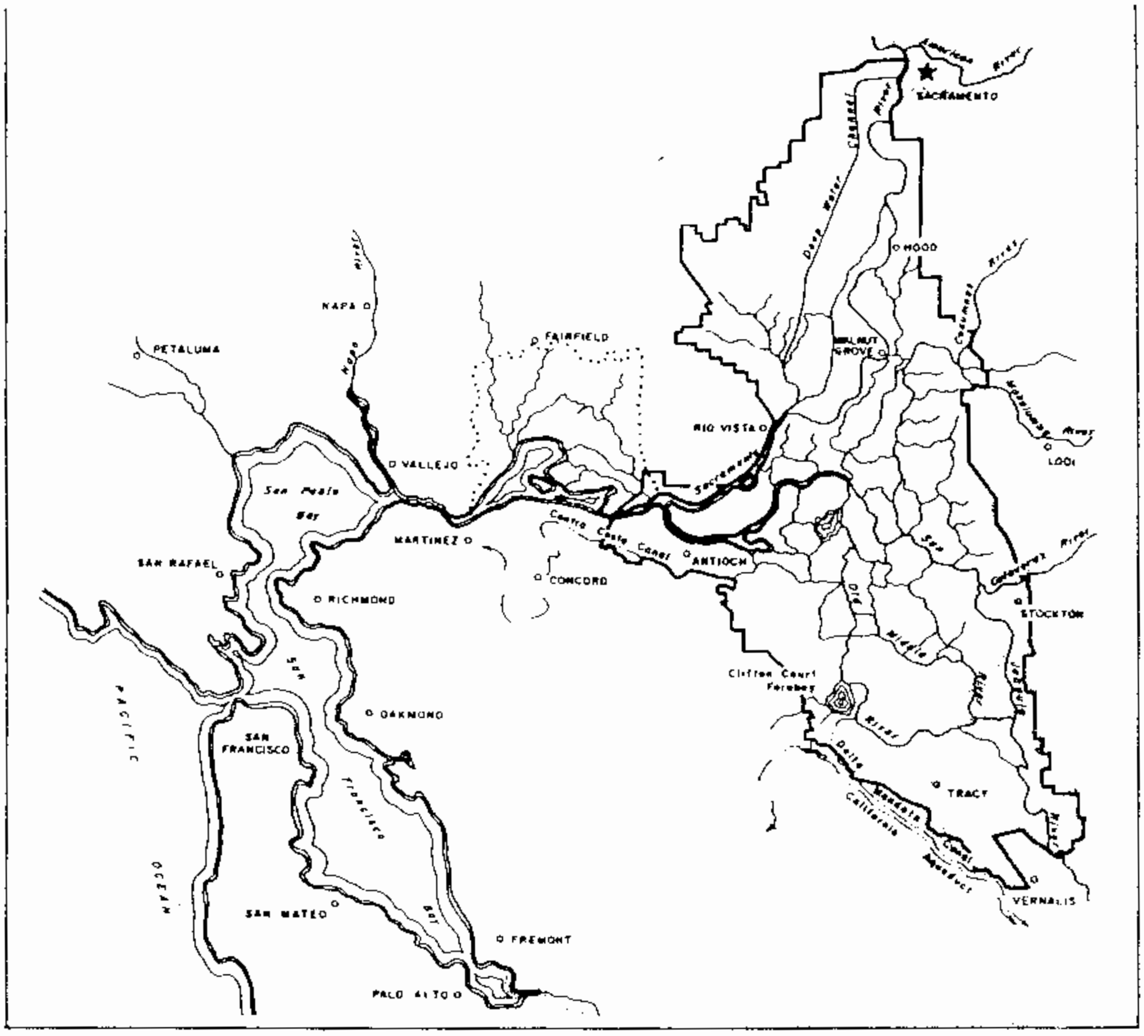
° Registered Professional Engineer

° Former Assistant Chief Engineer of Chevron's Richmond Refinery

° Retired Director of Chevron's Oil Field Research Laboratory. The research in that laboratory covered a broad spectrum of science and engineering, including substantial research on the flow of

Attachment "B"

fluids through permeable earth materials (both in laboratory and field tests) together with the movement of dissolved materials. This work required an understanding of the mechanisms of fluid flow, the physical chemistry involved, and the consequences of non-uniform permeability. Also responsible for analyzing and determining the applicability of these research results to commercial operations.



DRAFT

WATER QUALITY CONTROL PLAN

for the

San Francisco Bay/ Sacramento-San Joaquin Delta Estuary

MAY 1995

STATE WATER RESOURCES CONTROL BOARD

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Attachment "C"

4. **Southern Delta agricultural salinity objectives.** Elevated salinity in the southern Delta is caused by low flows, salts imported in irrigation water by the State and federal water projects, and discharges of land-derived salts, primarily from agricultural drainage. Implementation of the objectives will be accomplished through the release of adequate flows to the San Joaquin River and control of saline agricultural drainage to the San Joaquin River and its tributaries. Implementation of the agricultural salinity objectives for the two Old River sites shall be phased in so that compliance with the objectives is achieved by December 31, 1997.

REVISED
Water Right Decision 1641

In the Matter of:

Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary;

A Petition to Change Points of Diversion of the Central Valley Project and the State Water Project in the Southern Delta; and

A Petition to Change Places of Use and Purposes of Use of the Central Valley Project

Adopted December 29, 1999

Revised March 15, 2000
in accordance with Order WR 2000-02

STATE WATER RESOURCES CONTROL BOARD
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Attachment "D"

DWR, SDWA, Stockton, and the USDI presented evidence regarding the barriers. The main benefit of the barriers is improved water levels in the southern Delta. (SWRCB 87, p. S1.) The barriers also benefit water quality by improving circulation in the southern Delta. (R.T. p. 7525.) The barriers generally improve water quality in the southern Delta because salts otherwise trapped in the channels are transported out of the area due to the enhanced circulation. (DWR 37, pp. 12-13.) The barriers reduce the amount of salt imported by way of the Delta-Mendota Canal, which should result in some long-term improvement in the quality of the San Joaquin River. (R.T. p. 3905.) The improved quality of water delivered through the Delta-Mendota Canal should result in improvements to the salinity of drainage water that returns to the river. (R.T. p. 3731.)

The construction of permanent barriers alone is not expected to result in attainment of the water quality objectives. (R.T. pp. 3672, 3710, 3787-3788; DWR 37, p. 15; SWRCB 1e, pp. [IX 30]-[IX-41].) The objectives can be met consistently only by providing more dilution or by treatment. (R.T. p. 3737.) The modeling studies indicate that even when the barriers do not result in attainment of the standards, water quality generally improves as a result of the permanent barriers. The exception is at Brandt Bridge where water quality may worsen slightly at times due to barrier operation. (R.T. p. 3677; DWR 37, p. 18; SWRCB 1e, Figures [IX-19]-[IX-26].) Barriers may result in slightly worse water quality in the mainstem of the San Joaquin River in the Delta, but the more saline water is quickly diluted. (DWR 37.) Modeling shows that construction and operation of the temporary barriers should achieve water quality of 1.0 mmhos/cm at the interior stations under most hydrologic conditions.

The DWR and the USBR are partially responsible for salinity problems in the southern Delta because of hydrologic changes that are caused by export pumping. Therefore, this order amends the export permits of the DWR and of the USBR to require the projects to take actions that will achieve the benefits of the permanent barriers in the southern Delta to help meet the 1995 Bay-Delta Plan's interior Delta salinity objectives by April 1, 2005. Until then, the DWR and the USBR will be required to meet a salinity requirement of 1.0 mmhos/cm. If, after actions are taken to achieve the benefits of barriers, it is determined that it is not feasible to fully implement the objectives, the SWRCB will consider revising the interior Delta salinity objectives when it reviews the 1995 Bay-Delta Plan. The USBR and the DWR will be responsible to take any actions required by CEQA, NEPA, and the federal and State ESA prior to constructing the barriers.

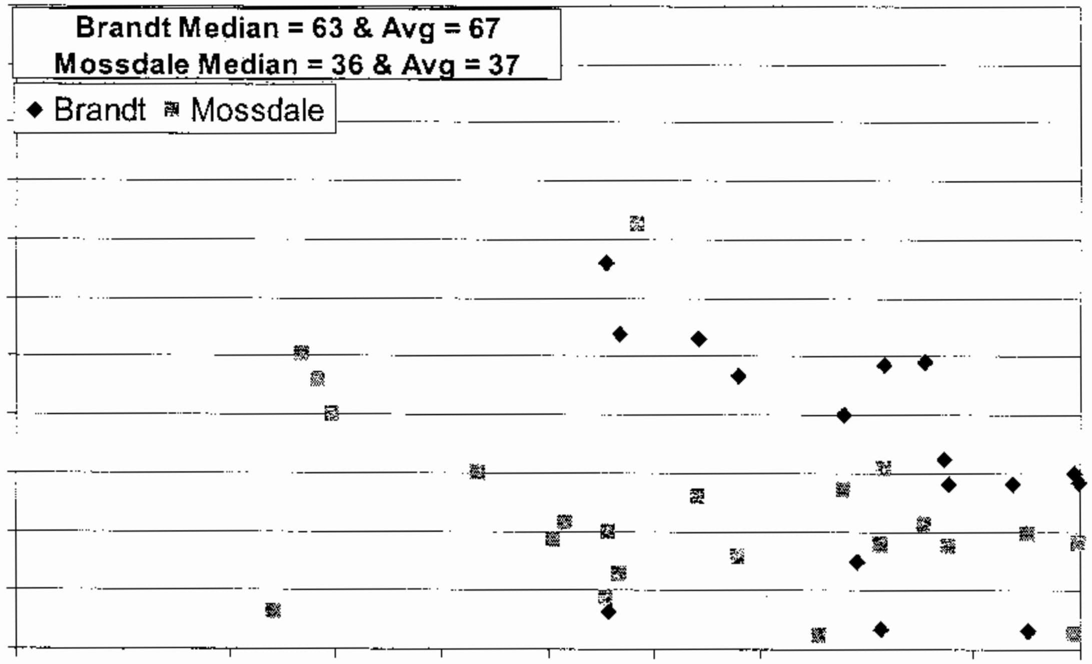
Public Law 108-361

Sec. 103 (d) (2)

