AGRICULTURAL WATER QUALITY ISSUES FOR DELTA SOURCE WATER

ISSUES OF CONCERN TO DELTA WATER AGENCIES

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DELTA WATER QUALITY PROBLEMS CAUSED BY SALTS BROUGHT INTO THE SOUTH DELTA VIA THE SAN JOAQUIN RIVER

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Delta Water Quality Problems Caused by Salts Brought into the South Delta via the San Joaquin River

Summary by Alex Hildebrand

Since 1950 there has been an enormous increase in both the quantity and the concentration of an array of natural salts that drain into the San Joaquin River and then flow north into the Delta. This memo summarizes the magnitude and the causes of the problem, and then presents two measures which could partially alleviate it.

Prior to 1950 there was never a salinity problem in the San Joaquin River. Furthermore, the river flow was then sufficient to maintain channel water quality throughout the South Delta. (Salt intrusion from the Bay into a few South Delta channels only occurred once. That was in September of 1931 after most irrigation in the South Delta had already been completed.) There is, of course, some salt in any river system due to the natural salts released by the weathering of soils. But this salt load is largely released during high flows and is, therefore, very well diluted. South Delta crops, like crops anywhere, evaporate irrigation water as a necessity of growth, but they reject any salt contained in that water. The more concentrated salt then goes back by return flow into the channels. However, the pre-1950 incoming water salinity was low enough, so that the return flows did not increase salt concentrations in the channels to significant levels.

After 1950 the flow was significantly decreased and the salt load was substantially increased. The decrease in flow resulted from increased (and still increasing) consumptive use of water from eastside San Joaquin Valley streams, and from substantial increases in upstream exports to the Bay Area which bypass the stream system, and from river flow depletions caused by operations of the CVP (refer to June 1980 joint USBR-SDWA report.) The resulting flow and salinity and salt load where the river enters the South Delta is shown on the following attached exhibits.

Exhibit WRINT-SDWA-17 illustrates the salt load that is carried into the Delta by the San Joaquin River. Note that a very large portion of the salt load derives from the portion of the CVP Service Area's drainage which enters the river via Salt and Mud Slough. This component of salt load constitutes the primary source of salt load during the summer season when river flows are low and South Delta diversions needed for irrigation are high.

Exhibit WRINT-SDWA-19 illustrates the fact that the river inflow to the South Delta during the summer is less than is needed to supply South Delta agricultural diversions, plus riparian water usage and plus channel evaporation; i.e., total

"channel depletion". At these times most of the river flow with its salt load is pumped onto the South Delta's agricultural crops. Over time this diverted salt is then leached from crop root zones and returned to the channels where much of it flows to the CVP export pumps. These pumps then send the salt back down the valley via the Delta Mendota Canal to the CVP Service Area. Exhibit SDWA-W2CP-21 shows the annual tonnage of salt delivered into the San Joaquin River System's watershed by the Delta Mendota Canal from 1951 to 1989. Since the promised valley drain was never built, the salt load in this irrigation water either has to seep to deep groundwaters or drain to the river, mostly by drainage through surface waterways to the river, but some by subsurface accretion.

Exhibit WRINT-SDWA-10 illustrates the salinity (salt concentration) of the river salt load where it arrives at the Delta boundary. This is not just a dry year problem. The next exhibit supplied by USBR shows the Vernalis salinity and flow for the first half of the 1993 water year which is far from dry. Some of the drainage water entering Salt Slough last month (March 1993) was reported to be 4900 ppm TDS. This flow when combined with drainage from wetlands in April was expected to constitute about 200 cfs at about 3000 ppm TDS. As the valley's westside irrigators are pressed to be excessively "efficient" the salinity of the drainage waters continues to rise.

Two measures have been proposed to partially alleviate this problem in the absence of a valley drain. The Department of Water Resources, the U. S. Bureau of Reclamation, and the South Delta Water Agency have a written agreement to promote three tidal barriers in South Delta channels (plus a fourth barrier needed for protection of San Joaquin salmon). Exhibit WRINT--SDWA-35 shows the <u>proportion</u> of the DMC salt load which derives from different sources. The tidal barriers would not only correct channel water depth and circulation problems, but would also substantially reduce the high salinity component of the DMC salt load which is derived from the San Joaquin River inflow. It would thereby reduce the total salt load in the Delta Mendota Canal. Exhibit WRINT-SDWA-36 illustrates the resulting potential for salinity reduction in the Delta Mendota Canal. This reduction in DMC salt load should lead to a significant reduction in the drainage salt load.

A proposal has also been developed to revise the drainage system in the relevant portion of the CVP Service Area so that drainage waters can be retained subsurface in the Service Area when adequate dilution water is not available, and can then be released to the river when dilution flows are available. The final attachment to this memo is a summary of a nearly completed report by William R. Johnston and Dr. Gerald T. Orlob describing this proposal.

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