**Appendices**

# Restoration of the Salton Sea

## Volume 1:  Evaluation of the Alternatives

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# Restoration of the Salton Sea

## Volume 1: Evaluation of the Alternatives

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# Chapter 1. Embankment Design

## Design Criteria and Considerations

The restoration alternatives include embankment structures at various locations around the Salton Sea (Sea). All designs of high and significant hazard embankments were developed to meet Reclamation's Public Protection Guidelines (Reclamation, 2003). These guidelines focus on the estimated annual probability of failure, the potential for loss of life (LOL), and the public trust components of decision-making. Estimates of possible LOL were made in accordance with the procedures outlined in Reclamation's Dam Safety Office publication DSO-99-06 (Reclamation, 1999). The potentials for loss of life or for environmental consequences in the event of failure led to determination of what Reclamation and the Federal Emergency Management Agency (FEMA) refer to as the "hazard classification" for the dam, dike, barrier, and habitat pond embankment structures evaluated in this study. On the basis of the potential for loss of life, the mid-, north-, and south-Sea dams of Alternative Nos. 1 and 4 would be classified as **high hazard** structures. Because of the potential for high environmental consequences in the event of failure, the mid-Sea barrier, perimeter dikes, and concentric ring dikes of Alternative Nos. 1, 2, and 3 would be classified as **significant hazard** structures. The habitat pond embankments would be classified as **low hazard** structures because of minimal environmental consequences of failure.

The general design criteria determined for the mid-, south-, and north-Sea dams; perimeter dikes; concentric ring dikes; mid-Sea barrier; and habitat pond embankments would be as follows:

- Resist and control embankment seepage, foundation seepage, internal erosion, and static settlements
- Resist large offsets, slope instability, and deformations due to seismic loading, and flooding
- Provide for constructability using proven methods and safe construction

## Evaluation of Embankment Designs

Detailed seepage, stability, deformation, risk, constructability, and cost evaluations were completed to support the evaluation of the various dam, dike,

barrier, and habitat pond embankments that comprise the alternatives. The sequence of study tasks was as follows:

1. Existing information and construction material sources assessment
2. Seepage and stability evaluations
3. Seismic deformation evaluations
4. Formulation and initial screening of embankment cross-section options
5. Supplemental seepage and stability evaluations
6. FLAC deformation evaluations
7. Finalization of decision criteria and cross-section requirements
8. Final screening of embankment cross-section options
9. Selection of preferred cross-section option
10. Initial cross-section optimization
11. Risk analysis
12. Final cross-section optimization
13. Cost estimates for optimized embankments

Following evaluation of the embankment design options, which included the Salton Sea Authority's rock notch design and California Department of Water Resources' (DWR) rock dam design, Reclamation determined that an optimized "sand dam with stone columns" was the preferred basic configuration for all of the various embankments, except habitat pond embankments, which were optimized as earthfill embankments. Overviews of both configurations are provided in the following sections.

### Sand Dam with Stone Columns Embankment Design

Existing very soft and weak foundation materials would be removed beneath the entire footprint of the embankment, and additional soft and weak foundation materials would be removed beneath the central section. The sand dam with stone columns embankment would consist of sand/gravel materials forming the central section and the outer shells. To resist static loadings, the embankment cross-section would include filter and drainage zones to help control embankment and foundation seepage. To resist seismic loadings, the central section's sand/gravel material would be densified using stone columns. A soil-cement-bentonite (SCB) wall would be constructed down through the middle of the central section and into the foundation. Riprap slope protection would be placed over the upstream and downstream embankment slopes. To resist seismic loadings, the embankment would be constructed using a combination of placement methods. Placement methods would include:

- Dumping/placing directly into the water from barges for the lower portion of the central section and the outer portions of the embankment, including riprap slope protection.

- End dumping or conveyor placement for the upper portions of the central and outer portions of the embankment.

The size of this basic sand dam with stone columns design would be adjusted as required to meet the location and configuration requirements of the mid-Sea, south-Sea, and north-Sea dams; perimeter dikes; concentric ring dikes; and barrier embankment designs. The basic embankment design also would be adjusted to address certain potential risks, such as the possibility of fault offsets of 2 to 5 meters in the foundation beneath the south-Sea dam and the concentric ring dikes in the southern Sea.

