CHAPTER III

Evaluation Process

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EVALUATION PROCESS

Described in this chapter is the process by which alternatives were evaluated for their ability to solve Salton Sea problems. The evaluation process included both threshold and ranking criteria which resulted in the relative ranking of 54 alternatives.

3.1 PURPOSE

Many alternatives for solving the problems at the Sea have been proposed over the years. Some of these alternatives have been studied in detail, while others have been presented only as vague concepts. Consequently, it was impossible to compare the merits of the alternatives on an equal basis. However, a valiant attempt was made to develop sufficient information to allow for an appropriate evaluation of each alternative.

In order to proceed with formulation and development of the most desirable alternative, a method of screening and ranking had to be developed. Trying to evaluate in detail the 54 alternatives that have been identified would be an overwhelming task that would take more money and time than available. Therefore, a process was developed that would first screen alternatives that did not meet minimum requirements and then provide a way of ranking the rest in accordance with criteria established by all groups, agencies, and individuals interested in improving the Sea. That process is described in this chapter.

3.2 PUBLIC INVOLVEMENT

While a number of alternatives have been identified during previous studies, it was important that any new ideas be included in the alternatives being evaluated. Opportunity was given to companies, universities, individuals, and the general public to suggest alternatives for solving challenges of the Sea.

A public discussion was opened on ideas and suggestions for management of the Sea in the form of two public workshops hosted by the Salton Sea Authority Board's TAC in August and September 1995. The TAC, along with *ex officio* members, was there to listen, discuss, and record alternatives proposed by the public. Notice of these meetings was given in Imperial and Coachella Valley newspapers and posted in local libraries in accordance with the California Government Code Section 54950 (Ralph M. Brown Act), governing open meetings. (All meetings of the Authority and TAC also fall under the Act.) 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.

3.3 SELECTION PROCESS

The selection process involved two steps. First, four elimination criteria were established and applied to all submitted alternatives. Alternatives which did not meet one or more of the

elimination criteria were dropped from further consideration. Remaining alternatives were then subjected to 20 evaluation criteria that were established to rank alternatives in order of ability to meet study needs.

All alternatives submitted from 1969 to the present were compiled in a brief narrative format which included a description of the alternative and an illustration, if applicable. Of the 54 alternatives being addressed in the report, 49 were eliminated based on criteria—explained later in this chapter—that were discussed and approved at the October 19, 1995, Authority Board public workshop. The list of alternatives that resulted from the initial consolidation was approved at the March 21, 1996, Authority Board of Directors meeting, as were the evaluation criteria developed at the same workshop and the method by which the criteria were to be ranked, weighted, and applied to the remaining alternatives.

The approved method for ranking alternatives that passed the elimination process was a two-step analysis process using a PCM and an Analysis Matrix. The PCM is used to determine the order of *importance of a list of evaluation parameters*, while the Analysis Matrix is used to determine the order of *preference of a number of viable alternatives*.

Paired Comparison Matrix (PCM)

Use of the PCM to rank and weight evaluation criteria took place during the Authority's public workshop on April 8, 1996, and included representation from Reclamation, U.S. Fish and Wildlife Service, California Department of Parks, DWR, California Department of Fish and Game, as well as the Authority Board members and the public.

The first step in the selection process was to define a list of parameters, or criteria, used to evaluate the alternatives available. To determine which of these parameters, or criteria, were more important than the others, each criterion was compared with the others. The comparison determined which of a given pair of criteria were more (or less) important than the other, and by how much. With the 20 criteria selected in this evaluation process, the PCM was used to keep the decision process valid.

As an example of how the PCM is used, consider an example with two alternative solutions and three evaluation parameters. Assume the three evaluation parameters are:

Table 7, Evaluation Parameters

Parameter Identification Letter	Parameter
A	Color
B	Price
C	Speed

When color and price are compared, price is determined to be much more important. On a random scale of 1 to 4, price would be given a score of 4. When color and speed are compared, speed is determined to be more important by a score of 3. Comparing price to speed results in price being more important by a score of 2.