(D) PROGRAM TO MEET STANDARDS.-- (i) IN GENERAL.--Prior to increasing export limits from the Delta for the purposes of conveying water to south-of-Delta Central Valley Project contractors or increasing deliveries through an intertie, the Secretary shall, not later than 1 year after the date of enactment of this Act, in consultation with the Governor, develop and initiate implementation of a program to meet all existing water quality standards and objectives for which the Central Valley Project has responsibility. (ii) MEASURES.--In developing and implementing the program, the Secretary shall include, to the max- imum extent feasible, the measures described in clauses (iii) through (vii). (iii) RECIRCULATION PROGRAM.--The Secretary shall incorporate into the program a recirculation pro- gram to provide flow, reduce salinity concentrations in the San Joaquin River, and reduce the reliance on the New Melones Reservoir for meeting water quality and fishery flow objectives through the use of excess capacity in export pumping and conveyance facilities.

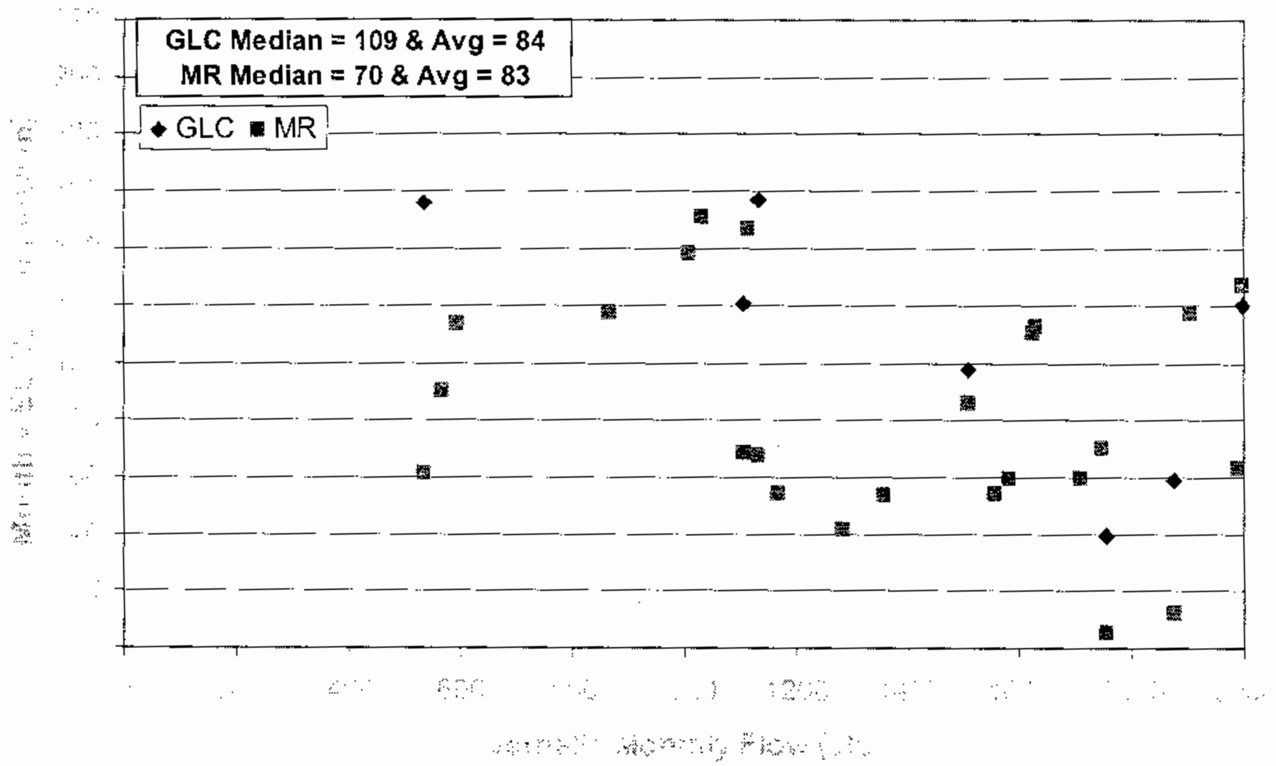
Attachment "E"

Monthly EC Diff (Brandt/Mossdale – Vernalis) When Vernalis Flow < 2000 cfs During 1987-1997 (June-August)

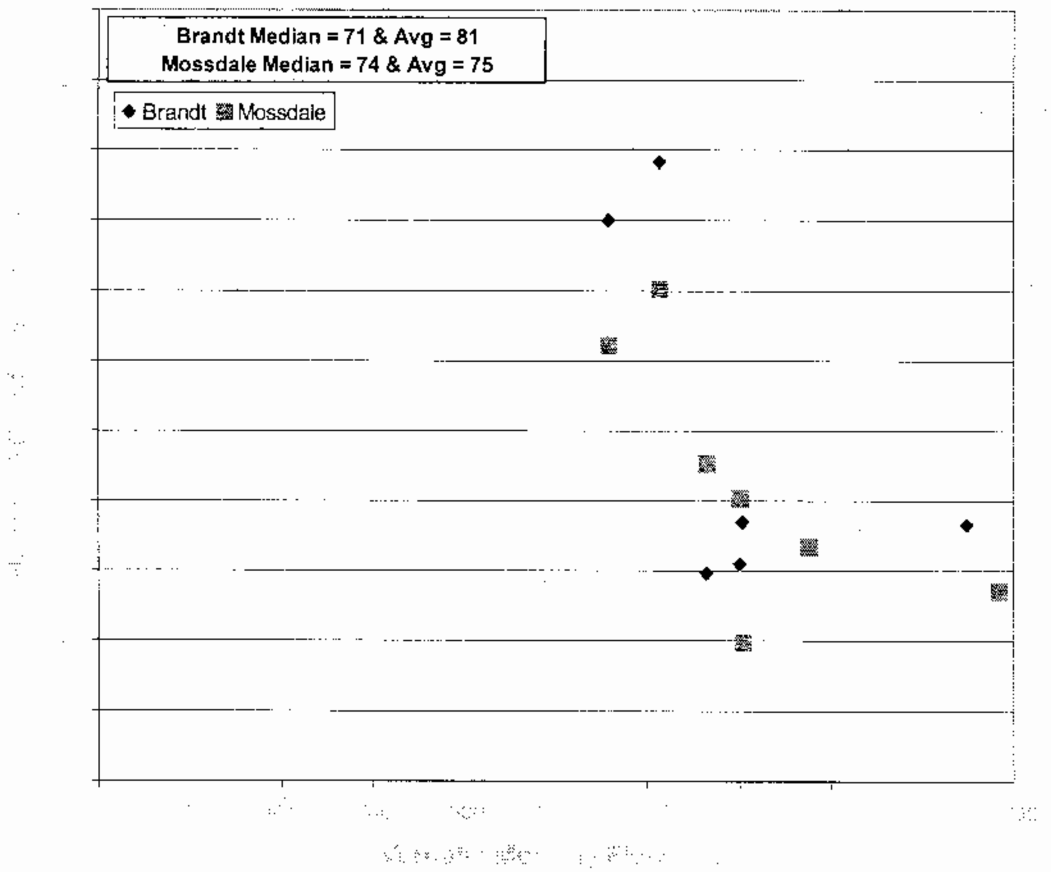


Attachment "F"