**Figure 1.1** provides the cross-section view of the basic sand dam with stone columns embankment design for a mid-Sea dam. Configurations for the less tall mid-Sea barrier, south-Sea dam, and concentric lakes dikes would be similar but with different heights.

### Sand Dam Without Stone Columns Embankment Design

The sand dam concept was considered with and without stone columns for the significant hazard structures in Alternative No. 2, Mid-Sea Barrier with South Marine Lake, and Alternative No. 3, Concentric Lakes.

The sand dam concept was applied to these alternatives to compare the risk replacement costs of structures that reduce both seismic and static risks with the risk-based replacement costs of structures that reduce only static risk. Costs are presented in Chapter 2 for these two alternatives assuming that (1) stone columns are included and (2) stone columns are not included.

### Habitat Pond Embankments Design

**Figure 1.2** provides the cross-section view of the habitat pond embankment design. This design would be applied to habitat pond embankments associated with the saline habitat complex components in each of the alternatives. These low earthfill embankments would be very simple designs that would be constructed in the dry. The existing soft and weak foundation materials would be removed beneath the entire footprint of the embankment to achieve a competent foundation. The excavated material would be dried and reused as earthfill to construct the habitat pond embankments. The embankment cross-section would include a blanket layer of sand filter/drain material under the embankment's downstream shell. There would be no riprap slope protection. Because of its small size and shallow water depth, the habitat pond embankment design would likely not need to meet Reclamation's Public Protection Guidelines.

