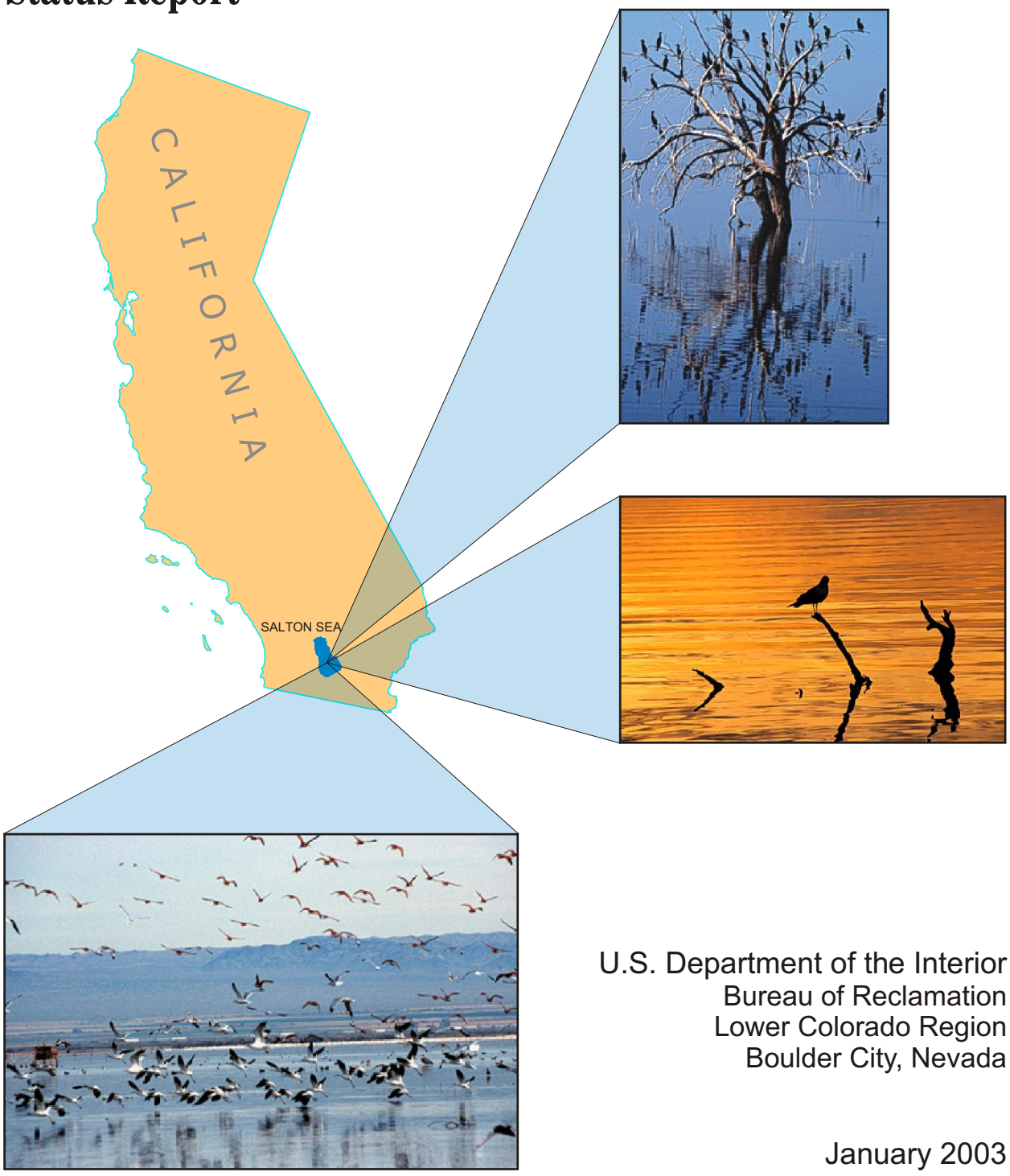
SALTON SEA STUDY

Status Report



U.S. Department of the Interior
Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada

January 2003

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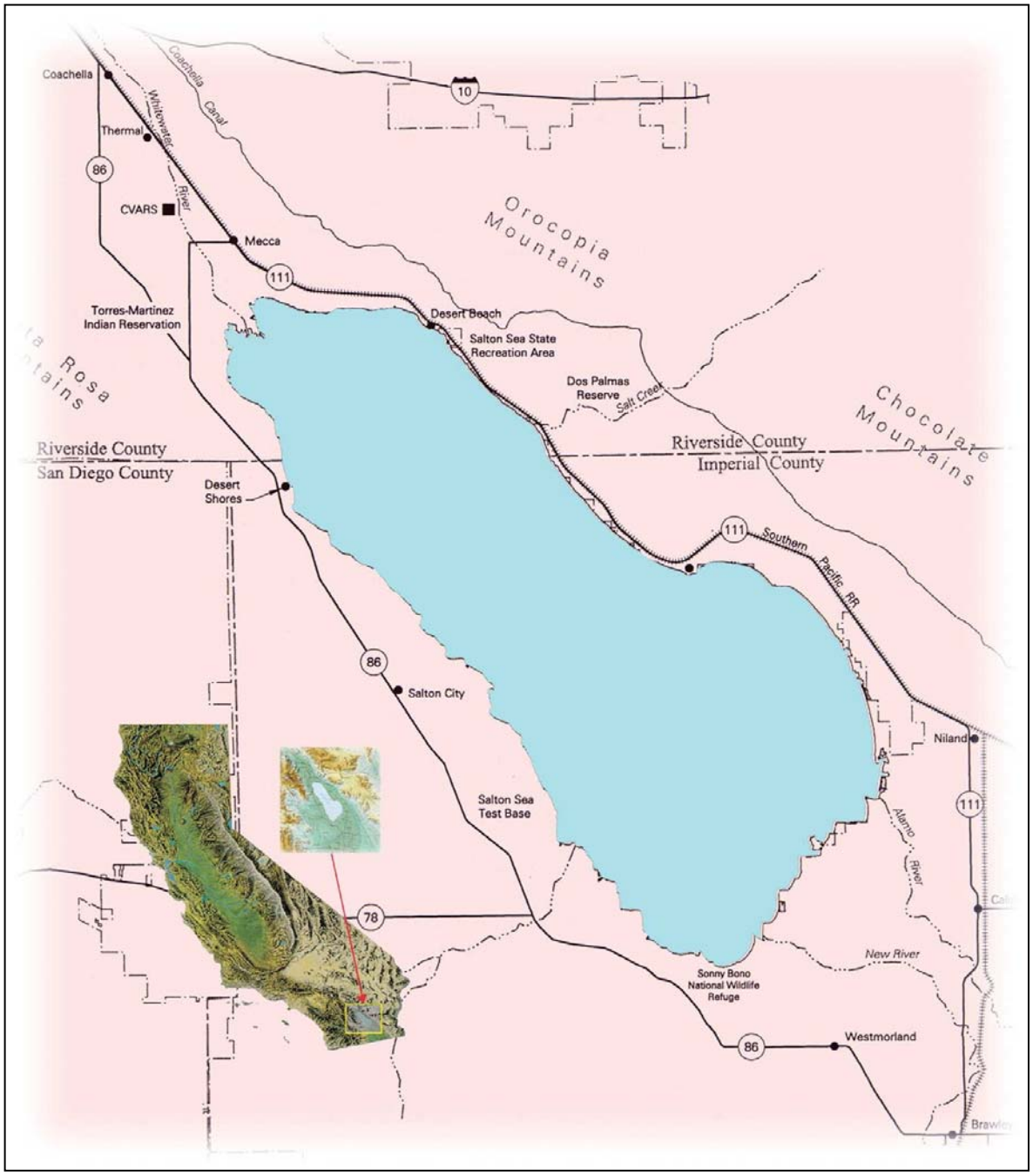

Salton Sea location map

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EXECUTIVE SUMMARY

The Salton Sea is located in a closed basin in Riverside and Imperial Counties in southern California, south of Indio and north of El Centro. The Sea is situated in a closed basin, more than 200 feet below sea level and has no natural outlet. Although lakes have existed in this basin in the past, the current body of water formed in 1905 when a levee break along the Colorado River caused flows from the Colorado River to enter the basin for about 18 months. Since 1905, the Sea has fluctuated in size with varying inflow, and it recently has had a surface area of 365 square miles.

A balance between inflowing water and evaporation sustains the Sea. With no outlet, any salts that are dissolved in the inflow are trapped, although some do precipitate. Salt concentrations are currently about 44,000 milligrams per liter (mg/L), or about 25 percent higher than ocean water. Salinity will continue to rise under current conditions. It is highly likely that in the future, the inflow to the Sea will be less than it has been in the past. A reduction in inflow would cause the Sea to shrink and cause salinity to rise faster than it would have without a reduction in inflow.

A gradual increase in salinity and its consequences was recognized soon after the Sea was formed. Formulation of salinity control measures was reported as early as the mid-1950s. Since then, many alternatives have been proposed and analyzed. The alternatives presented in this report were developed to address the goals contained in the Salton Sea Reclamation Act of 1998. The Act directs the Secretary of the Interior to study options for managing the salinity and elevation of the Sea in order to preserve fish and wildlife health and enhance opportunities for recreation use and economic development while continuing the Sea's use as a reservoir for irrigation drainage. The Act required that certain options be analyzed and required consideration of reduced inflows down to 800,000 acre-feet or less per year. Consideration of any option that included importation of water from the Colorado River was prohibited. Reporting requirements of the Act were met on January 27, 2000, when Secretary Babbit forwarded a draft EIS/EIR and several other reports to Congress. Since then, analyses have continued on options presented in those reports and on new options. The development and transmission of this report is not required by law.

This report provides a summary of the current status of the evaluation of alternatives currently under consideration. The primary purpose of the planning study was to evaluate possible methods of controlling the salinity and elevation of the Sea. The study also includes elements that address other issues at the Sea, such as high levels of nutrients. Fourteen alternatives providing a range of salinity and elevation control benefits and costs are presented in this report. For ease of presentation and understanding, alternatives were divided into the following categories:

- Salinity control alternatives

- Salinity and elevation control alternatives
- Causeway/barrier alternatives (the terms causeway and barrier are interchangeable in this report)
- Specialized diking alternatives

Methods to control salinity and elevation include pumping water out of the Sea with discharge to some remote location; pumping water out of the Sea with discharge to local desalting plants or evaporation ponds, possibly in combination with enhanced evaporation systems that would require disposal of salt residues near or within the Sea; and dividing the Sea through the construction of dikes so that one portion serves to concentrate and isolate salts from the remainder of the Sea.

