Salton Sea Management Project Implementation Plan

Submitted by the Salton Sea Authority
to the
California State Water Resources Control Board
Contract No. 4-054-250-0

Final
January 16, 1997

I. Why Save the Salton Sea ?

The Salton Sea, California's largest body of water, is a haven for wildlife, supporting more than 380 species of birds and 40 mammals. Although the Sea was created by a flood of the Colorado River over 90 years ago, it has developed into an important resource, maintained by inflow from the $1 billion agricultural industry. Benefits from the resource itself exceed $12 million annually.

WILDLIFE

The serene views of the Sea and the surrounding mountains, along with the mild climate of the area are attractive to recreationalists and permanent residents alike. In addition, both State and Federal wildlife agencies have developed extensive wildlife refuges on the shores of the Salton Sea. In fact, the Salton Sea National Wildlife Refuge has the second highest bird diversity of any refuge in the Federal System. The Sea is a major stopover for the Pacific Flyway migration of waterfowl, marsh, and shore birds. There are a number of endangered/threatened species, including the California brown pelican, Yuma clapper rail, an occasional bald eagle and the peregrine falcon, that have been observed on the refuge. Walking and hiking can be enjoyed on designated trails where birdwatchers have the opportunity to see a great diversity of bird life.

RECREATION

Sportfishing became popular at the Sea after 35 different species were introduced by the California Department of Fish and Game in the 1950s. Three species flourished, the gulf croaker, sargo, and orangemouth corvina weighing up to 32 pounds, making the Salton Sea one of the greatest, most exciting fishing areas in the Southwest. It is readily accessible and attracts enthusiastic anglers from San Diego and Los Angeles.

GEOTHERMAL

The geothermal industry ranks the Salton Sea as one of the three most significant locations in the world to produce geothermal power. Geothermal plants dot the southern end of the Sea. Over the years, numerous communities with marinas, boat landings, charter services, stores, motels, restaurants, tackle shops and RV parks developed around the shores of the Sea. Many of them are still maintained by groups of dedicated residents who have chosen this place to spend their retirement years.

ECONOMICS

In the early 1960s, the North Shore Beach and Yacht Club was considered quite swank by the likes of Jerry Lewis, the Marx Brothers, and others. The Beach Boys performed there and various social clubs and organizations from the Coachella Valley would gather there for boat races, parties, and dances. But as was the case with several of the developments around the shoreline, fluctuating water elevations created problems. Flood waters eventually wiped out the glamorous yacht clubs on both the north and west shores.

Recent news stories about how polluted the Sea has become are misleading. The real problem at the Sea is the rising level of salinity—25% higher than ocean water—that can be damaging to the reproduction of fish, and consequently a threat to the wildlife there.

TABLE OF CONTENTS

The cyclical nature of the water level and increasing salinity have been sources of concern for several years. These conditions are expected to continue if left to take their own course. What California stands to lose is:

1) the State and National Wildlife refuges totaling 2200 manageable acres of 35,000 remaining acres;
2) the Torres-Martinez Indian Reservation on the Sea's northwest shore;
3) the geothermal plants and agricultural operations on the southern shore;
4) the Salton Sea State Park which provides important recreational opportunities for California's populous south coastal area; and
5) the economic benefits the Sea's recreational opportunities hold for the residents of Imperial County and those residents of Riverside County living in the Coachella Valley. In both areas, the value of the Sea is particularly important because of low per capita income and high unemployment rates. All of these losses pass on significant third-party impacts.

The potential for the Sea has not yet perished. In 1993, the counties of Riverside and Imperial, the Imperial Irrigation District (IID) and the Coachella Valley Water District (CVWD) entered into a Joint Powers Agreement, creating the Salton Sea Authority (Authority). The Authority has pulled together with State and Federal agencies to work on projects to, "save the Sea." The Authority, by directing and coordinating actions relating to improvement of water quality, stabilization of water elevation, enhancement of recreational and economic development potential of the Salton Sea, and other beneficial uses, recognizes the importance of the Salton Sea to the dynamic agricultural economy in Imperial and Riverside counties.