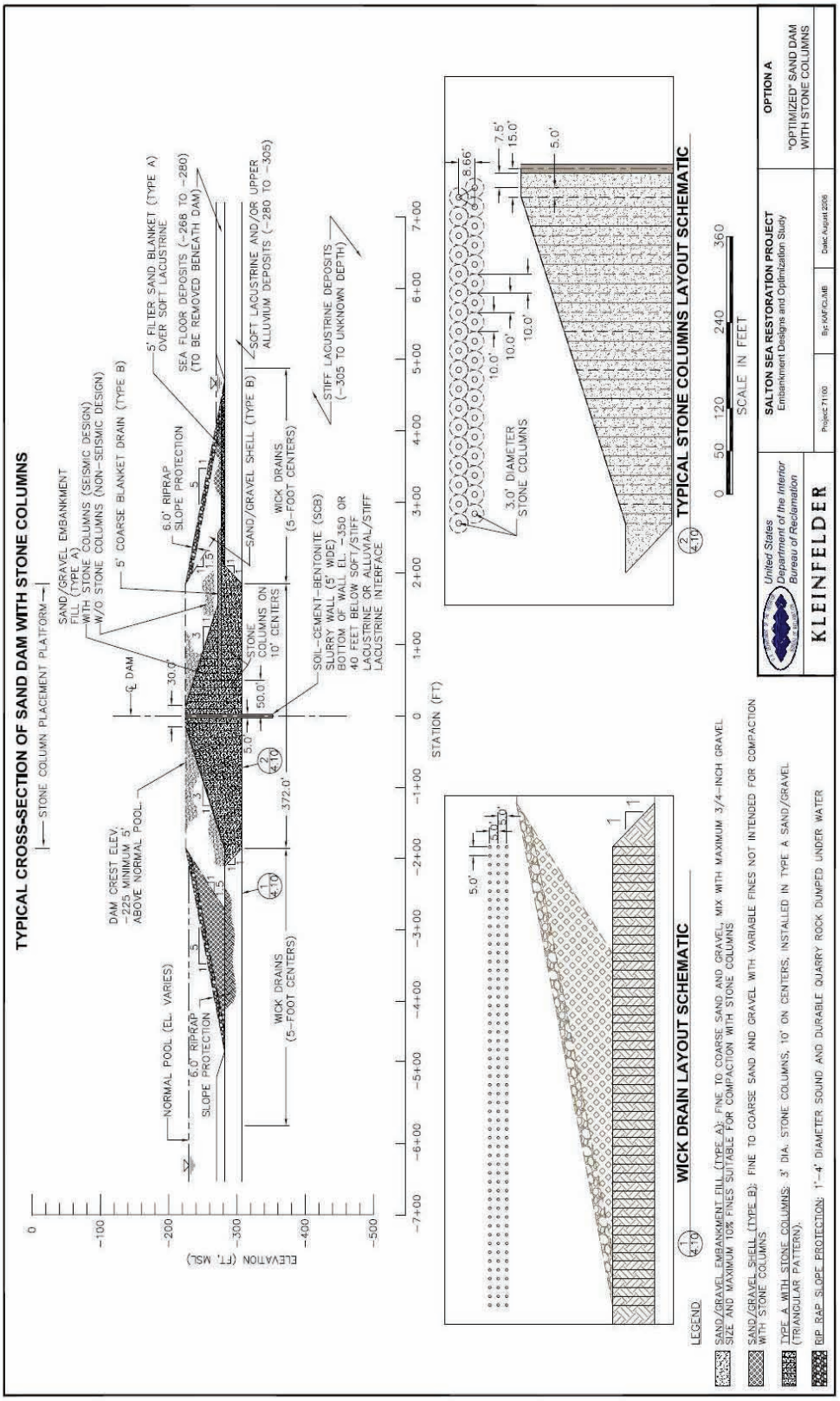


**Figure 1.1 Typical cross-section of sand dam with stone columns.**

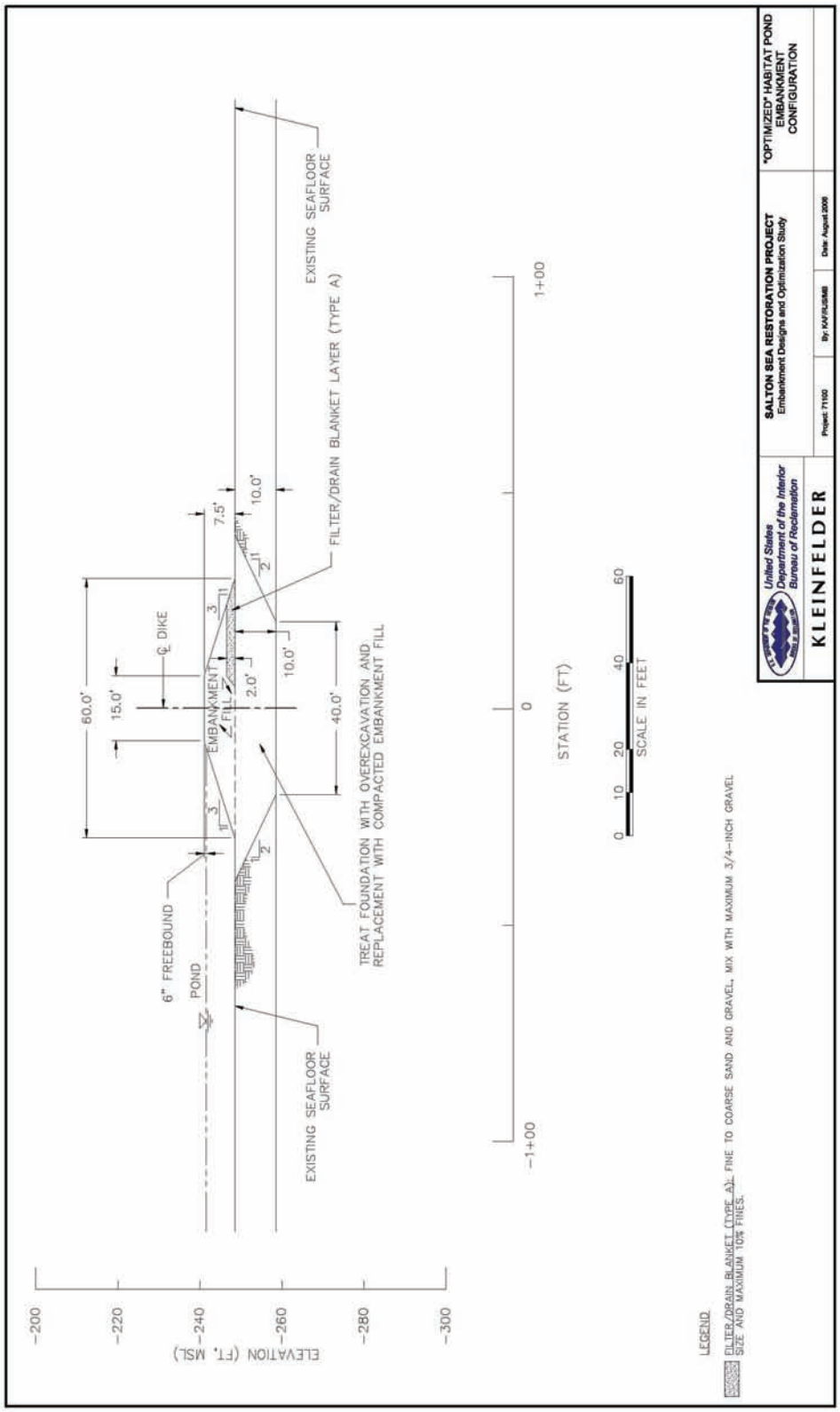


**Figure 1.2 Typical cross-section of habitat pond embankment.**

## Geotube® Embankment Design

The Imperial Group has proposed using Geotube® technology to construct the concentric lakes dikes. Reclamation considered three concentric lake dike design options, and one incorporates the Geotube® technology (**Figure 1.3**). The other two options are based on the sand dam approach discussed above. One design includes features to reduce only static loading risks (without stone columns), and the other includes features to reduce both static and seismic loading risks (with stone columns). The Geotube® design would not reduce either seismic or static loading risks.

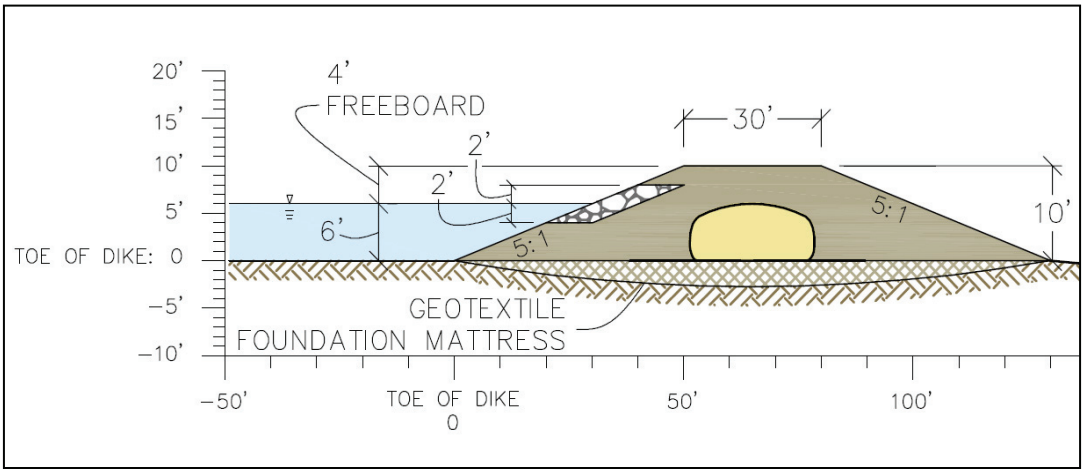


**Figure 1.3 Typical Geotube® design.**

Constructing concentric lakes dikes using Geotubes® would likely result in significant seismic, static, and constructability problems.

## SSA Rockfill and Rock Notches Embankment Designs

The SSA has proposed using a rockfill embankment design for its proposed alternative as shown in **Figure 1.4.** The SSA had previously proposed using a rock notches embankment design similar to that shown in **Figure 1.5**. Reclamation evaluated both the rockfill and rock notches embankment concepts and determined they would not meet Reclamation's general design criteria. The use of traditional sand and gravel horizontal filters in these designs would not be possible without sacrificing stability under seismic loadings. Use of geocomposite filters would result in constructability problems and would result in unreliable filter performance. Cost estimates were prepared for the SSA's original (south alignment) alternative using the rockfill and rock notches concepts. (The rockfill embankment cost estimate includes costs for an SCB wall and a fine rockfill layer above the geocomposite not shown in **Figure 1.4**.) The SSA's original alternative incorporated a mid-Sea dam about 1.5 miles farther south than what is presented in Figure 3.2. (This south alignment is also