Each alternative is discussed briefly below. The present value cost estimates for each alternative are also mentioned below. Present value cost includes the initial construction cost plus funds that would need to be set aside today to fund operation, maintenance, and energy over a 30-year period.

This status report makes no recommendation regarding future action relating to restoration of the Salton Sea. In fact, given that all of the alternatives identified to date are extremely expensive, it is difficult, if not impossible, to make any recommendation without a decision by Congress regarding the relative importance of the Sea in light of other pressing national priorities.

Salinity Control Alternatives

In-Sea Ponds — In-Sea solar ponds with in-Sea salt disposal would be constructed using standard dike construction procedures. With the solar evaporation pond process, a series of shallow ponds would be constructed. Because these systems reduce the evaporative surface of the Sea, they could be operated without having much effect on elevation. For the inflow conditions evaluated, the present value cost for in-Sea ponds could range from $2 billion to $3.5 billion.

On-Land Solar Ponds and Enhanced Evaporation Systems — On-land solar ponds would operate similar to the in-Sea ponds discussed above, but would be constructed entirely on-shore. The pond systems could be made smaller by adding ground-based evaporator units that operate similar to snowmaking equipment. A tower style enhanced evaporation system has also been considered. Since land-based systems would not reduce the evaporative surface of the Sea, but do require water withdrawals, they would tend to lower the elevation of the Sea by 5- to 10-feet below any reductions that occur because of reduced inflows. In addition, they need to be larger than in-Sea systems and generally do not control salinity as well under reduced inflows. For the inflow conditions evaluated, the present value cost for on-land ponds could range from $800 million to $1.3 billion; and with enhanced evaporation systems, the present value costs could range from $1.3 to 2.4 billion.

In-Sea Ponds Coupled With On-Land Ponds — This option would have less effect on elevation than on-land ponds alone, but would be less expensive than a full in-Sea system. For inflow conditions evaluated, the present value costs for this option could range from $1.6 billion to $2.4 billion.

Desalination — A desalination process using vertical tube evaporation technology is being considered that would use energy produced by waste steam from geothermal energy operations at the south end of the Sea. Desalination offers the advantage of producing replacement water so that the process would have little effect on elevation of the Sea. For the inflow conditions evaluated, the present value cost for desalination could range from $1.2 billion to $1.5 billion.

Salinity and Elevation Control Alternatives

Three types of alternatives that offer control of both salinity and elevation have been evaluated: (1) in-Sea ponds similar to those discussed above but combined with displacement dikes that reduce the evaporative surface of the Sea to help maintain elevation; (2) desalination coupled with displacement dikes; and (3) an import/export alternative with two variations, either pipelines to and from the Gulf of California or pipelines combined with open channels (which could be less expensive). The present value cost would depend on the inflow assumption used in the design. For either in-Sea ponds or desalination coupled with displacement dikes, the present-value cost could range from over $4 billion to nearly $9 billion. The present-value cost for import export systems could range from $15 billion to over $35 billion.

The cost estimates for most of the alternatives described above are higher than initially reported because the original estimate was based on a dike or berm design that did not consider hydraulic head difference.

Causeway Barriers

The "causeway" concept could be implemented in several configurations with multiple locations possible. Two locations are considered in this study to bracket the possible sites: a mid-Sea causeway and a north-Sea causeway. A causeway or barrier across the central, narrower middle area of the Sea could be used to divide the Sea into two separate water bodies. Dividing the Sea would allow the south basin to establish much lower and stabilized salinities while the north area would have much higher concentrations and eventually become hypersaline. The salinity in the south area could be reduced to well below ocean water levels (salinity values are expected to be about 10,000 mg/L), and salinity could be managed by flow control between the north and south or by the location of the barrier. The cost or ability of a causeway alternative to control salinity is not dependent on inflow. A preliminary estimate for the present value of the mid-Sea causeway ranges from $500 million to $1 billion, including funds set aside for 30-year maintenance of the facility. The cost

of the north-Sea causeway would be about 30 percent greater. These alternatives did not receive the same level of examination as the other alternatives and the wide spread in cost is attributable, to a large degree, on the preliminary nature of the analyses. Because of the promise these salinity control methods demonstrate, additional work is underway to further develop these designs and cost estimates.

Specialized Diking Sytems

Private interests have proposed two specialized diking alternatives that provide unique benefits. Both of these proposals include the construction of dikes in 10- to 15-foot water depths that would create brackish water impoundments, thus maintaining current shoreline levels (in one case, only in certain areas). For both proposals, the central portion of the Sea would become smaller and increase in salinity to a hypersaline condition. Current estimates for the cost of dike construction alone are $1.2 billion for the limited proposal and $2.8 billion for the proposal that involves a dike completely around the Sea. These costs are much larger than originally reported because the original estimates were based on diking designs that did not consider a hydraulic head difference. These new designs require construction methods that are more complicated and more costly.

1.0 INTRODUCTION

The Salton Sea is subject to rising salinity and high levels of nutrients. The Salton Sea Reclamation Act of 1998 directed that studies be conducted to evaluate the feasibility of possible actions to allow continued uses at the Sea. Following the passage of the Act, a study was initiated to develop alternative measures to address rising salinity and other problems at the Sea. In response to the Act, a draft environmental impact statement/environmental impact report (EIS/EIR) was released in January 2000. The January 2000 EIS/EIR underwent agency and public review in the spring of 2000, and public hearings were conducted. In light of public and agency comments, further internal reviews of the alternatives presented in the draft EIS/EIR, and various congressional requests, further analyses and design work has been performed.

1.1 Background and History of the Salton Sea

The present-day Sea was formed in 1905 by flooding on the Colorado River, which accidentally breached an irrigation control structure on the River allowing the entire River to flow into the Salton Basin for a period of about 18 months. Since then, agricultural drainage flows from the surrounding watersheds of Imperial, Coachella, and Mexicali Valleys and smaller contributions from municipal effluent and stormwater runoff have sustained the Sea. This is not the first time the Salton Basin has contained a lake, however. Historical evidence and geologic studies have shown that the Colorado River has spilled over into the Salton Basin on numerous occasions over the last thousand years, creating intermittent lakes. Evidence of an ancient shoreline suggests that Lake Cahuilla occupied the Basin until about 300 years ago. From 1824 to 1904, Colorado River flows flooded the Salton Basin no fewer than eight times. Each time, the lake went through a cycle of fresh to salty water as the lake eventually evaporated.

The Salton Basin extends from Banning, California, on the north to near the international border with Mexico on the south. At present, the Sea itself is about 35 miles long and 15 miles wide. With a current surface elevation at about 227 feet below mean sea level, the Sea has a maximum depth of about 50 feet. The Sea's salinity concentration is about 44,000 milligrams per liter (mg/L), which is about 25 percent saltier than ocean water. Recent annual inflows have been in balance with the water that evaporates from the Sea's surface. Inflows contribute about 4 million tons of salt each year to the Sea. Since the Sea is a terminal body of water (it has no outlet), salinity continues to rise as salts are left behind while water evaporates from its surface.

In the early 1900s, the Sea was relatively fresh and thereafter salinity fluctuated, but with a general increasing trend. By the 1950s through the 1970s, the salinity was near ocean salinity levels, and the Sea became an attractive recreation site. Private

land around the Sea was subdivided into lots, roads were bladed, and land speculation flourished. Fish were introduced into the Sea and several marine species have thrived. Tilapia, a fish commonly raised in fish farms, accidentally found their way into the Sea and are now the predominant fish species. The Sea is located along the Pacific flyway and provides habitat and seasonal refuge to many species of birds. A federal wildlife refuge, established at the south end of the Sea as a sanctuary for birds, provides viewing and educational opportunities. In 1956, a state recreation area was established along the east shore of the Sea to provide camping and boating access.

The Salton Sea fills a depression in a hot desert environment. Without an outlet, the natural progression of the Sea is for the water to become more saline over time and monumental efforts would have to be made to reverse that progression. As the Sea becomes saltier, the ecosystem will change in response to the more saline environment.

1.2 Past Studies

Rising salinity concentrations and the realization in the 1950s that eventually salinity levels would affect uses of the Sea led to studies of ways to manage salinity. An early investigative report was prepared in 1965, a Federal-State Reconnaissance Investigation was conducted in1969, and a Federal-State Feasibility Study was completed in 1974. A rising water surface elevation and consequent stabilization of salinity muted the call for implementation of salinity control actions at that time. In the mid-1980s, federal and state agencies again began looking at ways of controlling salinity. Public Law 102-575, passed in 1992, gave the Bureau of Reclamation (Reclamation) the authority to conduct salinity control studies. In response to that law, Reclamation and the Salton Sea Authority, which was established in 1993, published and provided a report to Congress in 1997 that contained an evaluation of a wide suite of alternatives that would address the salinity and elevation problems of the Sea.

1.3 The Salton Sea Reclamation Act of 1998

On November 12, 1998, Congress enacted Public Law 105-372, The Salton Sea Reclamation Act of 1998. This Act authorized the Secretary of the Interior to complete studies of options that

1. Permit the continued use of the Salton Sea as a reservoir for irrigation drainage,

2. Reduce and stabilize the overall salinity of the Salton Sea,

3. Stabilize the surface elevation of the Salton Sea,

4. Reclaim, in the long term, healthy fish and wildlife resources and their habitats, and

5. Enhance the potential for recreational uses and economic development of the Salton Sea.

The Act also directed the Secretary to consider inflow reductions that could result in total inflows of 800,000 acre-feet or less a year. Options that were to be considered included segregating the Sea into one or more evaporation sections, pumping water out of the Sea, augmenting inflows, combinations of various options, and other options as the Secretary deems appropriate. The Act was clear that no options that relied on importation of water from the Colorado River were to be included in the study. This is consistent with the Colorado River Compact, the Boulder Canyon Project Act, and the 1964 Supreme Court Decree in Arizona vs. California which limit beneficial use of Colorado River water to domestic and irrigation purposes. A copy of the Salton Sea Reclamation Act is included as Attachment A.

On January 27, 2000, then Secretary of the Interior Babbitt transmitted certain reports to Congress as specified in the Act. Among these reports was an EIS/EIR, which was distributed for public review and comment. Comments were numerous and substantial. Consequently, subsequent to the publication of those reports, work on alternative formulation, further development of costs, and analysis of additional options have continued.