Many proposals have been made to manage salinity and elevation, and through recent efforts, a solution is finally in sight. The following implementation plan summarizes the Authority's work of considering the numerous alternatives and the steps remaining to accomplish its goal of preserving the many beneficial uses of the Salton Sea.

II. Purpose of Implementation Plan

The purpose of this implementation plan is to describe recommended options that will provide practical, partial or complete solutions to the salinity and elevation issues of the Salton Sea. The Plan will include a summary of previous tasks and other items as appropriate. It will also identify affected agencies, technical feasibility sources and funding sources for development and management of recommendations.

III. Recommended Option Description

On September 26, 1996, the Salton Sea Authority Board of Directors adopted within-Sea diked impoundment as the preferred approach. Although a specific project was not selected, the designation of a diked impoundment as the recommended option allows the Technical Advisory Committee (TAC) to proceed with feasibility to determine the best diking alternative and eventually to prepare an Environmental Impact Report/Environmental Impact Statement.

Managing salinity with diked impoundments is based on the concept of providing an outlet to the Sea by creating an evaporation pond. Water flowing into the impoundment would carry a heavy salt load, while inflow to the Sea from the Alamo River, New River, Whitewater River and other sources would carry a smaller salt load, thereby decreasing the salt concentrations of

the Sea. Water would be admitted into the impoundment through an inlet structure in the dike. Initially, a larger amount of water would have to flow from the Sea to the impoundment. When the Sea water concentration reached the target level, flow into the impoundment could be reduced. Within the impoundment, water would evaporate leaving the salt behind. The capacity of an impoundment depends on size and average depth as well as other factors to be defined through the feasibility analysis as discussed in Section VII of this document.

IV. Summary of Previous Tasks

Clean Lakes Grant

In 1994, the Salton Sea Authority received a grant from the U.S. Environmental Protection Agency's (USEPA) Clean Lakes Program to conduct environmental and economic analyses of salinity and elevation management options for the Salton Sea. Tasks under the Clean Lakes Grant Agreement include: Administration, Technical Advisory Committee (TAC), Citizens Advisory Committee (CAC), Public Meetings, Consultant Selection & Monitoring, Information Collection/Evaluation - Management Options, Economic Impact Analysis, Prioritize Options, Draft & Final Reports. The general goal of the management project is to stabilize the salinity and elevation of the Salton Sea at levels that maximize the economic, environmental, social, and cultural attributes of the region.

The TAC consists of a representative from each of the four Authority member agencies with input from USBR, DWR, the California Regional Water Quality Control Board, Imperial Valley Association of Governments, and U.S. Fish & Wildlife Service . The TAC met monthly throughout the duration of the Clean Lakes Grant Process and was responsible for program administration, oversight of the CAC, conduction of public meetings and selecting and monitoring the consultant to evaluate alternatives.

The TAC reviewed five proposals in response to the Authority's request. Of the five, four consulting firms were interviewed and a contract with Ogden Environmental and Energy Services (Ogden) was signed on October 20, 1994. Ogden commenced work on November 1, 1994 by assembling, reviewing, and summarizing existing information on potential salinity and elevation management alternatives for the Salton Sea.

Final appointments to the CAC were made on November 17, 1994 by the Authority Board of Directors. Each agency appointed two representatives and two representatives from environmental organizations were named. The CAC met on a review basis. As each submittal was made from the consultant, the CAC met and provided comments.

An interim document was submitted by Ogden for review on February 1, 1995 and the final report including comments from the Board, TAC, CAC, and the public was completed on March 21, 1995. This document was eventually incorporated into the Final *Evaluation of Salinity and Elevation Management Alternatives* Report.