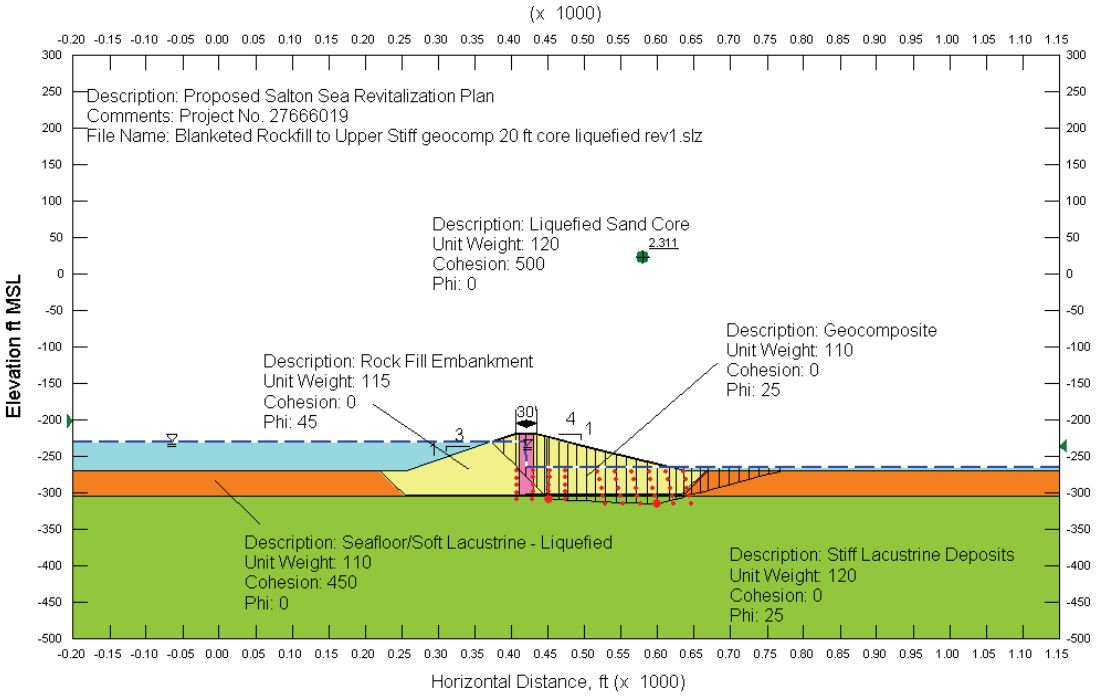


**Figure 1.4 Typical cross-section of the SSA rockfill embankment.**

included in Alternative 1C – Mid-Sea Dam – Sand with Stone Columns and Alternative 1D – Mid-Sea Dam – Rock Notches Dam.) The SSA original alternative also included a smaller SHC of 12,000 acres. Reclamation's cost estimates for the SSA rockfill and rock notches designs (Attachments 1B, 1D and 9) provide a basis for making comparisons to cost estimates prepared by DWR and the SSA for this same original alignment. The Alternatives 1B, 1C and 1D air quality mitigation cost estimates presented in Attachments 7 and 9 assume the use of salt crusting (as originally proposed by the SSA) via construction of small earth embankments (2.5 feet tall) to impound brine released from the SHC.

## Embankment Materials

Following is a description of the construction materials used in the embankment designs described above.

### Seafloor Materials

Suction-dredged and clamshell-excavated materials consist of a heterogeneous mixture of earth materials found on the floor of the Sea. These materials consist of very soft, weak, loose Seafloor deposits, soft, fine-grained lacustrine soils, and fine-grained alluvial soils. These materials are expected to be removed using barge-mounted, suction dredges and clamshell excavation equipment. The