1.4 Current Study Efforts

A number of alternative plans have evolved over the past couple of years in response to new information and the results of prototype testing. These new concepts are being evaluated for technical adequacy and cost. Additional alternatives have also recently been suggested by private interests for inclusion as viable ways of meeting study goals. These alternatives are being formulated and costs are being developed. Pilot projects are continuing to be conducted to refine and improve the alternatives. Desalination has often been considered as a potential salinity control method, but high cost has prevented it from serious analysis. However, a desalination technology that would take advantage of waste steam from geothermal activities at the south end of the Sea is now being evaluated. A pilot project is planned to determine if this desalination process could be cost effective. A new pilot project on biological treatment methods has also been initiated. This project will test methods of removing nutrients in an effort to reduce eutrophic conditions in the Sea.

2.0 OTHER ACTIONS THAT MAY AFFECT THE STUDY

Efforts to formulate solutions to the salinity and water elevation problems are not the only actions that could affect conditions at the Sea. Some of these other actions—being pursued under other initiatives and by other parties—could also influence the effectiveness of salinity/elevation control projects.

- Constructed Wetlands Projects—Several pilot wetlands have been constructed on the New and Alamo Rivers. Expansion of constructed wetlands projects in Imperial Valley could improve the quality of water flowing into the Sea, but would also cause some reduction of inflows.

- Total Maximum Daily Load Program—This program, being implemented by the Regional Water Quality Control Board, is designed to provide a long-term reduction in key constituents in waters that flow into the Sea. While improving the quality of water that flows into the Sea would be beneficial, it is also possible that TMDL efforts could result in some flow reductions.

- Mexicali Wastewater System Improvements—Mexico has been pursuing construction of projects to improve the collection and treatment of wastewater in Mexicali. These projects would improve the quality of water flowing across the international border. Since the Mexicali Valley is short of water, it is possible that improving the quality of wastewater could make such water attractive for uses in Mexico and would, therefore, no longer be discharged to the New River.

- Agriculture to Urban Water Transfers—Any transfer of agricultural water for urban use outside of Imperial Valley could affect salinity and elevation control measures.

3.0 INFLOWS TO THE SEA

Inflow into the Sea is highly dependent upon agricultural conditions in the Imperial Valley. Weather, commodity prices, conservation measures, and crop rotations are among the factors that could change the amount of water flowing into the Sea. There is currently much interest in transferring agricultural water to municipal uses. If such transfers occur, they could also affect the quantity of water flowing into the Sea. Other actions that could affect Sea inflow include some of those actions listed in section 2.0 above. In addition, reductions in surplus Colorado River flows to Mexico could, in turn, affect New River flows back across the border. It is also possible that the Coachella Valley groundwater management program would affect inflows. The collective effects of such actions would likely reduce future inflow to the Sea.

Recognizing that it is not likely that the inflow to the Sea will remain at recent levels, the Salton Sea Reclamation Act of 1998 directed that the Salton Sea study consider reductions in inflows to a level of 800,000 acre-feet or less a year. It is difficult, however, to accurately predict what future inflows might be and at what rate future inflows might decline. Consequently, several inflow assumptions were made when evaluating salinity control alternatives.

For most alternatives, assumptions regarding inflow reductions and timing are critical. For ecological reasons, 60,000 mg/L has been identified as a critical peak salinity value. Salinity peaks greater than 60,000 mg/L could make an alternative unable to meet fish preservation goals. If salinity exceeds 60,000 mg/L, the assumption is that fish would not survive and the fishery would need to be reestablished once the salinity returned to lower levels. For some inflow conditions, some alternatives have salinity peaks greater than 60,000 mg/L.

For the purposes of this report, three inflow assumptions were used to evaluate the performance of alternatives:

- **Inflow Scenario 1** — Assumes that an average 1,230,000 acre-ft per year inflow would persist until 2018, after which inflow would be reduced by an average of between 5,000- and 15,000-acre-ft per year until the annual inflow is 230,000 acre-ft per year less than the starting value, so that the long-term future inflow is 1,000,000 acre-ft per year.

- **Inflow Scenario 2** — Assumes that the inflow to the Sea would be reduced by an average of between 5,000- and 15,000-acre-ft per year starting in 2003 until the annual inflow is 230,000 acre-ft per year less than the starting value, so that the long-term future inflow is 1,000,000 acre-ft per year.

- **Inflow Scenario 3** — Assumes that the inflow to the Sea is reduced by an average of between 15,000- and 25,000-acre-ft per year starting in 2003 until

the annual inflow is 430,000 acre-ft per year less than the starting value, so that the long-term future inflow is 800,000 acre-ft per year.

For each inflow scenario, a large number of possible future inflow sequences are used in a Reclamation simulation model known as the Salton Sea Accounting Model. The method of running multiple flow sequences is a standard hydrologic procedure known as a stochastic process. For each flow sequence, the average rate of inflow decrease varies within the ranges listed above and other factors also vary from year to year so that realistic flow sequences can be used as input to the model. The average model results for all flow sequences are used in the analysis of the alternatives in this report.

4.0 STRATEGY FOR ALTERNATIVE DEVELOPMENT

Alternatives presented here have evolved through a process that has involved planning studies, engineering analysis, scientific oversight, and environmental reviews. As stated above, the amount of salt that would have to be removed from the Sea would depend on future inflows. With reduced inflow, the Sea would begin to shrink and salts would be concentrated. If the inflow continues to be reduced in the future, greater amounts of salt would need to be removed to meet the 1998 Act goals.

To address the rising salinity of the Sea, a surrogate outlet must be established. Three basic methods have been considered:

- Pump water out of the Sea and discharge it to some remote location. This could be accomplished by combinations of pipelines and canals to the ocean, the Gulf of California, or some other remote location.

- Pump water out of the Sea and discharge it to local desalting plants or evaporation ponds, possibly in combination with processes that enhance the rate of evaporation. This would require disposal of salt residues near or within impoundments in the Sea.

- Divide the Sea so that one portion acts as a receptor for the discharge from another portion. Through the construction of dikes, salts would be allowed to concentrate in one area while salinity levels in the remaining area would be controlled.

A myriad of alternatives have been identified over the years to provide one or another of those outlet scenarios, some of which also help control the elevation of the water surface of the Sea. Many of the alternatives have been eliminated from consideration for various reasons; the ones presented in this report were selected for additional analysis. There is, however, a disparity in the level of analysis of various alternatives. Some have received detailed analyses, while others have been explored at a more preliminary level. Although information presented here is considered reliable, additional work would be required to ensure that each alternative has received comparable analysis.

A modular strategy has been used for the development of many of the salinity control alternatives. This strategy has allowed for the development of salinity control alternatives that can be increased in capacity to respond to changes in inflow. A modular approach allows for the planning and design of a base system that works if recent inflow conditions extend into the future. The system can then be expanded if inflows decrease in the future. In such a case, alternatives could be sized to respond to these varying inflows by selecting the appropriate number of modules that would be needed.

The modular strategy involves two basic types of modules for salinity control:

- Salt removal modules
- Salt disposal modules

Each salt removal module would remove about 1 million tons of salt per year from the Sea. The quantity of salt removed by a single module would increase if the salinity in the Sea should increase in the future. The salt products that would be extracted from the Sea would be stored in salt disposal modules. Therefore, for every salt removal module, one salt disposal module would also be required.

The inflow of water to the Sea has typically contained about 4 million tons per year. Some salts precipitate as they enter the Sea and, therefore, the amount of salt accumulating in the body of water is less than 4 million tons per year. During a transition period, when inflow is decreasing, a salinity control system would need to remove 4 million tons per year (to remove inflowing salt) plus an additional 4 to 8 million tons to avoid concentration of salt in the shrinking Sea. Once inflow stabilizes and a steady-state elevation is achieved, salt removal could be reduced to about 4 million tons of salt per year.

For salt disposal, either on-land or in-Sea, the disposal options involve crystallizing salts in an impoundment. Initially, saturated brines would be conveyed to shallow ponds that would be constructed using earthen berms. Salts would crystallize in the ponds forming a rock salt similar to pea gravel that would cause the bottom of the pond to raise over time. As the pond bottom rises, berms containing the pond would have to also be raised. After about 30 years, the height of the berms would be about 25 feet. From the ground, the disposal facility would look like a large desert landfill. Salt disposal modules on land and on flat terrain would be the least expensive salt disposal method. Not all alternatives presented below would require construction of disposal modules.

Impoundments, such as those for either the salt removal or disposal components of solar pond systems, have the potential for accumulation of contaminants. Although there is currently no indication that there would be contaminant accumulation issues in the solar pond systems discussed later, a study is currently underway—using biological and water quality samples gathered at the solar pond pilot projects—to evaluate potential human health and ecological risk factors associated with solar pond systems at the Salton Sea.

At the current stage of alternative development, specific locations where facilities can be sited have not been identified. Instead, a siting analysis was conducted to identify areas that would be generally suitable for locating salt removal and disposal facilities. About 60 square miles of suitable area have been identified for possible siting of facilities that would use enhanced evaporation salt removal methods, and more than 400 square miles have been identified as suitable for on-land solar pond siting. More than 100 square miles have been identified as suitable for on-land salt disposal.

5.0 DESCRIPTION OF ALTERNATIVES

The removal and disposal techniques have been grouped into the following general categories of alternatives:

- Salinity control alternatives
- Salinity and elevation control alternatives
- Causeway/barrier alternatives
- Specialized diking alternatives

Each of these groups of alternatives is discussed below. In addition, the salinity control and salinity and elevation control alternatives would include a number of other elements that are discussed in this section. Other elements that could provide ecological or recreational benefits are also discussed.

5.1 Salinity Control Alternatives

The salt removal and disposal methods, along with other elements, have been grouped into six salinity control (SC) alternatives. The alternatives vary by the method of salinity control—solar ponds, enhanced evaporation systems (EES), and vertical tube evaporation (VTE)—and the location—within the Sea or on land. The number of salt removal and disposal modules required for some alternatives will depend on the inflow conditions.