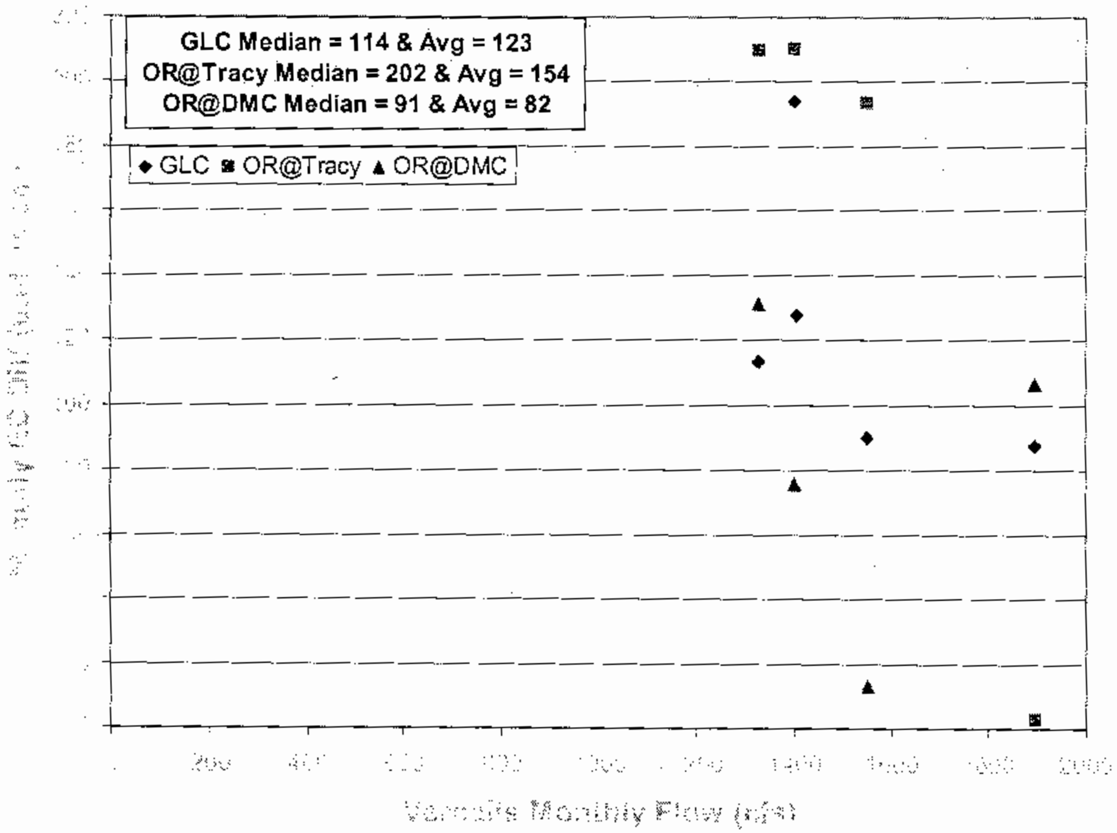
Monthly EC Diff (GLC/MR – Vernalis) When Vernalis Flow < 2000 cfs During 1987-1997 (June-August)



Monthly EC Diff (Brandt/Mossdale – Vernalis) When Vernalis Flow < 2000 cfs During 1999-2002 (June-August)



Monthly EC Diff (GLC/OR@Tracy/OR@DMC – Vernalis) When Vernalis Flow < 2000 cfs During 1999-2002 (June-August)



Subj: **Re: New Melones**
Date: 9/22/2005 8:24:50 A.M. Pacific Standard Time
From: EKITECK@mp.usbr.gov
To: Jherrlaw@aol.com

Hello John,

The final allocation for Vernalis water quality (in June) according to the IOP was 180,000 ac-ft. Thus far there have been no releases this year for salinity.

Elizabeth

>>> <Jherrlaw@aol.com> 9/21/2005 3:49:02 PM >>>
Dear Elizabeth:

Can you give me the current figures for amounts of water allocated for
water quality (salinity) and the amounts actually used this year from/in Mew
Melones? Thanks, JOHN

John Herrick, Esq.
4255 Pacific Avenue, Suite 2
Stockton, CA 95207
(209) 956-0150
(209) 956-0154 Fax

Attachment "G"

RECLAMATION
Managing Water in the West

Recirculation Pilot Study Final Report

Stanislaus County, California
Mid-Pacific Region

Recirculation Pilot Study Attachment "H"

Final Report

Stanislaus County, California
Mid-Pacific Region

prepared by

Division of Planning
Delta and Integrated Resource Planning Branch
Sharon McHale, AICP, Project Manager
Erika Kegel, P.E., Civil Engineer

Decision Analysis Branch
Gene Lee, Water Quality Specialist

Central Valley Operations Office
Water Operations Division
Paul Fujitani, Chief
Peggy Manza, P.E., Hydraulic Engineer

South-Central California Area Office
M. Chris Eacock, Natural Resource Specialist

As with TSS, it is unknown from the study if the turbidity level exiting the Wasteway would have decreased to the level of the upstream site given a longer period of time for the sediment to flush out. Methods should be considered that reduce sediment mobilization in the Wasteway, and therefore turbidity impacts to the River, if recirculation is going to be evaluated further.

Dissolved Oxygen

The CVRWQCB basin plan lists 5.0 mg/L as the most stringent objective for dissolved oxygen (DO). DO concentration of the DMC water entering the Wasteway hovered around 8 mg/L. Water exiting the Wasteway during the initial flush dropped below 5 mg/L, and then rose to a concentration around 7 mg/L. Levels in the lower River did not drop below the 5 mg/L water quality goal, but the addition of the recirculated water from the Wasteway decreased the average DO concentration in the River from 8.3 mg/L at the upstream site to 7.7 mg/L at the downstream site.

Water Quality Monitoring Summary

Analysis of the data shows that implementation of the recirculation pilot study impacted the River water quality for the following parameters: aluminum, metolachlor, TKN, total phosphorus, ammonia as nitrogen, TOC, TSS, DO, and turbidity. In assessing the data for the above parameters, a declining trend in concentration over the course of the pilot study was noted with the exception of aluminum, TSS, and turbidity. The initial elevated levels shown for these chemical constituents were the result of the first flush effect caused by the mobilization of accumulated agricultural drainage, channel bottom sediments, and vegetation in the Newman Wasteway.

For the three parameters that were elevated due to the discharge of CVP water, none exceeded the most stringent water quality standards. TSS and turbidity effects attributable to recirculation were expected and could be reduced through design and structural improvements and/or operation of the Wasteway. The elevated aluminum levels may be the result of analytical matrix problems and will be investigated further.

Flow and Salinity Data

In addition to the data collected by the study team in the vicinity of the Newman Wasteway, flow and salinity data from existing gauges along the River were also downloaded from the CDEC website. This data was analyzed to quantify the impact of the study on the River at the Wasteway, as well as determine if the impacts were measurable at downstream monitoring stations.

Analysis of flow data

The flow data plotted in Figure 11 shows an abrupt increase in flow in the River at Newman (NEW) about 12 hours into the study, and about 24 hours at the Patterson (SJP) gauge. Both stations show an abrupt spike in flow which peaked at a little over 600 cfs at both stations (located about 14 miles apart). The 250 cfs flow introduced from the Wasteway was diminished in amplitude to about 200 cfs when the pulse reached the Newman gauging station then increased to the full 250 cfs about 48 hours into the study. The pulse was only 150 cfs when it reached the Patterson gauging station about 12 hours later, then increased to 200 cfs about 72 hours into the study. Since the Fremont Ford and Mud Slough gauges showed stable flows for the first week of the pilot study, the increased flow in the River can be attributed to the discharge from the Newman Wasteway.

Mud Slough (MSG) and San Joaquin River at Fremont Ford (FFB) are the main sources of water upstream of the Wasteway. Fremont Ford diminished from 150 cfs to about 100 cfs after the first week (160 hours) of the pilot study. Newman flows were reduced from 600 cfs to 500 cfs at about the same time – the Patterson gauge showed flow diminishing by the same amount, although starting at about day 4 (100 hours) after onset of the pilot study. The greater flow decrease at Patterson as compared to flow at Fremont Ford can be attributed to the decreased tributary inflow from the Merced River (see Figure 12). The Merced River diminished from 100 cfs to about 50 cfs after the first week (144 hours) of the pilot study.

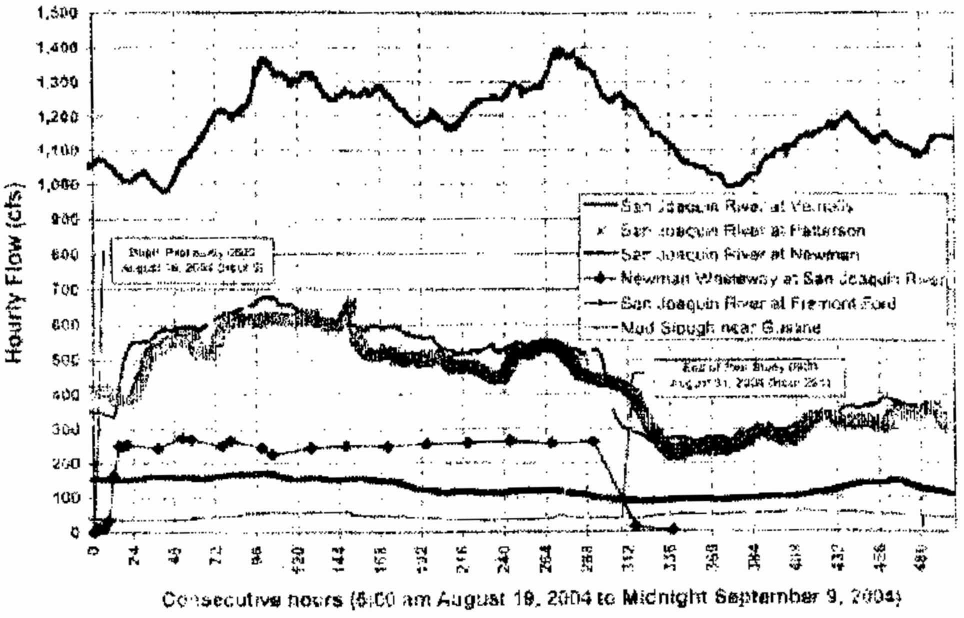


Figure 11. Analysis of San Joaquin River and main tributary flow data.

