

Salton Sea Management Project Implementation Plan

**Submitted by the Salton Sea Authority
to the
California State Water Resources Control Board
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1. 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.

GEOHERMAL

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 ad 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.

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 (ID) 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

USER 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 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	
40 m ³ skid impoundment	G	G	P	G	G	F	F	F	G	G	F	F	F	G	G	F	F	F	F	796
50 m ³ skid impoundment	G	G	P	G	G	F	F	F	G	G	F	F	F	G	G	F	F	F	F	796
47 m ³ skid impoundment	F	G	P	G	G	F	F	F	G	G	F	F	F	G	G	F	F	F	F	752
127 m ³ skid impoundment	F	G	P	F	F	F	F	F	P	P	F	F	F	P	P	F	F	F	F	717
Enhanced Evaporation/Solar	F	F	F	F	F	G	P	G	F	P	G	F	G	P	P	G	G	G	G	664
On-shore Evaporation	F	F	F	F	F	G	P	F	F	F	G	F	F	F	P	G	G	G	F	671
Phased Impoundment	F	G	P	G	G	F	G	F	F	F	F	F	F	F	F	G	F	F	F	655
No Action	F	P	P	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	648
30 m ³ skid/Max Pumping	G	F	G	F	F	F	F	F	P	G	F	G	F	P	P	F	F	F	F	521
30 m ³ skid/Pumping	G	F	F	F	F	P	F	F	P	G	F	G	F	P	P	P	P	F	F	572

E=Excellent (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 derailed 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.

U. 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