An economic profile study was also prepared by Ogden and describes baseline economic data which reviewed previous economic profiles of the Salton Sea and the immediate vicinity, compiled a composite economic profile of the area, and identified information needed to complete an economic impact analysis related to specific management options. The study analyzed the principal characteristics of the local and regional economies, which depend on the resources of the Salton Sea or which may be affected by the proposed management alternatives. It also looked at population, income, employment, housing and taxable retail

sales. The economic profile was also incorporated into the final document and was used by USBR for the interagency agreement workplans

The final document, *Salton Sea Management Project Evaluation of Salinity and Elevation Management Alternatives (Ogden Report)* was prepared by Ogden Environmental and Energy Services, and summarizes management alternatives proposed to date, screens these proposed alternatives against criteria established by the Salton Sea Authority Board of Directors, and presents environmental Scoping issues raised during the public review period. The Ogden report appears as part of this Implementation Plan as Appendix A.

The Authority held its first public meeting February 16, 1995 at Coachella Valley Water District. Approximately 30 citizens from the local area attended and offered comments. A public hearing is planned for November 21, 1995, to comment period was held open until December 31, 1996 upon completion of the Implementation Plan, and adoption of the Implementation plan was in January at the Authority's regular board meeting.

The Clean Lakes Grant Agreement required a non-federal match of $41,000. To date, TAC members and staff of other participating agencies (California Regional Water Quality Control Board and Imperial Valley Association of Governments) have contributed in-kind approximately $48,000. The final invoice and all appropriate back-up material will be submitted to the State Water Resources Control Board with this document when adopted by the Authority Board.

USBR Projects

In 1994, the Authority signed an agreement with the U.S. Bureau of Reclamation(USBR) and the California Department of Water Resources (DWR) to engage in planning and research of management activities at the Salton Sea. This agreement is funded under Public Law 102-575 which authorizes planning and research expenditures up to $10 million. Although the $10 million is authorized, each year a request is made to Congress for an appropriation from this fund. To date, the Authority, through USBR and help from Members of Congress, has requested $600,000. Of the $600,000, $200,000 has actually been utilized or is currently obligated.. Of the $400,000 requested for this fiscal year, $200,000 was appropriated. All funding through Public Law 102-575 must be matched 100% by non-federal funds.

Selection/Evaluation Process

All alternatives submitted either solicited or unsolicited were compiled and a public discussion was opened on ideas and suggestions for management of the Salton Sea in the form of two public workshops hosted by the Authority in August and September of 1995. The Technical Advisory Committee listened, discussed, and recorded the alternatives proposed by the public. In addition to those presented in the workshops, written submissions were accepted with the understanding that all the alternatives submitted to the TAC would be considered on their technical and economic merit.

The ideas gathered at the workshops along with all alternatives submitted from 1969 to present were written up for inclusion in the draft Alternative Appraisal report and also included in the *Salton Sea Management Project Evaluation of Salinity and Elevation Management Alternatives* produced by Ogden. Of the 55 alternatives addressed, 20 were eliminated based on the following elimination criteria discussed by the SSA Board and other participating agencies on October 19, 1995.

Target Salinity 35 - 40 ppt.
Salinity management targets were established at levels that are protective of the existing fishery in the Salton Sea. To maintain the existing fishery, a target salinity range of 35 ppt to 40 ppt was established.

Target Elevation -230 to -235 feet mean sea level (msl)
There are many considerations when determining a target water surface elevation. Private and commercial property owners are concerned with elevation because of its direct affect on property values. As the Sea is a repository for agricultural drainage, the Sea's elevation is important to agricultural interest as well.

$10 million threshold for annual Operation and Maintenance Costs
To ensure affordability of the project for the long-term, operation, maintenance, energy and replacement costs of the project was used to screen the alternatives. An annual threshold of $10 million, not including debt service, is considered the maximum feasible for the project. Therefore, management alternatives that exceed this threshold were eliminated from further consideration.