Salinity control alternatives currently being studied are as follows:

- **SC 1: In-Sea Ponds** — In-Sea solar ponds with in-Sea terraced salt disposal would be constructed using standard dike construction procedures. With the solar evaporation pond process, a series of shallow ponds would be constructed for each module (Figure 1). Salton Sea water would be pumped to the first pond and flow by gravity through successive and increasingly more saline ponds. The evaporative process would produce brine saturated with salts in the last pond that would be pumped to the disposal module. Depending on inflow condition, eight to twelve removal and disposal modules would be needed. Each set of removal and disposal modules occupy 5.5 square miles. Since

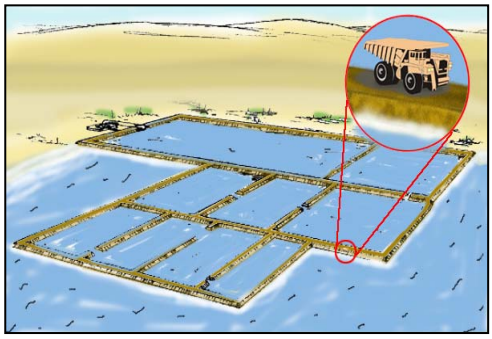

Figure 1. Sketch of in-Sea solar ponds.

in-Sea ponds reduce the surface by displacing water of the Sea, this alternative would have little effect on the elevation of the Sea.

- **SC 2: Ground-Based Enhanced Evaporation Systems** — The EES process involves spraying water in the air to accelerate the rate at which water evaporates. Ground-based, turbo-enhanced blower units (Figure 2) that operate similar to snowmaking and agricultural spraying equipment would be used for the spray process. These would be used in conjunction with a series of evaporation ponds that would be about half the size of those described for Alternative SC 1, but would be located on land instead of within the Sea. After Salton Sea water passes through the EES units and ponds, the remaining concentrated brine would be piped to an on-land terraced salt disposal facility or facilities. Twelve to 20 modules, depending on inflow condition, would be needed. Since this system would involve removing water from the Sea, it would cause a reduction in the elevation of the Sea.

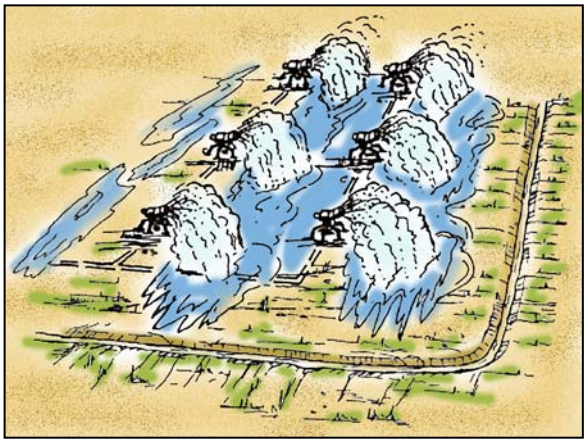

Figure 2. Sketch of ground-based EES.

- **SC 3: Tower EES** — An on-land EES tower configuration would be constructed with in-line showers and an on-land salt disposal facility. A tower system that would spray water from nozzles along in-line showers would be used to evaporate the water (Figure 3). The number of tower EES modules required would be the same as the requirements for Alternative SC 2 for all inflow scenarios. As with Alternative SC 2, this would cause some reduction in the elevation of the Sea.

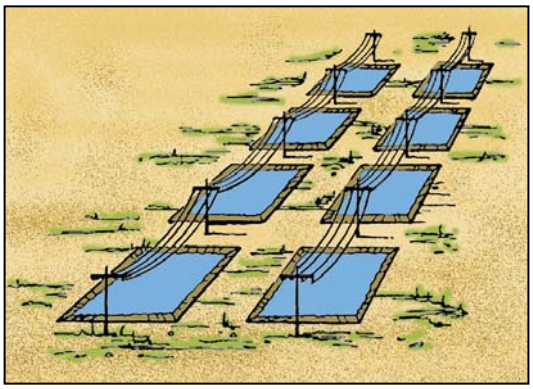

Figure 3. Sketch of tower EES.

- **SC 4: In-Sea and On-Land Ponds** — This alternative would involve the construction of a combination of in-Sea solar ponds with in-Sea salt disposal, and on-land solar ponds with on-land salt disposal facility. Up to eight

in-Sea modules and eight on-land modules, depending on inflow condition, would be needed. Combining in-Sea and on-land ponds (Figure 4) would have less effect on elevation than on-land construction alone and would be cheaper than all in-Sea construction.

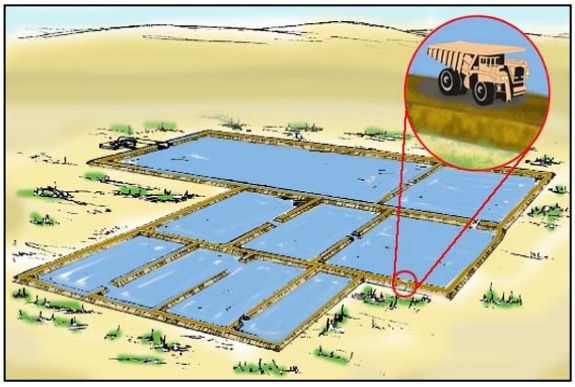

Figure 4. Sketch of on-land solar ponds.

- **SC 5: On-Land Ponds** — On-land solar ponds would be constructed along with on-land salt disposal facilities. The system would operate the same as the in-Sea system discussed for Alternative SC 1. The number of modules required would be the same as the requirements for Alternatives SC 2 and SC 3 for all inflow scenarios. As with Alternative SC 2, this would cause some reduction in the elevation of the Sea, but on-land construction would be cheaper than for the in-Sea modules of Alternative SC 1.

- **SC 6: VTE Desalination** — One or two desalination plants would be constructed at the south end of the Salton Sea using vertical tube evaporation technology. The plants would use waste steam from geothermal energy operations in the area. Although not strictly modular, the costs have been presented assuming the plants could be scaled to be comparable to other alternatives. Desalination offers the advantage of producing replacement water so that the process would have little effect on elevation of the Sea. For cost purposes, it has been assumed that salt brine would be disposed in an on-land facility similar to that for other alternatives such as SC 2, 3 and 5. However, it is possible that brine could be injected into the geothermal formation.

The salinity control alternatives were evaluated using the Salton Sea Accounting Model for each of the three assumed inflow scenarios. For each assumed inflow scenario, a large number of hypothetical (stochastic) sequences of future inflows were modeled for the no project case and for each alternative. Figures 5a and 5b depict future salinities under inflow scenarios 1 and 2 for each of the alternatives. The projected mean simulation results for salinity and elevation for each alternative are reported on Table 1. In addition, Table 1 shows how many salinity control and disposal modules would be required for each alternative, either on land or within the Sea. The mid-Sea and north-Sea barriers require no disposal modules, and the mid-Sea barrier salinity values for flow scenarios 1 and 2 shown on Figures 5a and 5b are for the south basin.

Table 1 also provides net present value cost estimates that are displayed graphically in Figure 6. Net present value (PV) costs shown in Table 1 represent the money that would be needed today to fund the construction of the project and provide for 30 years of operation, maintenance, energy, and replacement (OME&R) of the system and its components. Thirty years is used as a planning horizon to provide an equal basis of comparison. A range of costs has been developed for each alternative. The best estimate is shown in Table 1 and the range is displayed on Figure 6. Factors affecting cost assumptions include slope and height of berms and dikes; the unit cost factors for items such as fill, excavation and slope protection; and land costs.

As shown on table 1, all salinity control alternatives described here result in a reduced water surface elevation and, therefore, exposes lake-bottom sediments. When dried, these exposed sediments become susceptible to wind erosion and, at times, may result in significant air quality impacts. The degree of these impacts are not known. However, studies are presently underway to better understand the potential air quality effects of these exposed sediments.

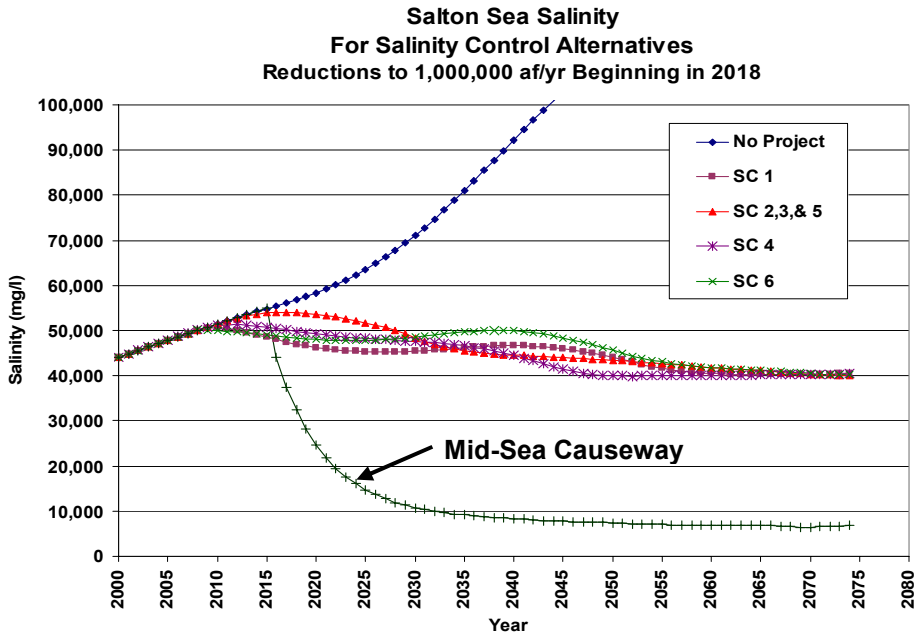

Figure 5a. Salton Sea salinity for SC projects and mid-Sea causeway for inflow scenario 1.

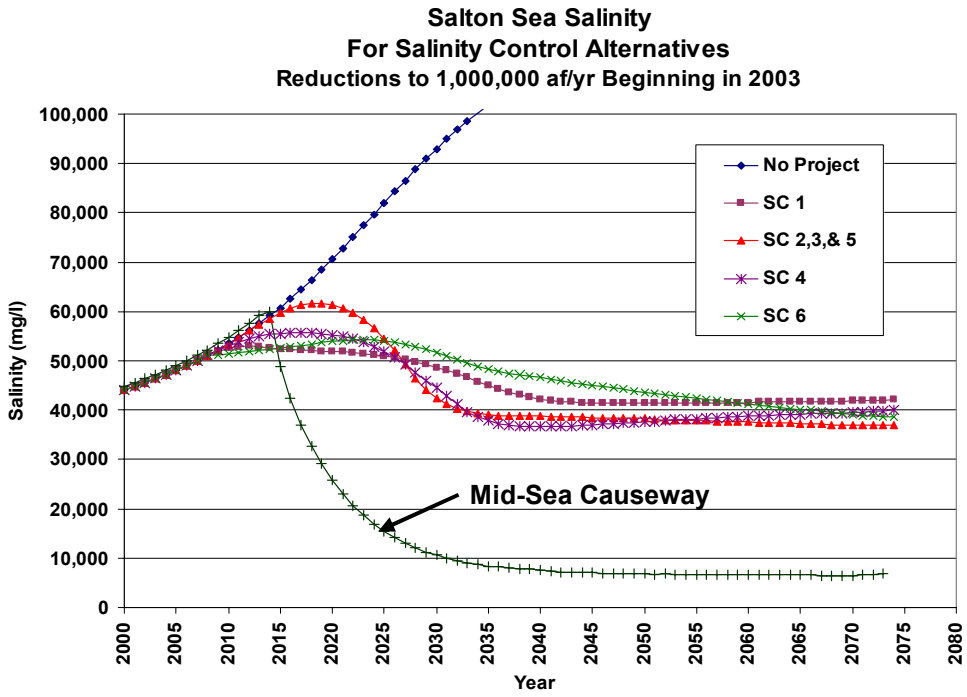

Figure 5b. Salton Sea salinity for SC projects and mid-Sea causeway for inflow scenario 2.

