Salinity-1-31-06
Workshop

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January 20, 2006

Selica Potter, Acting Clerk to the Board
State Water Resources Control Board, and
Central Valley Regional Water Quality Control Board
Sacramento, CA 95812

Re: **COMMENT LETTER** – January 31, 2006 Board Workshop
Salinity Management Issues in the Central Valley

Introduction

The UC Center for Water Resources is a University of California system-wide research unit dedicated to supporting water resources developments in California through faculty research and professional training. Established by the state legislature in 1957, it subsequently was designated as the National Resources Research Institute in California through the Federal Water Resources Research Act. Through an annual call for proposals, the Center funds faculty research projects that advance scientific and economic knowledge of water related processes and offer solutions to critical issues on management of the State's water resources. In collaboration with state agencies, professional organizations, and advocacy groups, the Center regularly conducts conferences and workshops to disseminate relevant technical information.

When the disposal of selenium-rich agricultural drainage water from croplands in the west side of the Central Valley resulted in an eco-toxicological crisis, UC launched a focused salinity and drainage research program that has been sustained to the present. As the State Water Resources Control Board and the Central Valley Water Quality Control Board solicit input on managing salinity issues in the Central Valley, the Center is devoted to continuing our research commitment to further the understanding of the nature of the problems and, in collaboration with involved parties, to foster outreach activities that provide technical knowledge and promote best management practices.

Historical Perspectives

In semiarid areas, successful and sustained crop production is intimately tied to the proper management of inter-related irrigation, salinity, and drainage practices. It is imperative that new developments in irrigation are coupled with the development of comparable drainage components designed to mitigate the ill effects of shallow groundwater tables and salinity build up in the soil. The need for drainage and salinity management was recognized as the Central Valley Project was initiated and imported water became available for crop irrigation on the west side of the Valley. While the

acreage of irrigated cropland expanded and requirements for the disposal of agricultural drainage rose, an out-of-the-Valley outlet site was never provided and drainage flows terminated at the Kesterson Reservoir and Wildlife Reserve.

From 1980 to 1985, the research mission of the UC Kearney Foundation of Soil Sciences, an endowment dedicated to agricultural soil conservation and management issues, was directed at understanding and mitigating the effects of salinity on crop production. Through this concerted research program, irrigation efficiencies were studied to allow reduced leaching requirements and salinity build up. The potential for the reuse of drainage water to irrigate crops based on their salt tolerance was also tested. A great deal was learned on how to minimize the impact of soil salinity during the production of irrigated crops. The subsequent discovery that selenium in the drainage water, bio-accumulated through the aquatic food chain, caused catastrophic harm to bird hatchlings and embryos added a new eco-environmental dimension to the traditional agricultural drainage problem. In the Central Valley, the salinity problem must be solved along with the selenium problem.

Since 1985, the University of California, through the Salinity Drainage Program, has focused a system-wide effort on understanding the geochemical processes governing the fate and transport of selenium and salts in the irrigation-drainage settings of the Central Valley and on examining potential mitigating measures for selenium found in subsurface agricultural drainage water. This program currently is being managed by the UC Center for Water Resources. As a result, a large body of knowledge has been published as scientific papers in technical journals. Currently, the program supports ongoing research on modulating surface water salinity through flow through wetland systems, drainage water reuses and salinity tolerances of crops, and trace element biogeochemistry of drainage water. Through the Salinity Drainage Program, UC has been an active participant in the state's Department of Water Resources' efforts to assess and plan the drainage reduction and reuse program. In addition, the Salinity Drainage Program sponsors an annual conference providing a forum for all professionals for open discussion of the issues and regular updates of technology developments and research findings. The revenues generated from the Prosser Trust, an endowment managed by the Center, have been used to develop and promote efficient irrigation technology.