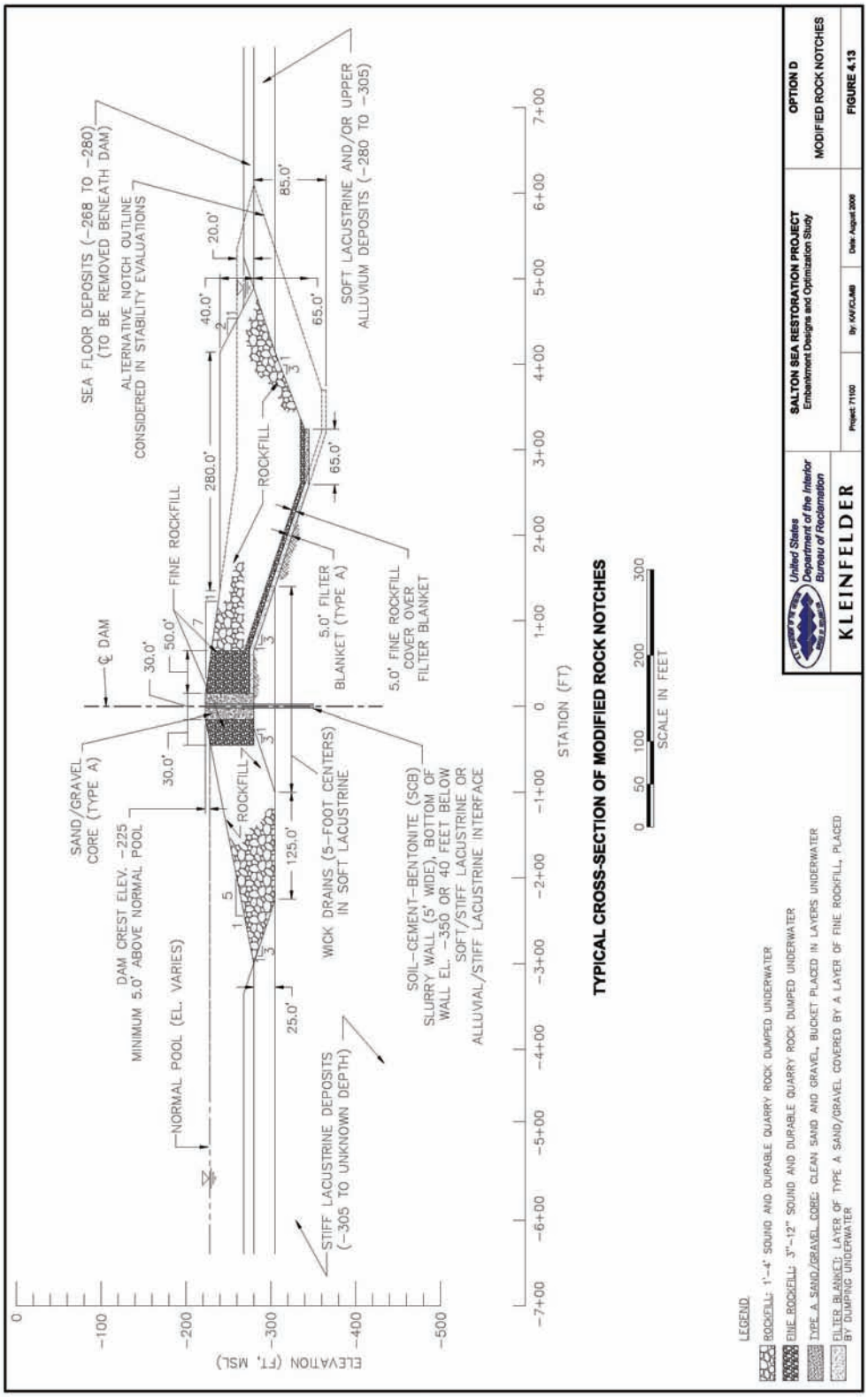


**Figure 1.5 Typical cross-section of the rock notches embankment.**

Seafloor, soft lacustrine deposits, and alluvial soils would be removed from the foundation zones of the various embankments before the embankment materials are placed, except in the case of the Geotube embankments. Seafloor materials would not be removed from beneath the Geotube embankments, but materials dredged and clamshell-excavated from areas near the embankments would be used to fill and cover the Geotubes, respectively. This process is discussed further under the Geotubes discussion later in this section. The suction-dredged waste materials would be pumped as slurry to areas well outside of the embankment limits and discharged at the Seafloor.

### Type A Sand/Gravel

Type A sand/gravel would be used to build the interior zones within all the dam, barrier and dike embankment components of the restoration alternatives, except the habitat pond embankments. Type A sand/gravel would be developed from alluvial borrow sources and screened to create a 3/4–inch minus material. Fines contents would be limited to less than 10 percent passing the No. 200 screen. This material would be suitable for densification using stone column construction techniques.

### Type B Sand/Gravel

Type B sand/gravel would be used in the outer shell zones of the various embankment dam, barrier and dike structures. Type B sand/gravel would be developed concurrently with the screening operations for the Type A sand/gravel. This material would not be as tightly controlled as the Type A sand/gravel, with gravels and cobbles allowed up to 1 foot in maximum dimension, or perhaps more. Fines content requirements would also be relaxed relative to the Type A sand/gravel. (Some Type B material would be used as blanket drain material, which would require a low fines content.)