Table 1. Summary of SC Alternatives Performance and Cost Data

Alternative	Salt Removal/Disposal		Salinity (1000 mg/L)			El (ft msl)		Cost ($M)
	Modules	Area (ac)	Peak	2030	2050	2030	Change[1]	PV[2]
Inflow Scenario 1: Inflow = 1.23 MAFY Until 2018 and Then Decreases to 1.0 MAFY								
No Project	NA	NA	NA	71	112	-236	-9	NA
SC 1. In-Sea Ponds	8	28,276	51	45	44	-235	-8	$2,000
SC 2. Ground-Based EES	12	33,028	54	48	43	-247	-20	$1,510
SC 3. Tower EES	12	24,436	54	48	43	-247	-20	$1,340
SC 4. In-Sea & On-Land Ponds	5 & 5	35,579	51	48	40	-240	-13	$1,600
SC 5. On-Land Ponds	12	42,076	54	48	43	-247	-20	$820
SC 6. VTE Desalination	8	5,976	50	49	46	-238	-11	$1,200
Inflow Scenario 2: Inflow Decreases to 1.0 MAFY Beginning in 2003								
No Project	NA	NA	NA	93	120	-242	-15	NA
SC 1. In-Sea Ponds	10	35,068	53	49	41	-241	-14	$2,830
SC 2. Ground-Based EES	16	42,408	62	42	38	-253	-26	$1,960
SC 3. Tower EES	16	30,952	62	42	38	-253	-26	$1,740
SC 4. In-Sea & On-Land Ponds	6 & 6	47,845	56	44	38	-248	-21	$2,130
SC 5. On-Land Ponds	16	54,472	62	42	38	-253	-26	$1,050
SC 6. VTE Desalination	10	7,168	54	52	44	-244	-17	$1,470
Inflow Scenario 3: Inflow Decreases to 0.8 MAFY Beginning in 2003								
No Project	NA	NA	NA	147	208	-251	-24	NA
SC 1. In-Sea Ponds	12	43,246	60	55	37	-251	-24	$3,460
SC 2. Ground-Based EES	20	52,226	77	55	40	-262	-35	$2,410
SC 3. Tower EES	20	37,906	77	55	40	-262	-35	$2,140
SC 4. In-Sea & On-Land Ponds	8 & 8	55,064	65	48	38	-258	-31	$2,440
SC 5. On-Land Ponds	20	67,306	77	55	40	-262	-35	$1,270
SC 6. VTE Desalination	10	9,746	73	71	46	-254	-27	$1,520

[1] Change from recent past elevation of -227' msl.
[2] Total Present Value (PV) Best Estimate Cost

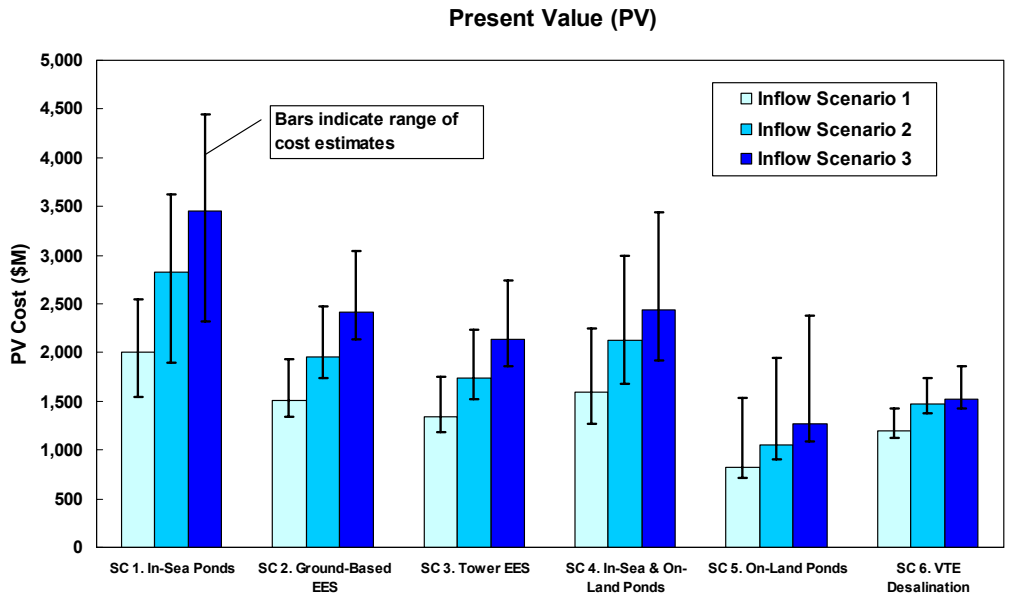

Figure 6. Present value of salinity control alternatives.

5.2 Salinity and Elevation Control Alternatives

Three alternatives that not only control salinity but also have the ability to control elevation (SEC) have been formulated from the previously mentioned components:

- **SEC 1: In-Sea Ponds with Displacement Dikes** — In-Sea pond/dike systems that reduce surface area and that can also be used to create solar ponds that remove salt from the Sea.

- **SEC 2: VTE Desalination With In-Sea Displacement Dikes** — Construction of a desalination plant to remove salts coupled with in-Sea dike systems that reduce surface area and can be used for disposal of brines from the desalting operation.

- **SEC 3: Import/Export** — Import/export pipelines would convey water from the Salton Sea to the Gulf of California and return water from the Gulf to the Sea. Pumping water from the Sea removes salt laden water and thus reduces the amount of salt and salinity in the Sea. Using other pipelines, water would then be pumped into the Sea to help maintain elevation. The water surface elevation of the Salton Sea would depend on a balance between water coming into the Sea and water leaving the Sea. Natural inflow, precipitation, and import quantities would be balanced by evaporation and export quantities. Likewise, salinity in the Sea would depend on the balance of salt coming in and salt going out. SEC 3 has two options: SEC 3a would have pipelines to pump water in both directions, and SEC 3b would use pipelines combined with unlined channels.

The projected performance of future salinity and elevation, along with total PV cost estimates for each of these alternatives, for a range of inflows to the Sea, are shown in Table 2 and on Figures 7a, 7b, and 8.

The development of range of cost values for salinity and elevation control is under development and not available at this time.

In addition to alternatives discussed above, another alternative is being developed that would control salinity and elevation in the north end of the Sea. It would involve construction of a dam across the middle of the Sea to retain water and control salinity in the north portion of the Sea and allow the south end of the Sea to become hypersaline with reduced elevations. A channel around the shoreline from the south end of the Sea would convey water from the New and Alamo Rivers to just north of the barrier. Preliminary cost estimates for this alternative suggest that it could cost between $1 billion and $2.5 billion, depending on the method of construction.

Table 2. Summary of SEC Alternatives Performance and Cost Data

Salinity and Elevation Control (SEC) Alternative	In-Sea Diked Area (sq mi)	VTE Desal.	Import/Export		Salinity (1000 mg/L)			El (ft msl)		Cost Estimates ($M)	
		Capacity (Mt/yr)	Import (KAFY)	Export (KAFY)	Peak	2030	2050	2030	Change	Capital[1] ($M)	PV[2] ($M)
Inflow Scenario 1: Inflow = 1.23 MAFY Until 2018 and Then Decreases to 1.0 MAFY											
SEC 1. In-Sea Ponds & Dikes	103	NA	NA	NA	55	42	40	-225	2	$4,400	$4,500
SEC 2. VTE & In-Sea Dikes	77	6	NA	NA	55	42	45	-224	3	$3,600	$4,200
SEC 3a. Imp/Exp Pipelines	NA	NA	1,690	1,410	55	46	47	-226	1	$31,600	$33,000
SEC 3b. Imp/Exp Pipes/Canals	NA	NA	1,690	1,410	55	46	47	-226	1	$13,400	$15,400
Inflow Scenario 2: Inflow Decreases to 1.0 MAFY Beginning in 2003											
SEC 1. In-Sea Ponds & Dikes	121	NA	NA	NA	62	47	36	-231	-4	$5,100	$5,300
SEC 2. VTE & In-Sea Dikes	90	7	NA	NA	61	44	42	-229	-2	$4,200	$4,900
SEC 3a. Imp/Exp Pipelines	NA	NA	1,710	1,410	61	46	47	-230	-3	$31,700	$33,100
SEC 3b. Imp/Exp Pipes/Canals	NA	NA	1,710	1,410	61	46	47	-230	-3	$13,400	$15,500
Inflow Scenario 3: Inflow Decreases to 0.8 MAFY Beginning in 2003											
SEC 1. In-Sea Ponds & Dikes	198	NA	NA	NA	74	47	26	-235	-8	$8,400	$8,700
SEC 2. VTE & In-Sea Dikes	141	10	NA	NA	68	43	39	-231	-4	$6,500	$7,500
SEC 3a. Imp/Exp Pipelines	NA	NA	2,080	1,590	68	50	51	-230	-3	$36,200	$37,800
SEC 3b. Imp/Exp Pipes/Canals	NA	NA	2,080	1,590	68	50	51	-230	-3	$15,400	$17,700

[1] Capital cost of salinity and elevation control.

[2] Total present value (PV) of salinity and elevation control and other restoration elements.