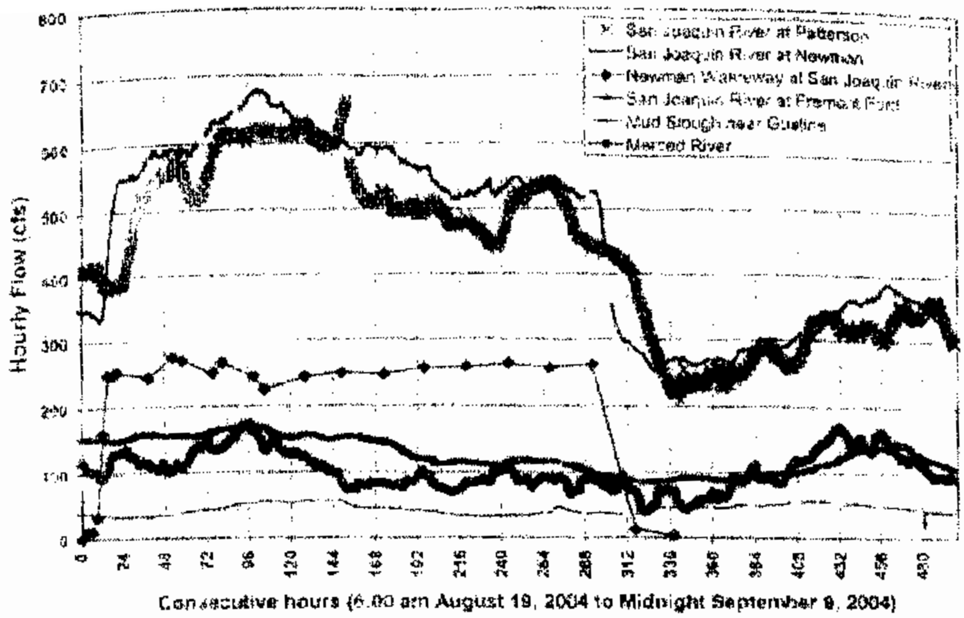


Figure 12. San Joaquin River tributary flow data.

Because there are no major tributaries between the Newman and Patterson gauges, the flow records should be very similar. However, the Patterson gauge data does not document as high of an initial increase from recirculation flow as that recorded at the Newman gauge. That muted response coincided with an increase in diversion by West Stanislaus Irrigation District commencing 20 hours into the pilot study. In contrast, diversion by the Patterson Irrigation District remained quite static at about 125 cfs throughout the pilot study (see Figure 13). Other variations in the Patterson gauge data can be attributed to ungauged surface drain inflows, seepage losses, and late season riparian diversions along the reach between the Newman and Patterson gauges. Because the recirculation pilot study was not designed to monitor all inflows to and diversions from the River, quantification of these flows was not possible.

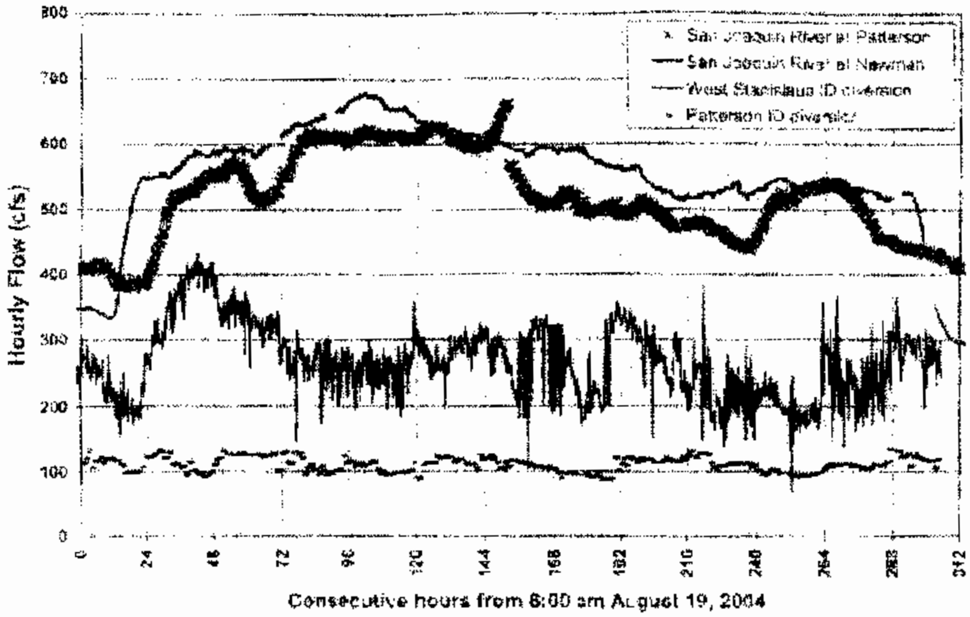


Figure 13. Effect of riparian diversion at Patterson ID and West Stanislaus ID on flow at San Joaquin River at Patterson.

Analysis of electrical conductivity data

D-1641 established a San Joaquin River agricultural salinity objective of 1000 μS/cm between April and August and 700 μS/cm between September and March to be met at Vernalis. Evaluation of the impact of recirculation on salinity, as measured by electrical conductivity (EC), was an objective of the pilot study.

In Figure 14 the displacement of salt in the Wasteway begins about 17:30, eleven and a half hours after the initial release of water into the Wasteway, and continues until about 7:00 the next morning after which time the Wasteway EC takes the characteristic signal of the diverted DMC water.

Interpretation of the EC data is more complex than the flow data on the San Joaquin River. Upon initial observation, the data does not exhibit the inverse relationship between flow and salt concentration expected at the San Joaquin River stations. In the case of the Patterson monitoring site, about 36 hours into the study the EC dropped from approximately 1200 μS/cm to less than 900 μS/cm until the seventh day of the pilot study after which the EC steadily climbed (see Figure 15). The EC increase can be attributed to upstream salinity changes. As shown in Figure 15, the EC concentration upstream of the Wasteway at Fremont Ford was stable near 1150 μS/cm for the first three days of the pilot study, then increased to 1600 μS/cm between day 6 and end of the study (after 290 hours). This 50% EC increase correlated with an approximate 50% reduction in flow during the same period, thus the salt load remained about the same.

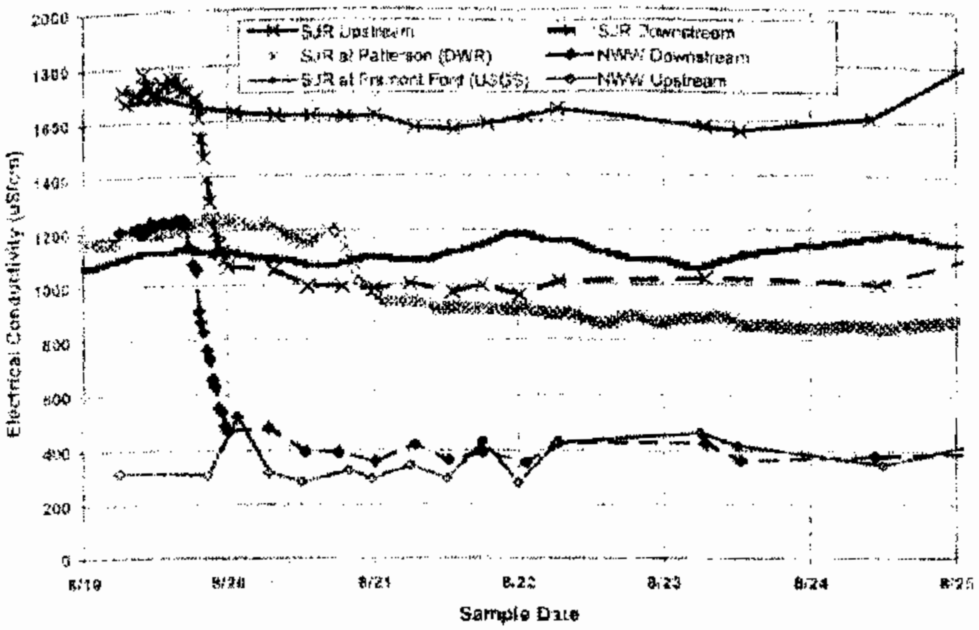


Figure 14. Effect of Recirculation on EC after 6 days (144 hours) at various main stem river sites as well as upstream and downstream sites along the Newman Wasteway

The Vernalis EC data showed a lagged response to the recirculated flow. The reduction in EC from about 700 μS/cm to 600 μS/cm occurred approximately 48 hours after the flow pulse was first evident at the Patterson gauging station. Similar to the trend at Patterson, after the initial drop around hour 72 the EC at Vernalis slowly increased during the 291 hour study period and was about 650 μS/cm at the end of the pilot study.

Initially it was thought that the drop in EC at Vernalis was not as great as might be expected given the reduction at Patterson. After analyzing the EC response with respect to the relative flow contribution from recirculation, the observed drop in Vernalis EC was found to be consistent. The flow at Patterson was only 400 cfs prior to arrival of the 200 cfs recirculation pulse, which provided a 50% increase in flow. The recirculated flow only increased the flow at Vernalis by 20%, from 1000 to 1200 cfs. From such a small increase in the flow at Vernalis one would expect the observed modest reduction in EC.