A PCM with these parameters would be represented as follows:

Table 8, Example PCM

	B: Price	C: Speed	Subtotal	Ranking
A: Color	B4	C3	0	3
B: Price		B2	6	1
C: Speed			3	2

The letter shown in each cell is the identification letter of the parameter that was determined more important, and the number is the score given to the respective parameter. The "subtotal" column is obtained by finding all the cells in the matrix where the parameter identification letter is shown and adding numbers in those cells. For the row "A: Color", for example, there are no cells that contain the letter "A", so that parameter receives a subtotal of "0". Row "B: Price", however, receives a subtotal of "6" because there are two cells that contain the letter "B", and the numbers in those cells add up to "6".

Whenever two parameters are equivalent in terms of importance, the cell will contain the letter designation for both parameters, and no numeric score will be given.

Numbers in the ranking column are determined by simply equating the highest subtotal with a ranking of "1", the second highest subtotal with "2", and so on.

For a complete list of the Salton Sea Evaluation Criteria and their relative weights, see the Evaluation Criteria narrative and table in section 3.5. The Analysis Matrix results obtained by evaluating the 54 proposed alternatives in this report is contained in Chapter VI. Appendix A contains a PCM from the 1996 workshop depicting how the individual criteria were weighted and ranked.

Analysis Matrix

An Analysis Matrix was used in the second step of the process to rank the alternatives in order of preference. This was accomplished with coordination and review by representatives of the public agencies which comprise the Authority and *ex officio* members of the TAC.

First, alternatives were evaluated as to how well they met each parameter, or criteria, on a scale of 1 to 4. In continuing with the example given under the Paired Comparison Matrix narrative, assume that Alternative 1 is cheap and slow, but the right color, while Alternative 2 is more expensive and unattractive, but faster. Now assume that subject matter specialists determine that Alternative 1 meets the price parameter by a score of 3 on a scale of 1 to 4, meets the speed parameter by a score of 2, and meets the color parameter by a score of 4. Alternative 2 meets the price parameter by a score of 2, the speed parameter by a score of 3, and the color parameter by a score of 1.

Here is how the Analysis Matrix would be represented in this example:

Table 9, Example Analysis Matrix

	Price 6	Speed 3	Color 0	Total	Alternative Ranking
Alternative 1	3 / 18	2 / 6	4 / 0	24	1
Alternative 2	2 / 12	3 / 9	1 / 0	21	2

The alternatives are displayed in the left column. Evaluation parameters are displayed, in ranking order, on the top row along with their respective weights, as obtained from the PCM. Two numbers appear in each matrix cell. The number to the left is the score obtained when comparing the alternative with the evaluation parameter; the number to the right is obtained by multiplying this score times the weighing factor for the parameter. Adding along the row gives a total "grade" for the alternative. The alternative with the highest grade receives the highest ranking and is, therefore, the preferred alternative.

The Analysis Matrix in Chapter VI, developed for use in finding a viable solution to the Sea's challenges, is a table comprised of values which measure how well each criterion is met by a given alternative, on a scale from 1 to 4. The alternatives are displayed in the left column and the criteria are shown along the top row in ranking order. As values were assigned, the alternatives were sorted from highest to lowest score. Any alternative with fewer points (that is, less value) than the No Action alternative was dropped from consideration.

3.4 ELIMINATION CRITERIA

Four elimination criteria were applied to the entire set of alternatives that were identified during this study. If an alternative did not meet the requirements of any one of the four criteria, it was eliminated from further consideration. These criteria include (1) ability to achieve a target salinity; (2) ability to achieve a target elevation; (3) exclusion of unproven technology; and (4) expected OME&R costs.

Target Salinity: 35 to 40 ppt

Salinity management targets have been established at levels that are protective of the existing fishery in the Salton Sea. The Sea currently supports a fishery of marine species (that is, corvina, sargo, and bairdiella) transplanted to the Sea when the salinity rose too high to support freshwater species. The Sea's fishery is important to the region from both environmental and economic viewpoints. For example, fish are important biologically to fish-eating birds and other animals found around the shore of the Salton Sea, and the wildlife in the region attract fisherman, hunters, and naturalists, providing economic growth to the area. Furthermore, the Water Quality Control Plan (Basin Plan) for the Colorado River Basin (California Regional Water Quality Control Board, Region 7, 1994) designates warm-water aquatic habitat as a beneficial use, and its water quality objective for salinity relates to sustenance of aquatic life.