### Filter and Drain Materials

Sand and gravel, fine rockfill, and geocomposite filter and drain materials would be developed for drainage blankets and internal drainage features in the various alternatives. The gradations of the fine rockfill and sand and gravel materials would be controlled to meet filter compatibility standards consistent with sound embankment design criteria. Both fine and coarse filter and drain gradations would likely be needed for the project. These materials would be produced concurrent with the Type A sand/gravel and Type B sand/gravel materials described above.

The geocomposite filter included in the SSA rockfill embankment design is a combination of two types of geosynthetics: 1) a geotextile serving the primary function to filter seepage from the dam foundation into the downstream rockfill and 2) a geonet (or geogrid) functioning to provide additional tensile strength and puncture resistance under the weight of the overlying rockfill. The two synthetics would be heat bonded together in the factory.

### Rockfill and Fine Rockfill

The gradation of the large rockfill material included in the SSA rockfill and rock notches embankment designs is from six inches to four feet in diameter. Fine rockfill would be used in the outer shell zones of the various embankment dam elements and for filter and drain elements, as discussed above. Two fine rockfill gradations are used: 1-inch to 6-inches diameter and 3-inches to 12-inches diameter. All rockfill material would be quarried from either a new source near the west shore (the Coolidge Mountain site) or salvaged from the waste rock stockpiles or a new quarry at the Eagle Mountain Mine site northeast of the Salton Sea.

### Riprap

Large riprap rock would be required to provide protection against the high waves that occur on the Sea. The riprap material has been tentatively sized to consist of hard angular rock ranging from 1 to 4 feet in diameter. The riprap would be quarried from either a new source near the west shore (the Coolidge Mountain site) or salvaged from the waste rock stockpiles or a new quarry at the Eagle Mountain Mine site.

### Stone Columns

The Type A sand/gravel material in the sand dam embankments would be densified to improve its insitu strength characteristics using stone column or vibrodensification techniques. Stone columns would be constructed within the Type A sand/gravel zone on a 10-foot triangular grid spacing and would average about 3 feet in diameter. The replacement stone within the columns would be produced concurrent with the Type A, Type B, and filter/drain material screening operations. The replacement stone (gravel) would range from ¾ to 1½ inches in diameter.

### Soil-Cement-Bentonite Slurry Wall

The SCB slurry wall would be constructed to control seepage through the permeable Type A sand/gravel within the interior zones of the various embankments. The SCB slurry walls would extend fully through the embankment height and penetrate into the underlying upper stiff lacustrine deposit. The upper stiff lacustrine deposit embedment by the wall would vary from 35 feet for the perimeter dikes, concentric lakes dikes, and south-Sea dam to 40 feet for the north-Sea and mid-Sea dams. The total depths would vary but could conceivably extend up to 125 feet from crest to bottom. As added protection against seepage through imperfections in the SCB slurry wall, a high-density polyethylene (HDPE) membrane could be inserted into the SCB wall as well. However, at this time a specialty contractor who has inserted the membranes to the depths contemplated for the Salton Sea restoration project has not been located. New techniques or procedures would have to be developed to insert a membrane

properly into the SCB slurry wall. Vinyl sheet piles may also be an alternative to the HDPE membrane. The slurry itself is contemplated to have a 7 percent bentonite and 2 percent cement content. The Type A sand/gravel would be used as the aggregate mass for the SCB wall. Construction of an SCB slurry wall in saline conditions would require special precautions to reduce flocculation of the bentonite and cement within the slurry and associated potential for adverse settlement of the flocculated materials and collapse of the upper portions of the slurry wall excavation.

### Wick Drains

Wick drains would be used to accelerate consolidation of the soft lacustrine deposits that would be left in place below select locations of the various embankment options. The wick drains would be installed from barges after dredging of the Seafloor deposits and prior to dumping of the Type A or B sand/gravel. Wick drain depths would vary, but they are expected to average 25 feet deep and would be placed on a 5-foot by 5-foot square grid pattern.