No unproven technology
In the interests of feasibility and availability of expertise, the technology in the alternative must be commercially available and proven in similar situations. The goal of this process is to select an alternative with the best chance of success.

Evaluation criteria were also adopted by the Board of Directors and were used in the second phase of evaluation after the elimination criteria were applied. The Evaluation Criteria was ranked by using a Paired Comparison Matrix by the Authority Board, and representatives from USBR, U.S. Fish & Wildlife Service, California Department of Parks & Recreation, California Department of Water Resources, and California Department of Fish & Game, during a workshop on April 8, 1996.The following table gives the criteria in rank order of importance, a brief description of how the criteria was applied, and the weighted value of the criteria to be used in the analysis matrix.

EVALUATION CRITERIA

Agricultural Interests: A higher score under this criterion indicates an alternative is more supportive of agricultural interests. The alternative should support use of the Salton Sea as an agricultural repository and support agriculture in the area.	33
Wildlife: A higher score under this criterion indicates an alternative is more beneficial to wildlife on, in, or near the Salton Sea. Specific attention should be paid to enhancement of threatened or endangered species in the area.	32
Elevation: A higher score in this area indicates a greater degree of control of the Salton Sea surface elevation. Degree of control increases for larger percentage of shoreline kept in the target range, faster control response time, and less seasonal fluctuation.	31
Disposal: A higher score under Disposal indicates a greater ease of handling and dealing with salts or other by-products. A higher score for ease of disposal means lower environmental impacts, higher property values, increasing longevity, minimizing health hazards and/or involving less stringent environmental regulation requirements	24
Water Quality - Salinity: A higher score under this criterion indicates a greater degree of control in maintaining salinity within the target range.	24
Water Quality - Other: A higher score under this criterion indicates an increasing benefit to water quality in the Salton Sea concerning those constituents not directly affecting salinity. Such constituents include pesticides, selenium, sewage and bacteria, as well as other nutrients	21
Operation & Maintenance Costs: A higher score under this criterion indicates a lower yearly expenditure for operation, maintenance, energy and replacement below $10 million, not including debt service.	19
Finance Costs: A higher score under finance costs indicates a greater availability of funding and/or at a lower lending rate.	17
Location: A higher score under this criterion indicates a higher level of support for a proposed location.	17
Construction Costs: A higher score under this criterion indicates a lower cost to construct the alternative	14
Sport Fishery: A higher score under sports fishery indicates the alternative will enhance sport fishing on the Sea	14
Recreation: A higher score under this criterion indicates the alternative will enhance overall recreational activities	12
Economic Development: A higher score under this criterion indicates the alternative should result in beneficial effects on the local economy and provide economic opportunity in the area	11
Inter-governmental Cooperation: A higher score under this criterion indicates fewer agreements and permitting requirements with government agencies, including local, state, federal, and international	9
Land: A higher score indicates availability and easier acquisition of a project site and ownership issues	7
Time to Solution: A higher score indicates less time to reach target salinities and elevation	6
Time to Construction: A higher score indicates less time to construct and begin operation of the alternative	3
Partners: A higher score indicates a greater opportunity for private investment in the project area	2
Water Removal: A higher score indicates less cost or easier implementation of a proposed water removal strategy.	N/A
Benefits & Impacts: A higher score indicates the alternative supports beneficial effects not otherwise considered	N/A

The results of the ranking by PCM was then applied to the remaining alternatives by an Analysis Matrix. The Analysis Matrix was used to rank the alternatives in order of preference. First alternatives were evaluated as to how well they met each criteria on a scale of 1 to 4. The following table shows the results of the Analysis Matrix performed by the Technical Advisory Committee.