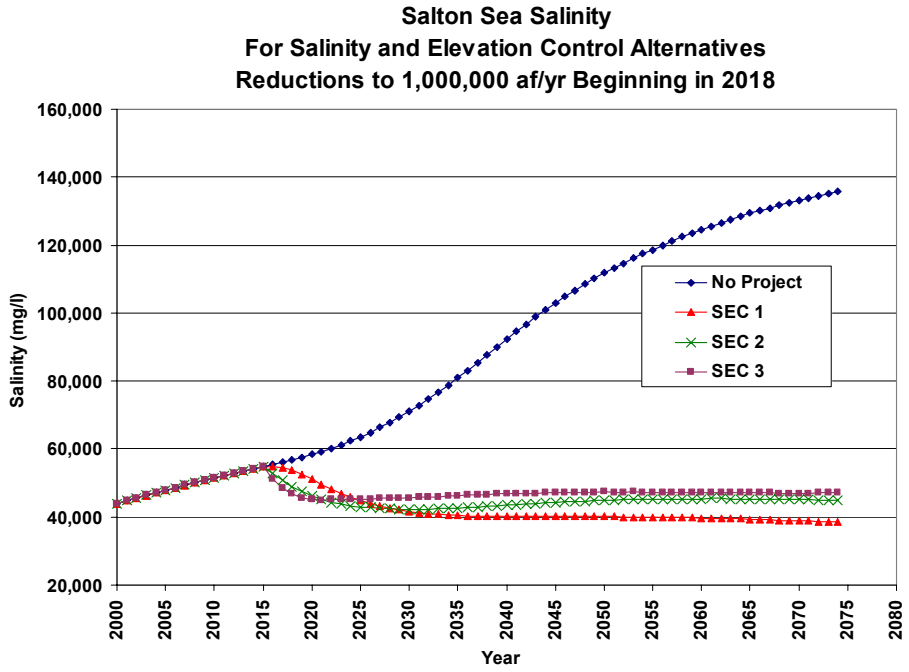

Figure 7a. Salton Sea salinity for SEC projects for inflow scenario 1.

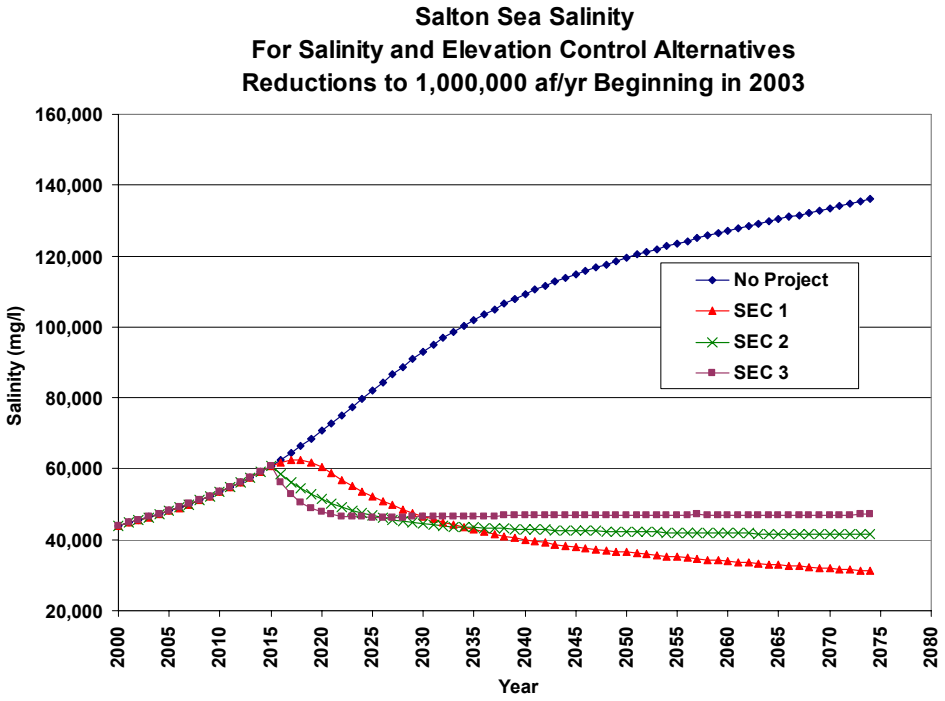

Figure 7b. Salton Sea salinity for SEC projects for inflow scenario 2.

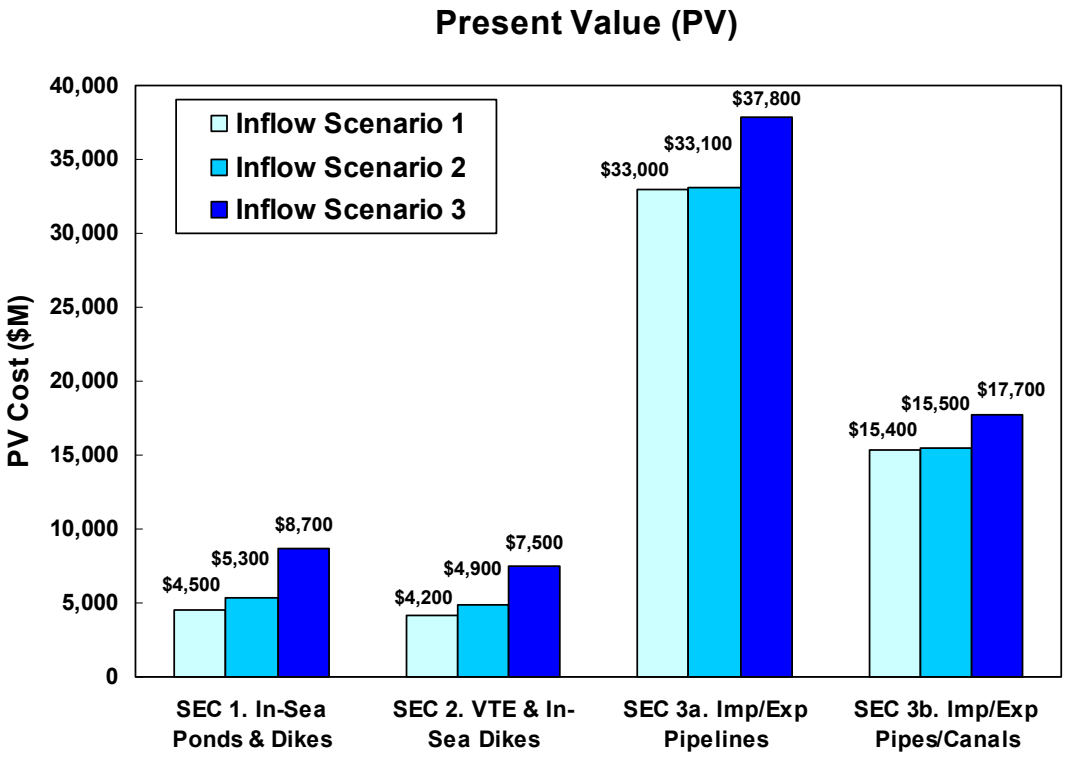

Figure 8. Present value of salinity and elevation control alternatives.

5.3 Causeway Concepts

A causeway concept is being considered with multiple locations possible. Two locations are discussed below: a mid-Sea causeway and a north-Sea causeway. This concept involving causeways has not received the same degree of evaluation as the other concepts in this report.

Mid-Sea Causeway. A causeway or barrier across the central, narrower middle area of the Sea could be used to divide the Sea into two separate water bodies. Dividing the Sea in this manner would create a two-celled solar pond system out of the Salton Sea itself. This would allow for a distinct division in the salinity of the Sea. The south basin would establish much lower and stabilized salinities and the north area would have much higher concentrations. The northern area would become the terminal location of dissolved salts and north concentrations would increase to the point where salt crystals would eventually begin to precipitate from solution. Dissolved salts would migrate to the northern area through the displacement of salty water from the southern basin to the north basin by the inflows from the Imperial Valley and Mexico. The salinity in the south area would be reduced to well below ocean water levels (salinity values are expected to be about 10,000 mg/L), while the salinity in the north basin would climb rapidly. The final location of a mid-sea causeway or barrier could be adjusted to accommodate expected inflow conditions

or to accommodate other considerations. A fishery in the south basin would be preserved. A fishery in the north basin would not survive. The water surface elevation would be approximately the same on both sides of the mid-sea barrier or causeway. Two causeway locations have been selected to illustrate the range of possible locations (Figure 9). The mid-Sea location would probably be the least expensive. Preliminary estimates for the present value of the mid-Sea causeway range from $500 million to $1 billion, including funds set aside for 30-year maintenance of the facility. Projected future values of salinity in the south basin are shown in Figures 5a and 5b for inflow scenarios 1 and 2.

North-Sea Causeway. This option would be similar to the mid-Sea causeway, except that the dike would be located farther north (Figure 9). The length of the north-Sea causeway would be about 25 percent longer than the mid-Sea and it is estimated that it would cost about one-third more to construct and maintain this

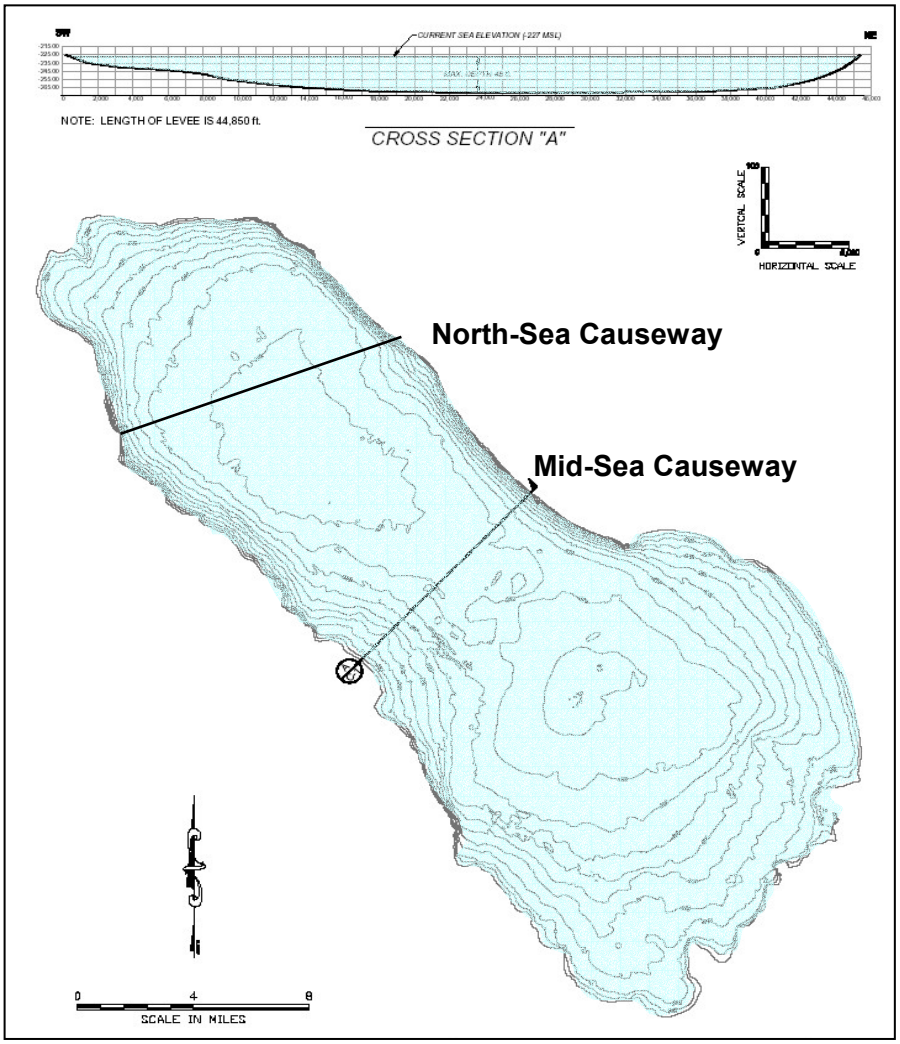

Figure 9. Mid-Sea and north-Sea causeway concepts.