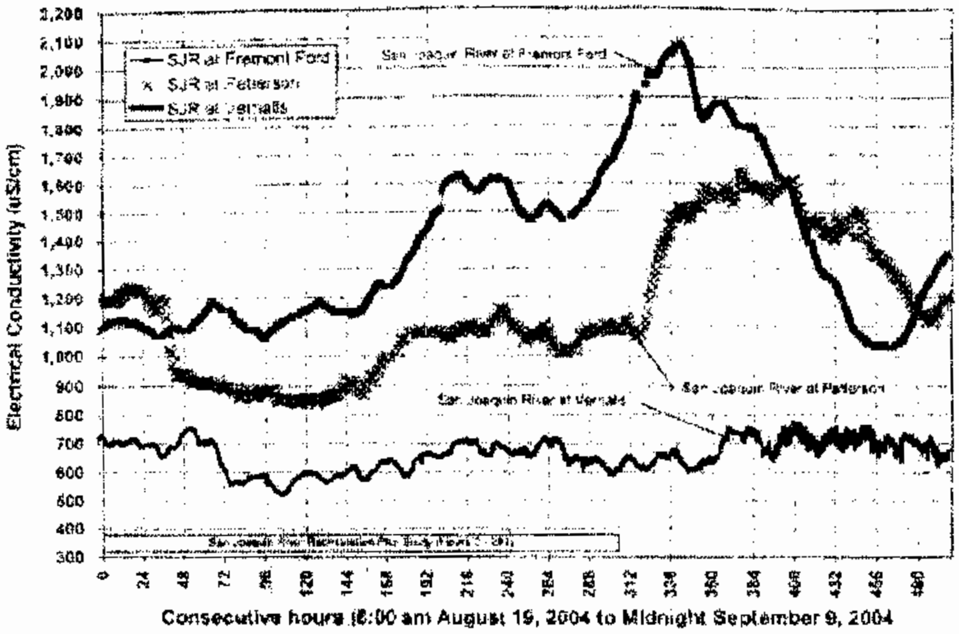


Figure 15. Effect of recirculation on EC after 21 days at various main stem San Joaquin River sites.

Figure 10 shows steady flows in Mud Slough and in the River passing Fremont Ford during the pilot study. These sites represent upstream or baseline conditions in the River and Grasslands Basin. Figure 14 shows an abrupt rise in salinity at Fremont Ford during the study that may have been caused by flushing out the refuges in preparation for the new season. The rise in salinity was diminished by the pilot study flow (reduced 500 uS/cm @ hour 240). This data shows a clear benefit of recirculation.

Findings and Conclusions

Water Quality Assessment

The pilot study showed clearly that recirculated flow through the Newman Wasteway was effective in increasing flow and reducing the EC concentration at Vernalis. The pilot study also demonstrated agency coordination at its best; data collection was well coordinated and a complete water quality characterization of the first flush flow from the Wasteway was obtained. The analysis does suggest, however, that real-time water quality monitoring and management will be essential if recirculation is to realize savings in New Melones water quality releases. A short-term increase in riparian diversion by the West Stanislaus Irrigation District resulted in a much lower response at Vernalis than was expected during the first two days of the pilot study. It was later determined that West Stanislaus Irrigation District had increased diversions for two days and then cutback again to the conditions that existed when the pilot study was initiated. A decision to increase recirculation flows in response to the less than expected Vernalis EC would have resulted in excess dilution and water wastage as West Stanislaus Irrigation District reduced its river diversion. Therefore, real-time flow and EC monitoring data from mainstem River stations, including the major Westside tributaries and the diversions, will be essential for full implementation of any future recirculation program.

Water Supply Assessment

There were no water supply impacts to CVP contractors as a result of the pilot study. It was difficult to accurately measure the losses due to insufficient data and controls during the recirculation operation. There are several irrigation districts which have tailwater flow into the San Joaquin River which are in the process of being calibrated, and monitoring data was not available during the pilot study. In addition, data on the quantities of water diverted from the San Joaquin River by the water districts is limited beyond the data available for West Stanislaus Irrigation District and Patterson Irrigation District. Without a higher level of detail, it is difficult to determine exactly how much of the water released through the Newman Wasteway was lost to the system between the release point and Vernalis. Therefore, monitoring of recirculation water will be an essential component of any future study when, and if, another test of recirculation is performed or a full-scale recirculation program is implemented.

IMPACT OF SAN JOAQUIN RIVER QUALITY
ON CROP YIELDS IN THE SOUTH DELTA

G. T. Orlob

INTRODUCTION

The agricultural productivity of lands within the South Delta Water Agency is dependent upon both the quantity of water that enters the Delta at Vernalis and its quality. It is also determined in part by the nature of soils, i.e. their permeabilities and leaching requirements to avoid excessive accumulation of salinity during the growing season. In general, fine textured soils such as those that comprise the major part of South Delta lands have lower permeabilities, and thus require higher quality of applied water to assure optimal crop growth without loss of yield.

To demonstrate the nature and dependence of agricultural productivity in the South Delta on San Joaquin River quality, it is necessary to consider the following factors:

1. Soil characteristics, i.e. permeabilities and field leaching fractions, and variability of these over the lands of the South Delta,

2. Crop yields in relation to water quality, soil characteristics, and crop type,

3. Quality of water available in South Delta channels during the growing season, and

4. Cropping pattern and crop value for the South Delta.

Attachment "I"

Combining these factors in a quantitative framework results in estimates of the sensitivity of the South Delta area to water quality at Vernalis.

SOIL CHARACTERISTICS

Soils of the South Delta, identified in the most recent soil survey of the area, have been organized into five groups according to field permeabilities. These are depicted on the general soil map for the South Delta area (SDWA Exhibit 106), and for a smaller representative area in the vicinity of Old River between the San Joaquin River and Salmon Slough (SDWA Exhibit 107). Characteristics of these soil groups, which are considered indicative of *between-field* variability in the South Delta, are given in Table 1.

Table 1. Soil Groups in the South Delta

Group	Map Color Code	Percent of area	Permeability description in/hr
A	brown	40	slow < 0.2
B	blue	34	mod. slow 0.2 - 0.6
C	yellow	17	moderate 0.6 - 2
D	green	6	mod. rapid 2 - 6
E	red	3	rapid > 6

Leaching characteristics of South Delta soils were derived from the 1976 South Delta Salinity Status Study (SDWA Exhibit 104), using observed EC_es and applied water EC_ws for 51 sites at 10 different locations. Leaching fractions (LF) were calculated for both spring and fall EC_e profiles at all sites (102 determinations) according to the relation

$$LF = \frac{EC_w}{2(EC_e)_d} \qquad (1)$$

where

EC_w = electrical conductivity of applied water, mmhos/cm (dS/m)

$(EC_e)_d$ = electrical conductivity of soil solution extract at drainage horizon (assumed to be the maximum in the EC_e profiles) mmhos/cm (dS/m)

Mean leaching fractions ($\overline{LF}$) and standard deviations from the mean (σ) were determined for each location (up to 15 observations in some cases). It was found that σ ranged widely, from about 25 to 65 percent of $\overline{LF}$. An average of about one-third, i.e. $\sigma = \overline{LF}/3$, was adopted as representative of *in-field* variation in leaching during the growing season.

Soil permeabilities and leaching fractions were related to one another by identifying specific locations (Salinity Study, SDWA Exhibit 104) with permeability groups (Soil Permeability Map, SDWA Exhibit 106). Calculated LFs were plotted against permeabilities as shown in Figure 1. While some scatter is apparent, owing largely to in-field variation, there appears to be a fairly consistent relationship between permeability and leaching fraction.

In subsequent calculations, values of $\overline{LF}$ and standard deviations of the distributions shown in Figure 1 are identified with the various soils as they are actually classified for the South Delta (SDWA Exhibit 106). These values for the moderate to slow permeability soils are:

Group	$\overline{LF}$	σ
A	0.053	0.0177
B	0.093	0.0310
C	0.188	0.0627

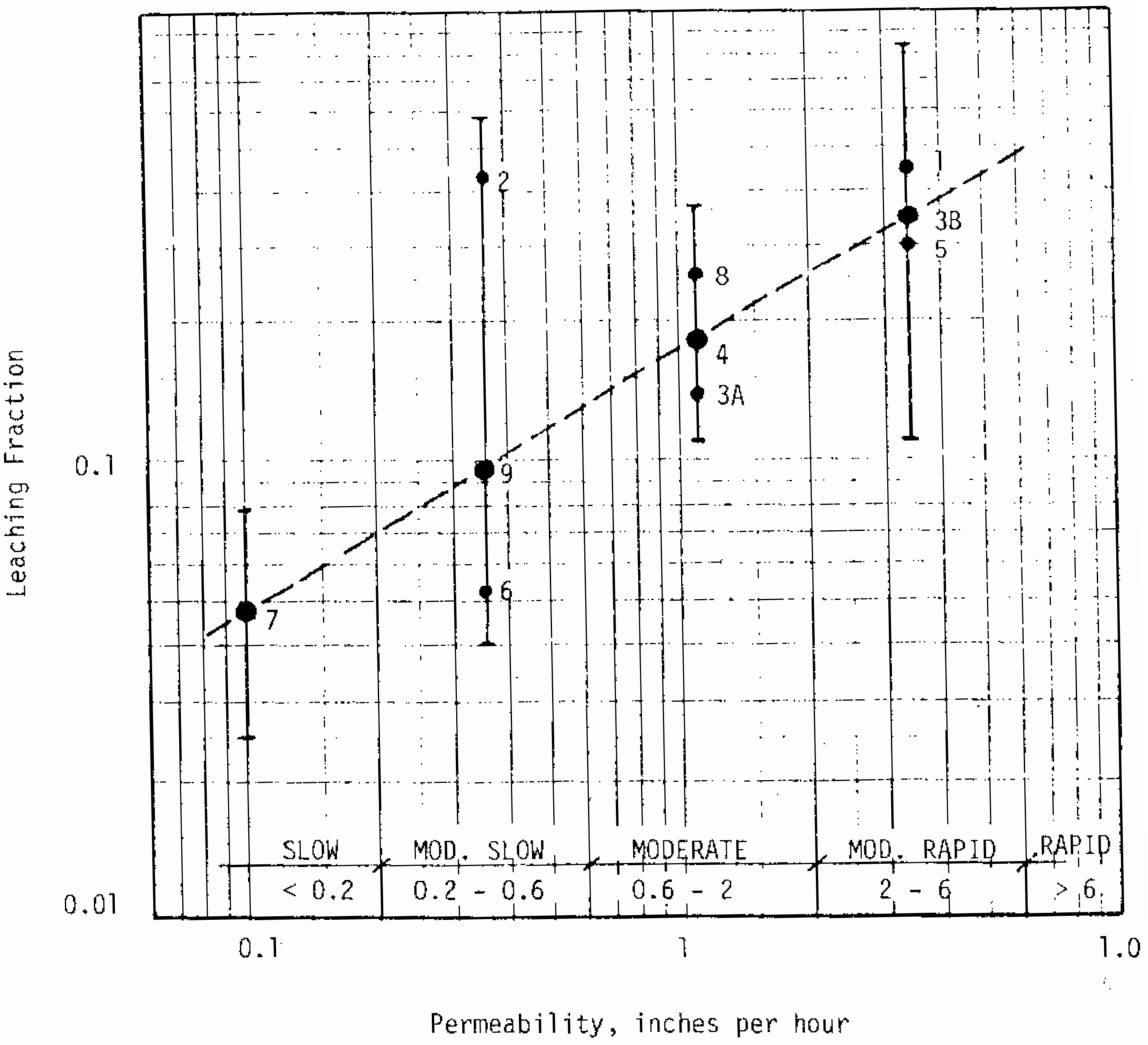


Figure 1. RELATIONSHIP BETWEEN LEACHING FRACTION AND FIELD PERMEABILITY, SOUTH DELTA SOILS

CROP YIELD VS WATER QUALITY

The relationship between yield decrement, leaching fraction, and applied water quality is given by

$$\Delta Y = S(EC_w \{ \frac{1 + LF}{5LF} \} - B) \qquad (2)$$

where

ΔY = yield decrement, percent

S = unit decrement, percent/mmho/cm

B = threshold EC_e, mmhos/cm

and other terms are as previously defined. Values of S and B for various crops are found in FAO Irrigation and Drainage Paper 29 as revised (SDWA Exhibit 105) and were supplemented by the Water Quality Advisory Panel for the South Delta Salinity Status Study (SDWA Exhibit 103).

The yield decrement for a field with variable LF is determined by combining equation (2) with the probability density function for LF and integrating from 0 to LF_c, a fraction above which no decrement in yield occurs.

$$\Delta Y = \int_{0}^{LF_c} S \left[EC_w \{\frac{1 + LF}{5\ LF}\} - B \right] \frac{\exp}{\sigma\sqrt{2\Pi}} \left(- \frac{1}{2} \frac{(LF-\overline{LF})^2}{\sigma^2} \right) dLF \qquad (3)$$

where all terms are as previously defined.

A yield decrement--quality relationship for a particular soil, e.g. Group A, is obtained by carrying out the integration of equation (3) over the range of EC_w that is of interest. In the case of the South Delta, this was 0.7 to 1.3 mmhos/cm, corresponding to a range of TDS of roughly 450 to 825 mg/L. The properties of the soil are given by $\overline{LF}$ and σ and the susceptibility of the crop by S and B. Representative yield decrement--quality relationships used in this study are summarized for the six most sensitive crops and the three soil groups in Table 2.

Table 2. Yield Decrement at Function of Water Quality, Soil Type, and Crop

EC_w,dS/m	Yield Decrement, Δy, percent					
	Beans	Corn	Alfalfa	Tomatoes	Fruit & Nuts	Grapes
			Soil Group A, $\overline{LF}$ = 0.053, σ = 0.0177			
0.4	19	4	-	-	10	3
0.7	42	18	9	8	34	16
1.0	68	34	19	21	61	29
			Soil Group B, $\overline{LF}$ = 0.093, σ = 0.0310			
0.4	6	-	-	-	2	-
0.7	18	4	2	2	10	4
1.0	33	12	6	4	24	12
			Soil Group C, $\overline{LF}$ = 0.188, σ = 0.0627			
0.4	-	-	-	-	-	-
0.7	3	1	-	-	2	-
1.0	9	2	1	1	4	2

REVENUE LOSS DUE TO QUALITY DEGRADATION

The dollar value of potential crop losses for a given water quality and soil is estimated from the known acreage of specific crops, the market value per acre, and the decrement calculated by equation (3), and is given by

$$C_T = \frac{1}{100} \sum_{i=1}^{n} \sum_{j=1}^{m} A_{ij} \, c_{ij} \Delta Y_{ij} \tag{4}$$

where

C_T = total potential loss, $

A = area, acres

c = value of crop, $/acre

ΔY = yield decrement, percent

i = crop, 1 to n

j = soil group, 1 to m

A representative cropping pattern for the South Delta Water Agency, i.e. values of A_{ij}, is derived from a survey of the San Joaquin County Agricultural Department for the period 1971-1975. Typical unit values of crops, i.e. values of C_{ij}, were derived from the 1980 San Joaquin Agricultural Report. These data are summarized in Table 3.

Table 3. Cropping Pattern for the South Delta Water Agency

Crop	Percent of total area	Area acres	Crop Value $/acre[1]
Beans	8	9,840	656
Corn	9	11,070	563
Alfalfa	26	31,980	732
Tomatoes	14	17,220	2110
Fruit and Nuts	5	6,150	2154[2]
Grapes	0.8	1,000	1358
Grains	16	19,680	426
Asparagus	7	8,610	1434
Sugar beets	10	12,300	1235
Other	4.2	5,150	-
Total	100	123,000	

Source: San Joaquin County Agricultural Department survey data within the SDWA for the 1971-75 period

[1]1980 values

[2]average of peaches and walnuts

CASE STUDY EXAMPLE

To illustrate the application of the procedure for estimation of potential crop losses due to water quality degradation, two scenarios are considered.

1. Actual conditions of water quality prevailing in the South Delta during 1976, and

2. 1976 conditions modified by the assumption of New Melones Project operation to maintain 500 mg/L TDS at Vernalis.

The procedure entails the following steps:

a. Simulation of hydrodynamics and water quality for the South Delta for the agricultural season, using the mathematical models of the estuarial system (SDWA Exhibit 82),

b. Estimation of the average quality of water supplied to each of 10 subareas of the South Delta, as identified in Figure 2,

c. Calculation of the yield decrement ΔY expected for each soil type (3), crop (6), and subarea(10) by application of Equation 3.

d. Summation of incremental costs due to loss of yield, by application of Equation 4,

e. Comparison of cost differences attributed to water quality control by New Melones.

Results of water quality simulations are presented in Figures 3 and 4. Conditions shown are for mid-July, considered to be representative of the quality of water available at the peak of the irrigation season. From the results of the two simulations, the average quality of water available to the 10 subareas may be estimated as that of the most accessible channel serving the area. These are summarized in Table 4.

Yield decrements were estimated from the relationships summarized in Table 2. These were then weighted by subarea and soil group in relation to the entire SDWA area, and summed to obtain the aggregate decrement for each crop type. These were then applied to the total value of the crop to obtain the decrement in revenue. Table 5 summarizes the calculations.