For the remainder of the Central Valley, subsurface drains may not be needed to lower the water table below the root zone, and the drainage effluent will not be collected and removed from the fields. However, under these circumstances, another type of salinity issue can be encountered. For irrigated agriculture, leaching using applied water is invariably required to maintain a salt balance in the soil profile that provides a suitable environment for root development and plant growth. The salts, as well as other chemicals, carried by the leachate are transported through the vadose zone and eventually to the groundwater. When the dairy wastes from 1.5 million milking cows in the Central Valley are land applied, salt loadings will be even higher as the salt-laden dairy wastes are added on top of the irrigation water. As the majority of irrigation water in this case is diverted in-basin surface flow or the groundwater and the salts in the dairy rations are from local produced feedstuffs, salts in question in this case are indigenous to the Central Valley and they are simply being redistributed and concentrated in selected areas especially the croplands where dairy wastes are applied. The degraded groundwater is expected to be significantly elevated in salinity, high in alkalinity and hardness, and sometimes contaminated with nitrate.

Future Directions

In the Central Valley, water quality degradation caused by the irrigation induced salinity buildups is predominantly caused by non-point source pollution. Unless the salinity and drainage problems of the

irrigated croplands are properly managed, water quality goals will be difficult to achieve. As the selenium issues in Central Valley have not yet been resolved, the solutions for the salinity and drainage issues are limited to the in-basin mitigation options that consist of reducing drainage volumes, switching to more salt tolerant crop species, reusing the drainage water, concentrating salts in evaporation ponds, and retiring marginal croplands. None of these solutions alone is completely adequate to solve the problems and the status quo is unacceptable.

UC research and Corporative Extension personnel have been actively involved in understanding the interactive nature of salinization processes, and in developing and promoting efficient and precise irrigation practices, drainage water reuses, and salt tolerant crops. Much of the present understanding and technology may be brought on line as regulatory requirements on salinity control are implemented. These solutions nevertheless do not provide a permanent answer to the salinity problems in the Central Valley, as salts continue to accumulate in the valley and the capacity to accommodate them will sooner or later be exhausted. Across the Central Valley, the water management and agricultural production schemes are complex and diverse. In our opinion, the current research findings need to be scaled up across the landscape and rigorous systems analysis completed in order to best select solutions.

Unlike other public agencies, the UC does not have a mandate to plan, develop and manage the State's water resources and quality. The University is an institution of higher learning, research, and transfer of research through Cooperative Extension programs. The most valuable resources of the University lie in its faculty's ability to conduct rigorous fundamental and applied research and to disseminating unbiased scientific findings. The UC Center for Water Resources as a research arm of the University will continue to commit its resources to support research relevant to the salinity issues in Central Valley, and to promote cooperative extension activities to optimize and adopt documented best management practices.

In addition to our commitment to support research, the Center coordinates an annual Salinity Drainage Conference to update interested parties on recent policy, management, and technology developments and to provide a forum where critical issues can be discussed in an open and frank manner between researchers, practitioners, and policy makers. We are currently designing an internet-based interactive California water resources information blog that may serve as a forum for dialog on water resources related issues such as increasing groundwater salinity and agricultural drainage. We also plan to develop a data portal that will become an integrated repository for relevant technical information on the efficient use, and reuse, of water. In January 2006, the UC Division of Agriculture and Natural Resources announced the 2006 through 2011 research mission of the Kearney Foundation of Soil Sciences. Entitled "Understanding and Managing Soil-Ecosystem Functions across Spatial and Temporal Scales", it will provide more than one million dollars annually to support faculty research investigating processes and reactions in the soil, water, and atmosphere at the ecological scale. Research on groundwater salinization and agriculture drainage is well suited to this research mission, which represents additional resource commitments by UC to study the fundamental science of these issues.

We look forward to collaboration with State Board and the Central Valley Regional Board on this endeavor, including input and suggestions as we formulate priorities and programs.

Sincerely,

Andrew C. Chang

Andrew C. Chang, Director
UC Center for Water Resources