option than the mid-Sea causeway. The benefit of placing the causeway or barrier farther north is that a marine environment could more easily be maintained in a much larger south basin. The north-sea location would result in salinities in the south basin close to present conditions (under inflow scenario 1) but would result in salinities above 60,000 mg/L under inflow scenarios 2 and 3. The location of the north-sea barrier could be moved further south to an intermediate position between the locations shown in Figure 9. This would provide for salinities below 60,000 mg/L but still above 40,000 mg/L under inflow scenarios 2 and 3. A fishery in the south basin would be preserved. A fishery in the north basin would not survive. The water surface elevation would be approximately the same on both sides of the north-sea causeway or barrier.

Continuing Investigation of Causeway Options. These options appear to warrant further investigation, and work is being done regarding the optimal location, design specifications, and cost of these salinity control methods.

5.4 Specialized Diking Alternatives

Two proposals have been presented that use dikes to create impoundments around the Sea that provide some benefits that may not be equivalent to benefits provided by the other alternatives. Each is discussed below.

Pacific Institute Proposal for Diked Impoundments. In October 2001, the Pacific Institute proposed a solution to the problems at the Salton Sea that would provide environmental and recreational benefits at the Sea, but would not control salinity or preserve the fishery within the main body of the Sea itself. The Pacific Institute for Studies in Development, Environment, and Security is an independent, non-profit center created in 1987 to conduct research and policy analysis in the areas of environment, sustainable development, and international security. The proposal was posted on their website at http://www.pacinst.org/salton_sea.html.

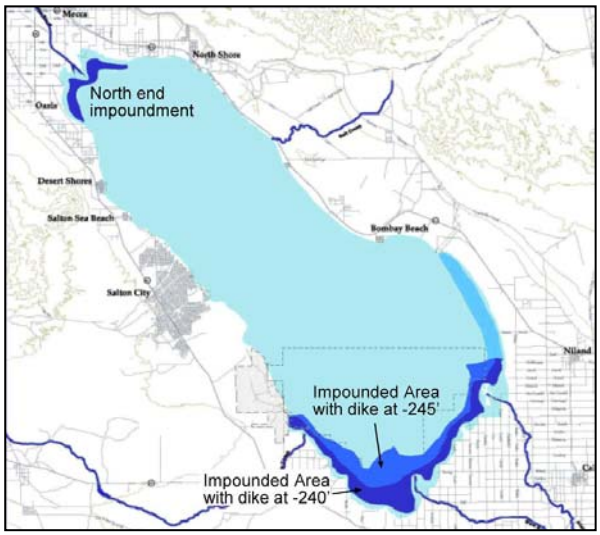

Figure 10. Impoundment locations in Pacific Institute proposal.

This proposal would involve constructing dikes within the Sea near the north and south shores (Figure 10) to capture inflows and stabilize the water surface elevation

at –230 feet. Water above elevation –230 feet would flow via gravity through pipes in the dikes to the main body of the Sea. Such a gravity fed system requires a reduction in inflows. The impounded north and south shore areas would transition to brackish, estuarine conditions. Actual salinity in these impounded areas would depend on several factors, including the volume and salinity of inflows (salinity of the Alamo and New rivers is currently about 2,900 mg/L) and the total volume of the impounded area. The Pacific Institute estimated that the full proposal could cost $400 million, based on cost factors from an earlier Salton Sea Restoration Project report; however, a more recent estimate of the present value of the full dike construction program is $1.2 billion. This more recent estimate involves 45 miles of dike most of which would be constructed in 15 feet of water. This figure compares favorably with the estimate of 92 miles of dike proposed with the U.S. Filter proposal.

U.S. Filter Proposal for Shallow Water Shoreline Dike Integrated with Desalination, Water Transfer, Seabed Reclamation, and Salt Storage. Under this concept, a dike would ring the Sea separating better quality water along the shoreline from hypersaline water in the center. U.S. Filter's proposal included a desalination plant at the north end of the Sea that would produce approximately 500,000 acre-feet per year of water with low salinity (< 150 mg/L total dissolved solids). This water would be transferred to urban water users via the Coachella Canal and the Colorado River Aqueduct. The concentrate from the Reverse Osmosis (RO) plant would be returned to the central Sea. Figure 11 illustrates the U.S. Filter proposal.

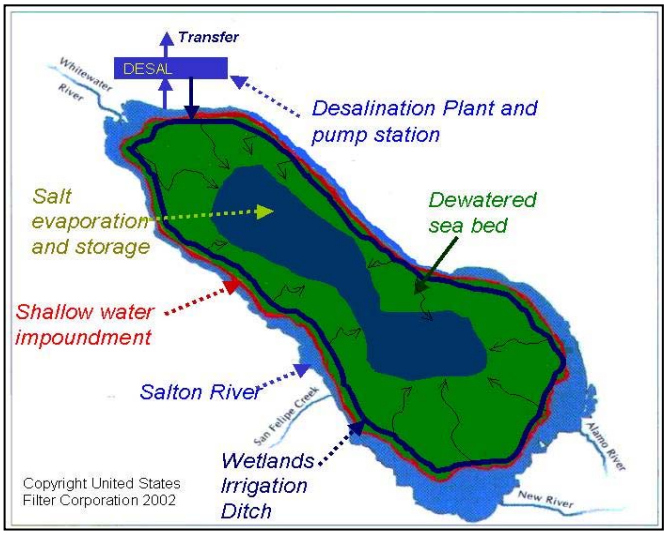

Figure 11. Sketch of U.S. Filter Corporation concept.

U.S. Filter estimated that the costs of dikes for this option would be about $600 million. However, this estimate was based on cost factors from several years ago for dikes that were not designed to have differences in water surface elevation from one side to the other. In addition, U.S. Filter estimated that the length of dikes would be about 80 miles. Current design concepts for impervious dikes that have differential water surfaces would be more costly. In addition, the actual length of dikes along the shoreline would be 95 miles if constructed in 10 feet of water, and 92 miles if constructed in 15 feet of water. Therefore, Reclamation estimates the

current dike costs alone for the U.S. Filter Corporation proposal, without the treatment plant, are $1.9 billion if constructed in 10-feet of water and $2.6 billion if constructed in 15-feet of water.

6.0 COMMON STUDY ELEMENTS

It is recognized that long-term health of the Sea could depend upon eutrophication and water quality problems other than salinity. To address those concerns as well as other areas that contribute to the attractiveness of the Sea, other elements that could be included with any alternative were formulated. These elements are designed to address the study's multiple goals and objectives when combined with salt removal and disposal actions. These elements are designed to help stem further degradation of the Sea and may be supplemented by later actions developed under the adaptive management efforts of the Salton Sea. Other possible actions that could be included, but have not yet been fully developed, are also discussed below.

The other elements that could be included with all alternatives are the following actions:

- **Wildlife disease control**—An integrated approach would be implemented to reduce the incidences of wildlife disease at the Sea. The program would include environmental monitoring, disease surveillance and response, and scientific investigations of disease ecology. Wildlife rehabilitation would also be provided because of the avian botulism problem that affects pelicans at the Salton Sea.

- **Created wetlands**—A wetland habitat would be created to preserve snag habitat used by wildlife in the northern portion of the Sea.

- **Recreation and public information**—The recreational enhancements program would provide funding for improvements to recreational facilities around the Sea. Specific improvements would be designed to meet future needs, but may include a visitor center or interpretive boards at salinity control facilities, improvements to access areas or creation of new access points associated with these facilities, upgrades to public use areas, and public outreach material.

- **Continuing work on eutrophication assessment and control measures**—Eutrophication, the abundance of organic material in the Salton Sea, has been recognized as one of the major factors affecting recreation and fish and wildlife resources. A number of possible treatments have been identified that could help reduce eutrophication. These include biological treatments, alum treatment, treatment wetlands, adding polymers to increase the settling rate of fine particles in the tributaries, reducing loading to tributaries, limiting total maximum daily loads, and managing the fisheries. A pilot project is underway to determine if biological treatments could be effective.

- **Shoreline cleanup**—The shoreline cleanup program would be designed to improve aesthetics and reduce odors around the Salton Sea. The program would include a fish recovery system and cleanup program to remove dead fish along the shoreline, particularly in areas of likely public exposure. Removing the dead fish would reduce noxious odors and nutrient load within the Sea, creating a healthier environment for the public and the fishery.

- **Fishery management**—Two elements of fishery management are being investigated at the Salton Sea: a fish hatchery and fish population control. The fish hatchery would be an interim measure to ensure the continuance of a sport fishery and a food base for birds that eat fish. The hatchery would be designed to preserve the genetic stock of key sport fish in the Sea that can tolerate high levels of salinity. Fish population control may include harvesting certain species at key times during the year to avoid overcrowding.

For planning purposes, it has been assumed that each of these elements would be included in each of the alternatives. Table 3 shows the planning level costs that have been assigned to each element. These costs have been included with the full alternative costs shown in Tables 1 and 2.