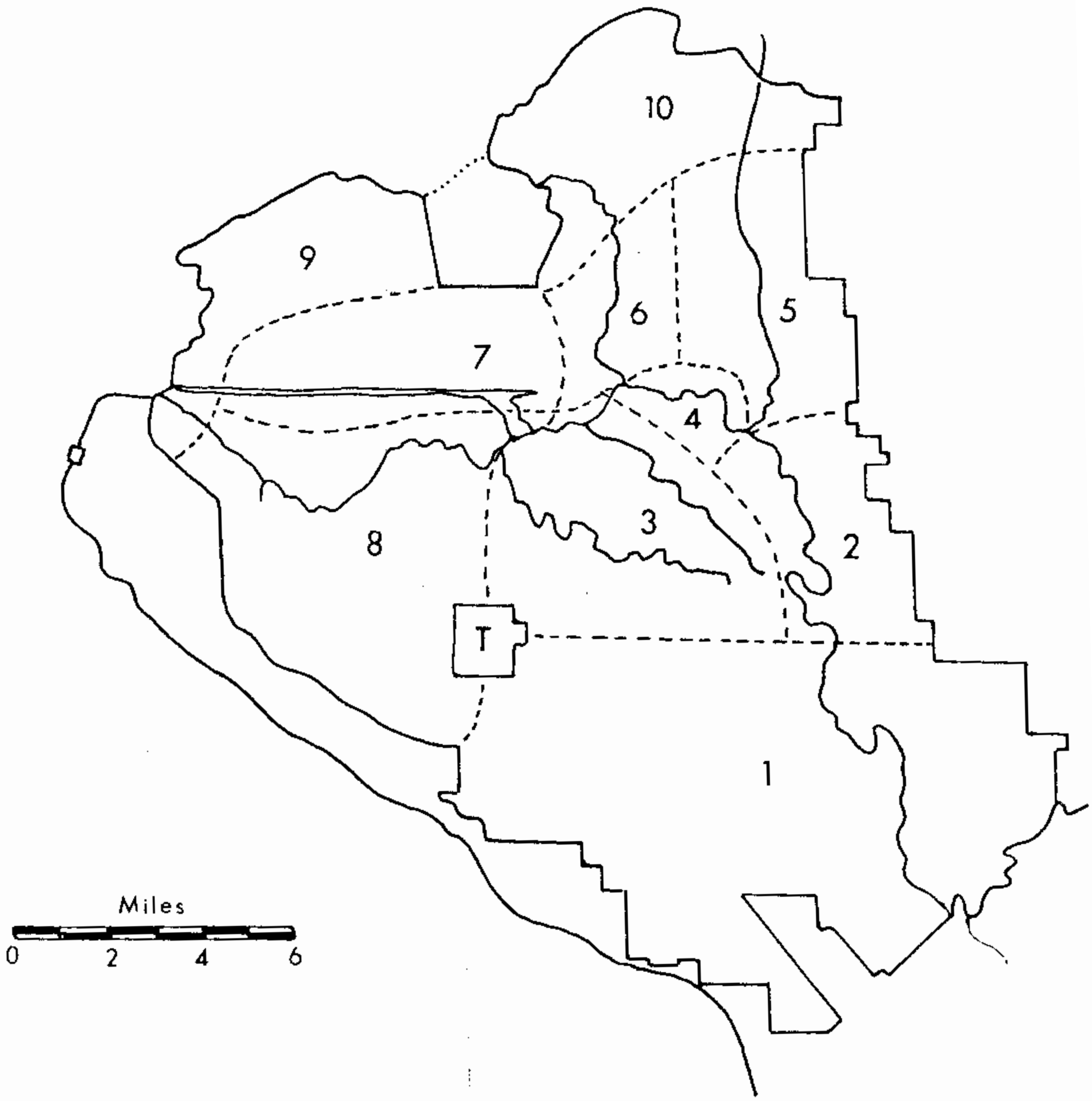


Figure 2. AGRICULTURAL SUBAREAS, SOUTH DELTA WATER AGENCY

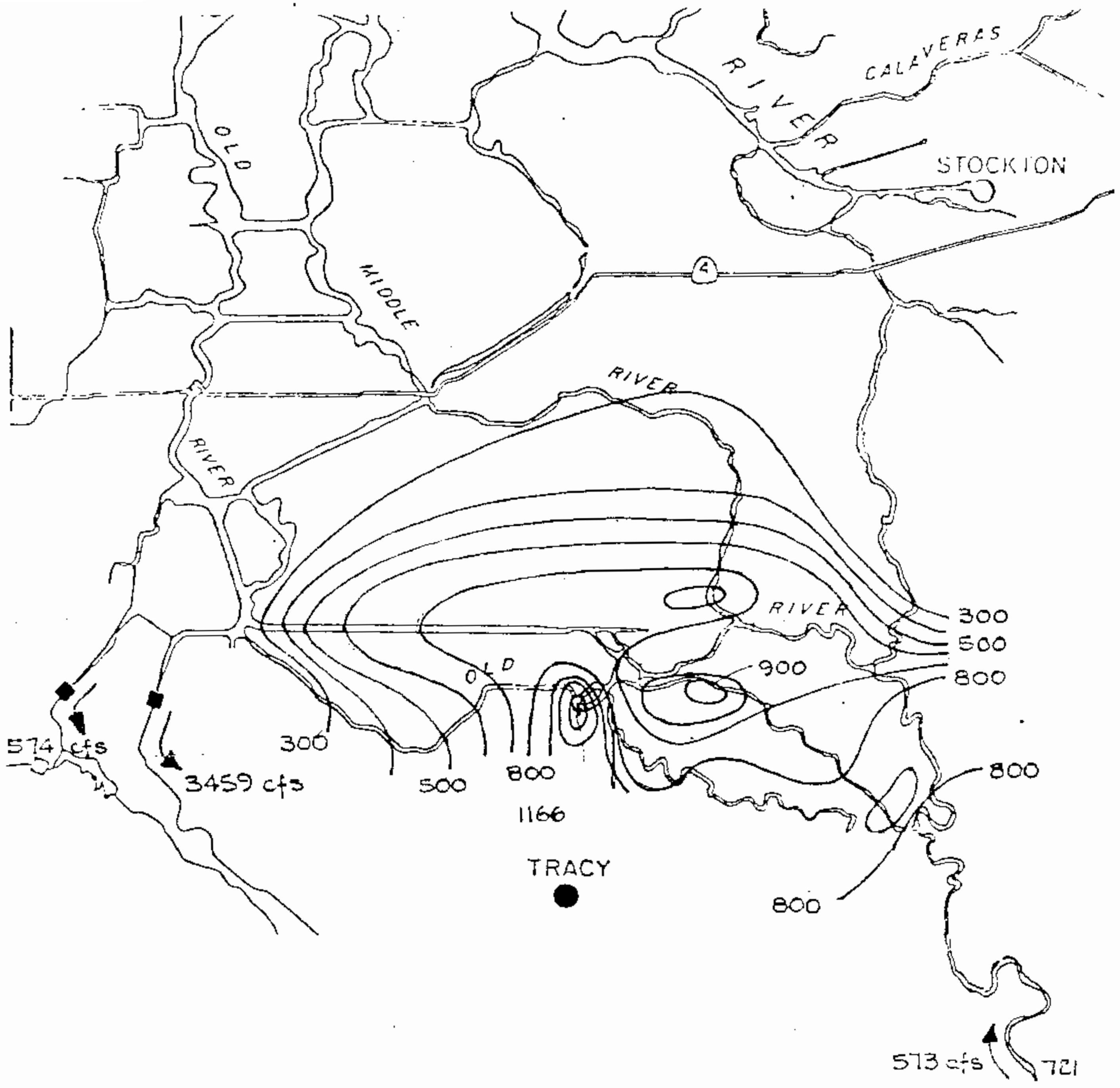


Figure 3. SIMULATED WATER QUALITY IN SOUTH DELTA CHANNELS, MID-JULY 1976, ACTUAL HYDROLOGY
(Contours are of equal TDS, mg/L)

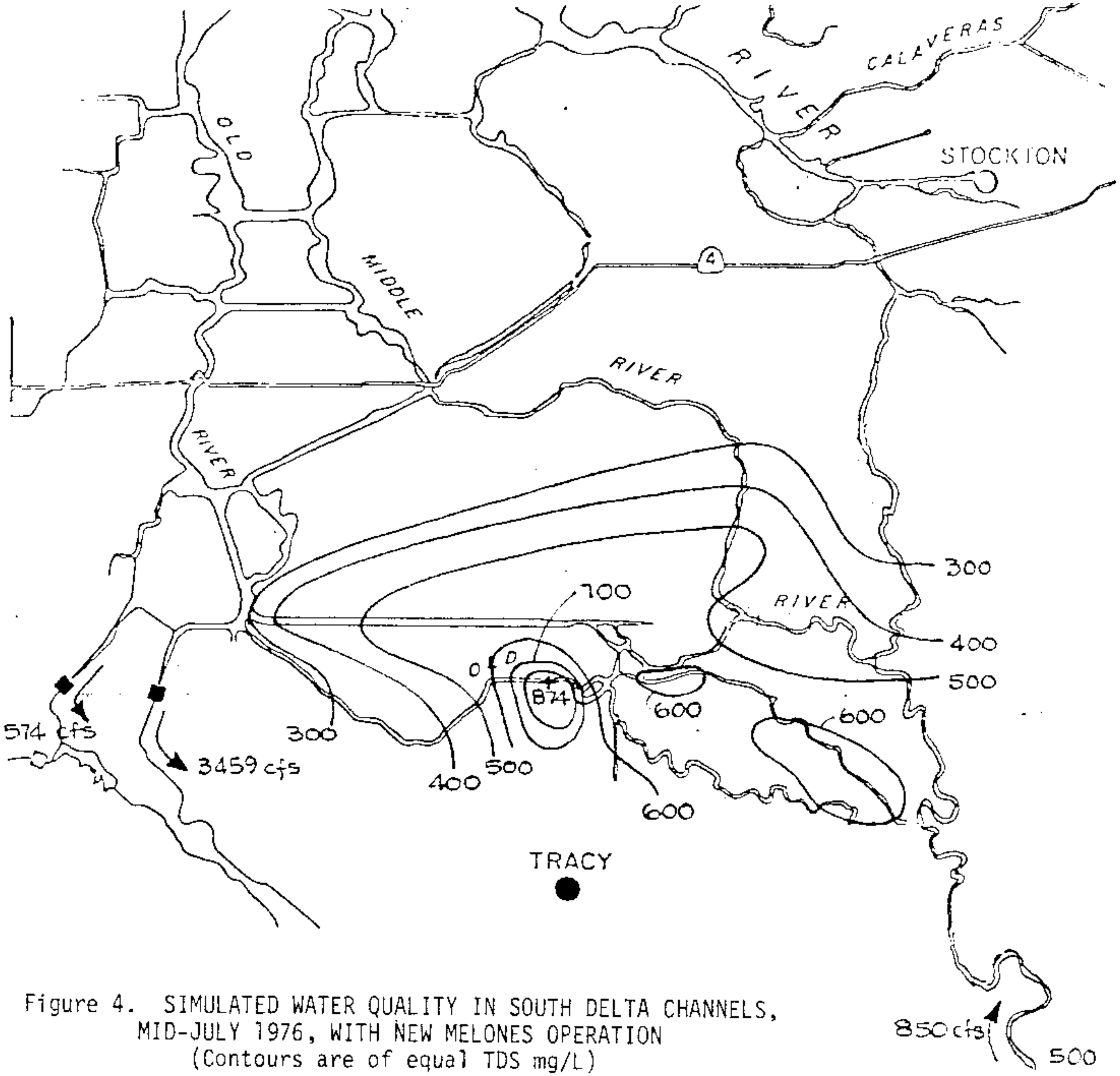


Figure 4. SIMULATED WATER QUALITY IN SOUTH DELTA CHANNELS, MID-JULY 1976, WITH NEW MELONES OPERATION
(Contours are of equal TDS mg/L)