For the existing fishery to be maintained, a target salinity range of 35 to 40 ppt has been established. (As a comparison, ocean water is approximately 35 ppt; Salton Sea water, at the time of this report, is approximately 44 ppt.) This salinity would allow fish species currently found in the Sea to spawn, thereby complying with Basin Plan requirements for protecting beneficial uses of the Sea.

Target Elevation Range: -230 to -235 feet msl

There are many considerations for determining a target water surface elevation of the Salton Sea. Private and commercial property owners are concerned with the Sea's elevation because of its direct effect on property values and on future construction projects along the shore. As the Sea is a repository for agricultural drainage, the Sea's elevation is important to agricultural interests. The Sea's elevation is also important to the biota of the area. Birds, such as the endangered Yuma clapper rail, are dependent on wetland habitat around the margins of the Sea for breeding, and many hundreds of acres of wildlife refuge have been inundated by rising Sea levels. State and Federal agencies must also plan for potential flood conditions. History has shown that rapid flooding occurs regularly in the area, and the Sea is a repository for storm runoff. Finally, the Sea's target elevation is closely connected to its target salinity. The removal of water from the Sea as a means of removing salt can result in dramatic changes in elevation. The elevation management target and ability to regulate elevation may ultimately determine the salinity management option selected for implementation.

The surface elevation of the Sea is currently about -227 feet msl. The Sea's elevation fluctuates about 1 foot per year based on Imperial Irrigation District elevation data for the past 9 years. In 1994, for example, the Sea's elevation ranged from between -227.75 to -226.75 feet msl and from -227.8 to -227.2 msl from November 1994 to February 1995.

While current shoreline damage resulted from high water surface elevations, much lower levels could also cause damages. A large drop in Sea elevation could adversely affect shoreline development, including marinas, the Salton Sea State Recreation Area, commercial enterprise, and residential developments. As a method of balancing between excessively high and low levels, a target elevation range of -230 to -235 feet msl was established.

Maintaining the elevation of the Sea within the target range is certainly of interest, but uncertainties of future flows into the Sea make it difficult to determine an alternative's effect on the Sea's elevation. As a result, the elimination of an alternative due to its inability to achieve and maintain the target elevation is used only on those alternatives that have no ability to control the elevation of the Sea.

No Unproven Technology

In the interests of the feasibility of commercial application and short timeframe allowed for applying the alternative, the technology in the alternative must be currently available and proven in similar situations. The goal of the evaluation/selection process is to select an alternative with

the best chance of success. To further the selection process, only alternatives that could present data demonstrating the involved technology's effectiveness were considered. An alternative's technology could be demonstrated by data gathered in a full-scale application, prototype, or lab results, but all data necessary for evaluation had to be available. By definition, this eliminated all research proposals.

Ten Million Dollar Threshold in Annual OME&R Costs

It is anticipated that the ultimate capital costs of any selected management project will be shared among Federal, State, and local governments. The long-term OME&R costs of the project, however, will most likely be paid for at the local level. To ensure long-term affordability of the project, OME&R costs were used to screen management alternatives during the elimination phase. An annual threshold of $10 million, not including debt servicing, was considered to be the maximum feasible cost for project operation. Therefore, management alternatives that exceeded this threshold were eliminated from further consideration. If there were doubts about the validity of the estimates provided, and the OME&R costs were close to $10 million, additional calculations were made to determine as accurate a number as possible to make a decision on the alternative. If additional calculations determined the costs were still close to the threshold amount, the alternative was carried forward into the evaluation process even though OME&R costs exceeded the $10 million criteria.

3.5 EVALUATION CRITERIA

Evaluation Criteria were formulated and weights assigned to each criteria through a process which included Steering Committee members, the Authority's Board of Directors, resources agencies, and the general public. After applying the elimination criteria, five of the 54 alternatives remained and were further appraised using the evaluation criteria. Table 10 lists the evaluation criteria in ranking order of importance, provides a brief description of how the criteria were applied, and describes the weighted values of the criteria used in the Analysis Matrix.