Table 3. Preliminary Appraisal-Level Cost Estimates for Other Project Elements

	Programs Included With All Alternatives							
	Program Management	Wildlife Disease Control	Created Wetlands	Recreation & Information Programs	Eutrophication Assessments	Fish Recovery	Fishery Management	Totals
Capital Cost	0.0	1.0	22.0	10.0	3.0	0.2	15.0	**51.2**
Yearly OMER Cost	0.5	0.5	0.06	0.0	0.0	0.1	0.5	**1.7**
Total PV	7	8	23	10	3	2	22	**74**

Attachment A

Public Law 105-372

The Salton Sea Reclamation Act of 1998

H. R. 3267

One Hundred Fifth Congress of the United States of America

AT THE SECOND SESSION

Begun and held at the City of Washington on Tuesday, the twenty-seventh day of January, one thousand nine hundred and ninety-eight

An Act

To direct the Secretary of the Interior, acting through the Bureau of Reclamation, to conduct a feasibility study and construct a project to reclaim the Salton Sea, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1.-SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE. - This Act may be cited as the "Salton Sea Reclamation Act of 1998".

(b) TABLE OF CONTENTS. - The table of contents of this Act is as follows:

Sec. 1. Short title; table of contents.
Sec. 2. Definitions.

TITLE I-SALTON SEA FEASIBILITY STUDY

Sec. 101. Salton Sea Feasibility study authorization.
Sec. 102. Concurrent wildlife resources studies.
Sec. 103. Salton Sea National Wildlife Refuge renamed as Sonny Bono Salton Sea National Wildlife Refuge.

TITLE II-EMERGENCY ACTION TO IMPROVE WATER QUALITY IN THE ALAMO RIVER AND NEW RIVER

Sec. 201. Alamo River and New River irrigation drainage water.

SEC. 2. DEFINITIONS.

In this Act:

(1) The term "Committees" means the Committee on Resources and the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Energy and Natural Resources and the Committee on Environmental and Public Works of the Senate.

(2) The term "Salton Sea Authority" means the Joint Powers Authority by that name established under the laws of the State of California by a Joint Power Agreement signed on June 2, 1993.

(3) The term "Secretary" means the Secretary of the Interior, acting through the Bureau of Reclamation.

TITLE I - SALTON SEA FEASIBILITY STUDY

SEC. 101. SALTON SEA FEASIBILITY STUDY AUTHORIZATION.

(a) IN GENERAL.- No later than January 1, 2000, the Secretary, in accordance with this section, shall complete all feasibility studies and cost analyses for the options set forth in subsection (b)(2)(A) necessary for Congress to fully evaluate such options.

(b) FEASIBILITY STUDY. -

(1) IN GENERAL. -

(A) The Secretary shall complete all studies, including, but not limited to environmental and other reviews, of the feasibility and benefit-cost of various options that permit the continued use of the Salton Sea as a reservoir for irrigation drainage and: (i) reduce and stabilize the overall salinity of the Salton Sea; (ii) stabilize the surface elevation of the Salton Sea; (iii) reclaim, in the long term, healthy fish and wildlife resources and their habitats; and (iv) enhance the potential for recreational uses and economic development of the Salton Sea.

(B) Based solely on whatever information is available at the time of submission of the report, the Secretary shall: (i) identify any options he deems economically feasible and cost effective; (ii) identify an additional information necessary to develop construction specifications; and (iii) submit any recommendations, along with the results of the study to the Committees no later than January 1, 2000.

(C)(i) The Secretary shall carry out the feasibility study in accordance with a memorandum of understanding entered into by the Secretary, the Salton Sea Authority, and the Governor of California.

(ii) The memorandum of understanding shall, at a minimum, establish criteria for evaluation and selection of options under subparagraph (2)(A), including criteria for determining benefit and the magnitude and practicability of costs of construction, operation, and maintenance of each option evaluated.

(2) OPTIONS TO BE CONSIDERED. - Options considered in the feasibility study -

(A) shall consist of, but need not be limited to -

(i) use of impoundments to segregate a portion of the water of the Salton Sea in one or more evaporation ponds located in the Salton Sea basin;
(ii) pumping water out of the Salton Sea;
(iii) augmented flows of water into the Salton Sea;
(iv) a combination of the options referred to in clauses (i), (ii), and (iii); and
(v) any other economically feasible remediation option the Secretary considers appropriate and for which feasibility analyses and cost estimates can be completed by January 1, 2000;

(B) shall be limited to proven technologies; and

(C) shall not include any option that -

(i) relies on the importation of any new or additional water from the Colorado River; or
(ii) is inconsistent with the provisions of subsection (c).

(3) ASSUMPTIONS. - In evaluating options, the Secretary shall apply assumptions regarding water inflows into the Salton Sea Basin that encourage water conservation, account for transfers of water out of the Salton Sea Basin, and are based on a maximum likely reduction in inflows into the Salton Sea Basin which could be 800,000 acre-feet or less per year.

(4) CONSIDERATION OF COSTS. - In evaluating the feasibility of options, the Secretary shall consider the ability of Federal, tribal, State and local government sources and private sources to fund capital construction costs and annual operation, maintenance, energy, and replacement costs and shall set forth the basis for any cost sharing allocations as well as anticipated repayment, if any, of Federal contributions.

(c) RELATIONSHIP TO OTHER LAW. -

(1) RECLAMATION LAWS. - Activities authorized by this Act shall not be subject to the Act of June 17, 1902 (32 Stat. 388; 43 U.S.C. 391 et seq.), and Acts amendatory thereof and supplemental thereto. Amounts expended for those activities shall be considered nonreimbursable for purposes of those laws and shall not be considered to be a supplemental or additional benefit for purposes of the Reclamation Reform Act of 1982 (96 Stat. 1263; 43 U.S.C. 390aa et seq.).

(2) PRESERVATION OF RIGHTS AND OBLIGATIONS WITH RESPECT TO THE COLORADO RIVER. - This Act shall not be considered to supersede or otherwise affect any treaty, law, decree, contract, or agreement governing use of water from the Colorado River. All activities taken under this Act must be carried out in a manner consistent with rights and obligations of persons under those treaties, laws, decrees, contracts, and agreements.

SEC. 102. CONCURRENT WILDLIFE RESOURCES STUDIES.

(a) IN GENERAL. - The Secretary shall provide for the conduct, concurrently with the feasibility study under section 101(b), of studies of hydrology, wildlife pathology, and toxicology relating to wildlife resources of the Salton Sea by Federal and non-Federal entities.

(b) SELECTION OF TOPICS AND MANAGEMENT OF STUDIES. -

(1) IN GENERAL. - The Secretary shall establish a committee to be known as the "Salton Sea Research Management Committee". The committee shall select the topics of studies under this section and manage those studies.

(2) MEMBERSHIP. - The committee shall consist of the following five members:

(A) The Secretary.
(B) The Governor of California.
(C) The Executive Director of the Salton Sea Authority.
(D) The Chairman of the Torres Martinez Desert Cahuilla Tribal Government.
(E) The Director of the California Water Resources Center.

(c) COORDINATION. - The Secretary shall require that studies under this section are coordinated through the Science Subcommittee which reports to the Salton Sea Research Management Committee. In addition to the membership provided for by the Science Subcommittee's charter, representatives shall be invited from the University of California, Riverside; the University of Redlands; San Diego State University; the Imperial Valley College; and Los Alamos National Laboratory.

(d) PEER REVIEW. - The Secretary shall require that studies under this section are subjected to peer review.

(e) AUTHORIZATION OF APPROPRIATIONS. - For wildlife resources studies under this section there are authorized to be appropriated to the Secretary, through accounts within the Fish and Wildlife Service, exclusively, $5,000,000.

(f) ADVISORY COMMITTEE ACT. - The committee, and its activities, are not subject to the Federal Advisory Commission Act (5 U.S.C. App.).

SEC. 103. SALTON SEA NATIONAL WILDLIFE REFUGE RENAMED AS SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE.

(a) REFUGE RENAMED. - The Salton Sea National Wildlife Refuge, located in Imperial County, California, is hereby renamed and shall be known as the "Sonny Bono Salton Sea National Wildlife Refuge".

(b) REFERENCES. - Any reference in any statute, rule, regulation, Executive order, publication, map, or paper or other document of the United States to the Salton Sea National Wildlife Refuge is deemed to refer to the Sonny Bono Salton Sea National Wildlife Refuge.

TITLE II—EMERGENCY ACTION TO IMPROVE WATER QUALITY IN THE ALAMO RIVER AND NEW RIVER

SEC. 201. ALAMO RIVER AND NEW RIVER IRRIGATION DRAINAGE WATER.

(a) RIVER ENHANCEMENT. -
(1) IN GENERAL. - The Secretary is authorized and directed to promptly conduct research and construct river reclamation and wetlands projects to improve water quality in the Alamo River and New River, Imperial County, California, by treating water in those rivers and irrigation drainage water that flows into those rivers.

(2) ACQUISITIONS. - The Secretary may acquire equipment, real property from willing sellers, and interests in real property (including site access) from willing sellers as needed to implement actions under this section if the State of California, a political subdivision of the State, or Desert Wildlife Unlimited has entered into an agreement with the Secretary under which the State, subdivision, or Desert Wildlife Unlimited, respectively, will, effective 1 year after the date that systems for which the acquisitions are made are operational and functional -

(A) accept all right, title, and interest in and to the equipment, property, or interests; and
(B) assume responsibility for operation and maintenance of the equipment, property, or interests.

(3) TRANSFER OF TITLE. - Not later than 1 year after the date a system developed under this section is operational and functional, the Secretary shall transfer all right, title,

and interest of the United States in and to all equipment, property, and interests acquired for the system in accordance with the applicable agreement under paragraph (2).

(4) MONITORING AND OTHER ACTIONS. - The Secretary shall establish a long-term monitoring program to maximize the effectiveness of any wetlands developed under this title and may implement other actions to improve the efficacy of actions implemented pursuant to this section.

(b) COOPERATION. - The Secretary shall implement subsection (a) in cooperation with Desert Wildlife Unlimited, the Imperial Irrigation District, California, and other interested persons.

(c) FEDERAL WATER POLLUTION CONTROL. - Water withdrawn solely for the purpose of a wetlands project to improve water quality under subsection (a)(1), when returned to the Alamo River or New River, shall not be required to meet water quality standards under the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.).

(d) AUTHORIZATION OF APPROPRIATIONS. - For river reclamation and other irrigation drainage water treatment actions under this section, there are authorized to be appropriated to the Secretary $3,000,000.

Speaker of the House of Representatives.

Vice President of the United States and President of the Senate.