Table 4. Comparison of Crop Loss for 1976 Conditions in South Delta With and Without New Melones Water Quality, Mid-July (Day 195)

Subarea	1976		1976 w/N.M.	
	TDS	EC*	TDS	EC*
1	753	1.19	496	0.77
2	812	1.28	492	0.76
3	777	1.22	559	0.87
4	675	1.06	487	0.77
5	244	0.36	264	0.40
6	684	1.07	486	0.75
7	710	1.12	521	0.81
8	673	1.06	575	0.90
9	227	0.34	226	0.34
10	297	0.45	282	0.43

* EC = (TDS - 18)/620, mmhos/cm

DISCUSSION

Results of this case study illustrate the potential impacts of water quality degradation on the agricultural productivity of lands within the South Delta Water Agency. These impacts are likely to be most severe in areas served by channels in which circulation is not sufficient for uni-directional transport of salt loads entering the Delta at Vernalis. Such was the case in 1976, the case investigated. It is noted that while the area is estimated to have suffered a substantial loss of productivity in this period--as much as 18 percent of the value of salt sensitive crops--this loss could be diminished by improving quality and flow at the upstream boundary at Vernalis. The apparent loss with New Melones operation, i.e. with a maximum TDS of 500 mg/L maintained by releases from the reservoir, would have been reduced by about one half, to roughly 10 percent of the total value of salt sensitive crops.

Table 5. Estimated Loss of Crop Revenue Due to Water Quality Degradation, Case Study: 1976 and 1976 With New Melones Operation

Crop	Area[1]	Unit Value[2]	Mkt. Value	Loss of Crop Revenue, 10^6 $ — Actual 1976 $\Delta Y/100$	Actual 1976 ΔC	1976 w/N.Melones $\Delta Y/100$	1976 w/N.Melones ΔC
	acres	$/acre	10^6 $		$		$
Beans	9,840	656	6.46	0.406	2.62	0.331	2.14
Corn	11,070	563	6.23	0.201	1.25	0.105	0.65
Alfalfa	31,980	732	23.41	0.102	2.81	0.051	1.19
Tomatoes	17,220	2110	36.33	0.111	4.03	0.052	1.89
Fruit & Nuts	6,150	2154	13.25	0.359	4.76	0.199	2.64
Grapes	1,000	1358	1.36	0.169	0.23	0.093	0.13
TOTALS	72,260[3]		87.04		15.70		8.64

[1] 1971-75 average

[2] 1980 San Joaquin County Agriculture Department

[3] Does not include 50,740 acres of salt tolerant crops

It should be noted, however, that the presumption that the target quality could be assured by New Melones releases is conditioned by the availability of water in storage for quality control. In some years, the entire volume allocated for this purpose may be released before the critical period of crop growth, as early as mid-April in the case of 1987. With the expectation of increased yield of salinity from the San Joaquin Basin, it will be increasingly difficult to achieve quality control at Vernalis, and in the South Delta, under the present mode of operation and with the current limitations imposed on storage for water quality control.

Another important factor which is illuminated by this example is the increased sensitivity of crops to damage when they are grown in soils of only moderate permeability, less than necessary to achieve optimum leaching during irrigation. A high proportion of South Delta soils are of this type; more than a third are classified as having "slow" permeabilities, less than 0.2 inches per hour. These soils have inherently poor leaching characteristics, with leaching fractions averaging 10 percent or less. Moreover, the wide variability in permeabilities in South Delta soils, over the entire area and even within the same field, exacerbates the leaching problem. Significant fractions of an irrigated area may be comparatively less permeable than the average, requiring higher quality water to avoid potential crop damage due to salinization in sensitive zones.

In summary, soils of the South Delta are found to be more sensitive than normal because of their lower average permeabilities and natural heterogeneity. Crops normally grown in the area are impacted adversely when water quality is not sufficient to preclude buildup of salinity in the soil profile during the irrigation season. Obvious solutions to this problem lie in enhanced water quality in South Delta channels and reductions in the salt load carried into the estuary by the San Joaquin River.

State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000 SACRAMENTO, CA 95812-2000
901 P STREET, SACRAMENTO, CA
(916) 657-1364 FAX: (916) 657-1485

A019194

REPORT OF LICENSEE FOR

1994, 1995, 1996

OWNER OF RECORD: BARBARA F. HILDEBRAND, ALEXANDER HILDEBRAND

APPLICATION: A019194

LICENSE: 007144

ALEXANDER HILDEBRAND
23443 SOUTH HAYS ROAD
MANTECA, CA 95336

TELEPHONE NUMBER:
(209) 823-4166

IF OWNER'S NAME/ADDRESS/PHONE NO. IS WRONG OR MISSING, PLEASE CORRECT.

SOURCE:		COUNTY:
SAN JOAQUIN RIVER		SAN JOAQUIN
PURPOSE:	DIVERSION/STORAGE SEASON:	ACRES/HP:
IRRIGATION	MAY 01 TO NOV 01 /	40 AC
STOCKWATERING	MAY 01 TO NOV 01 /	0 AC

AMOUNT: 0.5 CFS 0 AC-FT

THIS REPORT IS REQUIRED BY THE TERMS AND CONDITIONS OF YOUR LICENSE

IMPORTANT: EVERY license is subject to the conditions therein. I have currently reviewed my license: YES [✓] NO [ ]. I am complying with the conditions of my license: YES [✓] NO [ ]. Identify any noncompliance by license term number under "Remarks" on reverse side. This report is important in providing the record of use needed in maintaining your water right. It should be filled out carefully and returned promptly to the above-listed address.

THE PROJECT HAS BEEN ABANDONED, AND I REQUEST REVOCATION OF THE LICENSE: YES [ ].

COMPLETE FOR DIRECT DIVERSION PROJECTS

1. Have you used the full licensed amount of water each year? YES [✓] NO [ ].
2. State the quantity of water used each month in gallons or acre-feet (if not known, check months water was used).

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Annual
1994			✓		✓	✓	✓		✓				
1995			Flood		✓	✓	✓	✓	✓	✓			
1996				✓	✓	✓	✓	✓					

COMPLETE FOR STORAGE PROJECTS

	1994	1995	1996
3. Did your reservoir spill this year?			
4. If not, how many feet below spillway vertically was the water level at maximum storage?			
5. Have you emptied the reservoir?			
6. How many feet below spillway vertically was it drawn down at end of season?			

(Continued on reverse side)

1996

State Water Resources Control Board
Bay-Delta Hearings Application No. 5626
PARTICIPANT:
EXHIBIT: SDWA 061
INTRODUCED: 6/24/99
ACCEPTED IN EVIDENCE (YES) NO
DATE 6/24/99

Attachment "J"

State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000 SACRAMENTO, CA 95812-2000
501 P STREET, SACRAMENTO, CA
(916) 657-1364 FAX: (916) 657-1485

A 0 1 7 9 5 0

REPORT OF LICENSEE FOR

1994, 1995, 1996

OWNER OF RECORD: BARBARA F HILDEBRAND, ALEXANDER HILDEBRAND

APPLICATION: A017950

ALEXANDER HILDEBRAND
23443 SOUTH HAYS ROAD
MANTECA, CA 95336

LICENSE: 007143

TELEPHONE NUMBER:
(209) 823-4166

IF OWNER'S NAME/ADDRESS/PHONE NO. IS WRONG OR MISSING, PLEASE CORRECT.

SOURCE: SAN JOAQUIN RIVER

COUNTY: SAN JOAQUIN

PURPOSE:	DIVERSION/STORAGE SEASON:	ACRES/HP:
STOCKWATERING	APR 01 TO NOV 01 /	0 AC
IRRIGATION	APR 01 TO NOV 01 /	24 AC

AMOUNT: 0.3 CFS 0 AC FT

THIS REPORT IS REQUIRED BY THE TERMS AND CONDITIONS OF YOUR LICENSE

IMPORTANT! EVERY license is subject to the conditions therein. I have currently reviewed my license: YES [ ] NO [ ]. I am complying with the conditions of my license: YES [ ] NO [ ]. Identify any noncompliance by license term number under "Remarks" on reverse side. This report is important in providing the record of use needed in maintaining your water right. It should be filled out carefully and returned promptly to the above-listed address.

THE PROJECT HAS BEEN ABANDONED, AND I REQUEST REVOCATION OF THE LICENSE: YES [ ]

COMPLETE FOR DIRECT DIVERSION PROJECTS

1. Have you used the full licensed amount of water each year? YES [✓] NO [ ]
2. State the quantity of water used each month in gallons or acre-feet (if not known, check months water was used)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Annual
1994			✓		✓	✓	✓	✓	✓	✓			
1995			[illegible]			✓	✓	✓	✓	✓			
1996						✓	✓	✓	✓				

COMPLETE FOR STORAGE PROJECTS

	1994	1995	1996
3. Did your reservoir spill this year?			
4. If yes, how many feet below spillway vertically was the water level at maximum storage?			
5. Have you emptied the reservoir?			
6. How many feet below spillway vertically was it drawn down at end of season?			

(Continued on reverse side)

1996