TABLE 10
EVALUATION CRITERIA

	WEIGHTED VALUE
AGRICULTURAL INTERESTS	**33**
EXPLANATION: 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 wastewater repository so agriculture in the Coachella and Imperial Valleys can continue.	
WILDLIFE	**32**
EXPLANATION: 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 this area.	
ELEVATION	**31**
EXPLANATION: A higher score in this area indicates a greater degree of control of the Salton Sea surface elevation. Degree of control increases for a larger percentage of shoreline kept in the target range (-230 to -235 ft msl), faster control response time, and less seasonal fluctuation. Alternatives that could not achieve or maintain the target elevation were eliminated from further consideration during the elimination process.	
DISPOSAL	**24**
EXPLANATION: 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 fewer environmental impacts, higher property values, increasing longevity, minimizing health hazards and/or involving less stringent environmental regulation requirements.	
WATER QUALITY - SALINITY	**24**
EXPLANATION: A higher score under Water Quality - Salinity indicates a greater degree of control in maintaining salinity within the Salton Sea in the target range (35 to 40 ppt). Degree of salinity control increases for increasing percentage of surface area kept in the target range, simplification of control mechanism, and reduced seasonal fluctuation. Alternatives that cannot achieve or maintain the target salinity are excluded from this evaluation process and are covered under the Elimination Criteria.	
WATER QUALITY - OTHER	**21**
EXPLANATION: A higher score for Water Quality - Other indicates an increasing benefit to water quality in the Salton Sea concerning those constituents not directly affecting salinity. Such constituents include pesticides (soluble and insoluble), selenium, sewage and bacteria, and other nutrients.	

TABLE 10
EVALUATION CRITERIA

	WEIGHTED VALUE
OME&R COSTS	**19**
EXPLANATION: A higher score for OME&R Costs indicate a lower annual expenditure for those costs below $10 million. These costs do not include debt service and are calculated over the life of the alternative. Alternatives that exceed $10 million in OME&R costs per year were excluded from this evaluation process and were covered under the elimination criteria.	
FINANCE COSTS	**17**
EXPLANATION: A higher score under Finance Costs indicates a greater availability of funding and/or funding at a lower lending rate. .	
LOCATION	**17**
EXPLANATION: A higher score for the Location criteria indicates a higher level of Federal, State, and local support for a proposed location.	
CONSTRUCTION COSTS	**14**
EXPLANATION: A higher score under Construction Costs indicates a lower cost to construct the alternative.	
SPORT FISHERY	**14**
EXPLANATION: A higher score under the Sports Fishery criteria indicates the alternative will enhance sport fishing on the Salton Sea.	
RECREATION	**12**
EXPLANATION: A higher score under the Recreation criteria indicates the alternative will enhance overall recreation activities on the Salton Sea.	
ECONOMIC DEVELOPMENT	**11**
EXPLANATION: A higher score for Economic Development indicates the alternative should result in beneficial effects on the local economy and economic opportunity in the area.	
INTERGOVERNMENTAL COOPERATION	**9**
EXPLANATION: A higher score under this criterion indicates fewer agreements and permitting requirements with government agencies. Government agencies include Federal and State agencies and Mexico.	

TABLE 10
EVALUATION CRITERIA

	WEIGHTED VALUE
LAND	**7**
EXPLANATION: A higher score for Land criteria indicates availability and easier acquisition of a project site. Land criteria deal mainly with land ownership issues.	
TIME TO SOLUTION	**6**
EXPLANATION: A higher score indicates this alternative requires less time to reach target salinities and elevation.	
TIME TO CONSTRUCTION	**3**
EXPLANATION: A higher score indicates this alternative requires less time to construct and start operation.	
PARTNERS	**2**
EXPLANATION: A higher score indicates a greater opportunity for private investment in the project area.	
WATER REMOVAL	**N/A**
EXPLANATION: A higher score indicates lower costs or easier implementation of a proposed water removal strategy. In most cases the score is also indicative of the level of technology involved, higher technology solutions receive lower scores.	
BENEFITS & IMPACTS	**N/A**
EXPLANATION: A higher score indicates the alternative supports beneficial effects not otherwise considered above.	