Analysis Matrix

	Agricultural	Wildlife	Elevation Control	Disposal	Water Quality-Salinity	Water Quality -Other	O & M Costs	Finance Costs	Location	Construction Costs	Sport Fishery	Recreation Benefits	Economic Development	Intergov. Cooperation	Land	Time to Solution	Time to Construct	Partnering Opportunity	Summary
	33	32	31	24	24	21	19	17	17	14	14	12	11	09	07	06	03	02	
40 m² diked impoundment	G	G	P	G	G	F	E	F	G	G	F	G	F	G	G	F	F	F	796
50 m² diked impoundment	G	G	P	G	G	F	E	F	G	G	F	G	F	G	G	F	F	F	796
47 m² diked impoundment	F	G	P	G	G	F	E	F	G	P	E	G	F	G	G	F	F	F	752
127 m² diked impoundment	E	G	P	E	E	P	E	F	P	E	G	P	P	P	F	E	E	F	717
Enhanced Evaporation/Solar	P	E	F	P	F	G	P	G	F	P	G	F	G	P	P	G	G	G	664
On-shore Evaporation	F	E	F	P	F	G	P	F	F	F	G	P	F	F	P	G	G	F	671
Phased Impoundment	E	G	P	G	G	F	G	F	F	E	F	P	F	F	F	G	E	F	855
No Action	F	P	P	E	P	F	E	E	E	E	P	P	P	P	P	P	E	P	648
30 m² diked/Max Pumping	G	F	G	F	F	P	F	F	P	G	E	G	F	P	P	F	F	F	623
30 m² diked/Pumping	G	F	F	F	F	P	F	F	P	G	G	G	F	P	P	P	F	F	572

E=Excelent (4) G=Good (3) F=Fair (2) P=Poor (1)

Based on the outcome of the Analysis Matrix, the Board of Directors selected diked impoundments as the option with which to proceed into feasibility analysis. Other alternatives will only warrant investigation and use of resources if it can be demonstrated by the proponents that it meets and exceeds all criteria and can be constructed and operational at least five years before the preferred alternative including meeting all permitting and legal requirements

Concurrent USBR-Workplan Projects

During the on-going selection/evaluation process, several other projects were completed under the inter-agency agreement. These projects include: a bathymetry study task, an alternative dike structures task, a water current model, the collection of weather data, an economic assessment, and a water quality task. All are described in the following paragraphs.

The accuracy of underwater topography data for the Salton Sea was questionable. The available contours were developed over 20 years ago and evidence exists that siltation in the intervening years has changed the topography. Under this task, USBR surveyed the underwater topography of the Salton Sea - gathering data from November 1994 through February 1995. Field data was compiled to develop a topographic map and to compute storage elevation curves and the final report was submitted in September 1995.

The alternative dike structures task consisted of identifying other potential construction materials or techniques and evaluating those options at a preliminary level. Use of steel sheetpiling and impermeable plastic or rubber membrane are two possibilities which were considered. Recommendations on further evaluation or field testing and demonstration were included in the final report for alternative dike structures, completed in August of 1995. The report revisited the question of finding a more efficient or effective diking method than that originally evaluated in the April 1974 Federal-State Feasibility Report. The Alternative Dike Structure Report evaluates concepts, costs and adequacy of various dike construction methods to segregate the Salton Sea into areas of different salinity. Procedures used for this evaluation were those of a simplified Value Engineering study. The conclusion of the report was that, based on current technology, dump dike construction, as proposed in the April 1974 Feasibility Report, is still the overall best method for building dikes.

To help determine the environmental effects of construction projects within the Sea, water movements within the Sea are being studied and modeled by Dr. Gerald Orlob of UC-Davis. This study will ensure that 1) dikes are not constructed so as to inadvertently trap fresh rather than saline water; 2) dikes are not prematurely eroded by water movement; and 3) stagnant areas, which might trap planktonic fish eggs or promote plankton blooms, are not inadvertently created.

Thus far, the UC-Davis team has prepared a computer model utilizing the new bathymetry map and available wind information. As part of the next workplan, water movement measurements, customized wind data, and detailed salinity readings will be collected and utilized to calibrate and enhance the model. The final model will be capable of evaluating the impact of various structures within the Sea on water movement, the mixing of fresh and saline waters, and the values of other water quality parameters at various points within the Sea. DWR is acting as the lead agency for this task.

An economic input-output analysis is also being prepared by USBR. This model will further quantify information identified in the Ogden analysis and evaluate the impacts of the management option on local economies.

Other Salton Sea Authority Efforts

In 1994, Salton Sea Authority member agencies, Riverside County and Coachella Valley Water District, retained Dangermond & Associates, to review solutions previously proposed for various problems affecting the Sea and to explore new possibilities and combinations of possibilities which might either reduce costs, generate revenues, or create access to new funding sources. The resulting white paper suggests three alternatives which incorporate portions of previously proposed solutions with several new concepts, and evaluates funding strategies and sources, including revenue generating aspects of the solutions, for each. In so doing, the white paper, only generally, identifies concepts and potentials for further study; it is beyond the scope of the analysis to consider all of the environmental, jurisdictional, economic and technological factors which will affect the ultimate feasibility of a solution. *(paraphrased from Strategies for the Restoration and Enhancement of the Salton Sea, Dangermond & Associates, July 1994)*

Consulting engineer, David Butts was briefed in a meeting held by the Authority on October 6, 1995. He was given a field tour of the Sea by air and land. Mr. Butts briefly reviewed existing management alternatives and recommended that for the various pumpout options, the volume of water required to pump out of the basin could be considerably reduced by first evaporating and concentrating the Sea's water approximately four-fold, thus reducing the cost of these options.

V. Affected Agencies

The following agencies are expected to be affected by the preferred management alternative. Efforts to coordinate activities with these agencies are on-going.

A. Salton Sea Authority
   - Coachella Valley Water District
   - Imperial County
   - Imperial Irrigation District
   - Riverside County

B. U.S. Department of the Interior
   - Bureau of Reclamation
   - Fish & Wildlife Service
   - Bureau of Land Management
   - Bureau of Indian Affairs
   - Geological Survey

C. State of California
   - Department of Water Resources
   - Department of Parks & Recreation
   - State Water Resources Control Board
   - Regional Water Quality Control Board
   - Department of Fish & Game

D. U.S. EPA

E. Torres-Martinez Band of Mission Indians

F. Private Entities

VI. Technical Feasibility Sources

Agencies and organizations expected to participate during the technical feasibility stage are:

A. U.S. Bureau of Reclamation
B. Member Agencies
C. Universities
D. Independent Consultants

VII. Feasibility Scope/Definition of Project

Functioning as the Steering Committee under the inter-agency agreement, the TAC, DWR, and USBR are responsible for ensuring the completion of tasks included in upcoming workplans. The following tasks are deemed necessary for the analysis of dike feasibility and to define a specific diking project. Completion of the first workplan will provide the necessary information to go forward into the formal environmental process (specifically the National Environmental Policy Act and the California Environmental Quality Act) and ultimately to construction of the project.

This section will serve two purposes - to define the scope of feasibility information, and to act as the implementation checklist with specific milestones and decision points. The implementation schedule is attached.

Workplan 3.0 - FY '96 PHASE 1

Alignment Identification Task

Each impoundment alignment will be reviewed and data requirements will be developed to address the following:

- Size (20%, 30%, 40%, 50% of Sea)
- Length of time to reach target salinity based on above sizes
- Life of impoundment
- Average Depth

(Decision Point: based on the above information, the Board will be asked for criteria to eliminate certain alignments in order to maximize investigation resources)

- Location of pond

*best dike using part of shoreline
*best dike using none of shoreline
*best dike across the sea
*areas to exclude from dike placement consideration
*amount and ownership of land to be affected
*area to be disturbed

- Affect on elevation
- Design assumptions and preliminary analysis of alignments