### Habitat Pond Embankments

Shallow habitat ponds are planned for all of the restoration alternatives, except for Alternative No. 3, Concentric Lakes. The size of concentric lakes varies from 16,000 to more than 42,200 acres. As opposed to the various embankment options, such as the mid-Sea dam, south-Sea dam, north-Sea dam, mid-Sea barrier, perimeter dikes, and concentric lakes dikes, the habitat pond embankments would be built entirely "in the dry" using earthfill materials salvaged from the dried Seafloor as the Sea retreats. The embankments would range from 6 to 9 feet high. Soft materials would be over-excavated from beneath the embankments, aerated to reduce moisture contents to manageable levels in order to achieve compaction, and replaced as compacted earthfill. A geogrid or geotextile would be placed on the bottom of the over-excavation area to reduce pumping and improve equipment mobility. The over-excavation depth is estimated to be about 10 feet. The pond embankments would incorporate a horizontal drainage blanket to prevent uncontrolled seepage from exiting the downstream embankment face and improve the stability of the embankments.

### Geotubes®

The Imperial Group has proposed the use of a proprietary geosynthetic product called Geotubes® as an alternative technique to construct the concentric lakes embankment structures. Geotubes® consist of a closed cylindrical bladder constructed using a permeable geotextile material. Very wet soils, suction-dredged from the nearby Seafloor, could be pumped as a slurry into the Geotube's® bladder, creating an elliptically shaped structure. Water would bleed through the geotextile material, leaving the slurried soil as a backfill material. Two Geotube components are included in the embankment design: a central core and a foundation mattress (**Figure 1.3**). The central core is a near-round elliptical

tube that would be placed on top of the near-flat foundation mattress. Constructing concentric lakes dikes using Geotubes® would likely result in significant seismic, static, and constructability problems.

## Material Sources

A materials evaluation identified three possible sources for embankment materials: (1) the Coolidge Mountain/Aggregate Products (API) site on the west shore, (2) the Eagle Mountain mine site located well northeast of the project, and (3) relatively small borrow sites located along the east shore near the Bombay Beach area. The Bombay Beach sites are relatively thin and, after further evaluation, have been eliminated from consideration as a possible source for large-scale earthfill and riprap production. The two remaining sources are described in detail below.

### Coolidge Mountain/API Site

The Coolidge Mountain/API site is located within the Torres Martinez Indian Reservation. API operates a sand and gravel pit and screening operation just west of Highway 86 near the northwest shore of the Sea. The API pit produces a variety of aggregate products, including washed and natural sands and gravels for asphalt concrete and Portland cement concrete, and similar rock products. The source is a natural sand and gravel deposit within a broad alluvial fan. The existing pit is about 140 feet deep with indications that the alluvial materials continue to considerably greater depths. The surrounding topography infers that the alluvial deposits continue in all directions over a large area. This site seems promising for production of all of the embankment materials with the exception of rockfill and riprap.

West and upslope of the existing API pit, Coolidge Mountain rises above the alluvial fan. Much of this area is also located within the Torres Martinez Indian Reservation. Geology within this area appears to be more complex than previously known. Outcrops of hard granites, siliceous limestones, and perhaps metasedimentary rocks exist in this area. These materials could be used to quarry the rockfill and riprap for the project. Tight rock joint spacing could affect the “yield” for 4-foot minus rockfill and riprap from the quarry. This constraint should be evaluated to assess whether the tight jointing will limit production of the larger rockfill and riprap sizes.

### Eagle Mountain / Kaiser Ventures

The Eagle Mountain Mine site is located well northeast of the Sea beyond Interstate 10. The Eagle Mountain site is owned by Kaiser Ventures, which manages this former iron mine and mill site. The materials available at the Eagle Mountain site are vast and diverse. Processed materials such as sands and gravels are available within mill tailing waste dumps. In addition, large angular rock

derived from granites, monzonites, and iron ore has been deposited in huge waste rock stockpiles, but the percentage of large rock material is not high (less than 10 percent). Kaiser Ventures has estimated the existing tailings and waste rock to be up to 800 million tons. The Eagle Mountain site was once served by a rail line that extends from the mine itself to a tie-in to the Union Pacific Railroad at the northeast margin of the Sea. The existing rail line has been destroyed by flash flooding and would need to be rebuilt prior to shipping materials out of the Eagle Mountain site. This single trackline is estimated to be about 52 miles long. Kaiser Ventures estimates that the line can be placed back into service for approximately $6 million. The restored line would have considerable capacity constraints given its curvature, grade, and single-track nature. Kaiser Ventures believes the line can be restored to transport about 5,000,000 tons of rock per year. This production rate is very small in comparison to the volume of materials contemplated for the various alternatives.

## Construction Materials Production and Methods

### Quarry Stone

The most promising source for quarry stone appears to be the Coolidge Mountain area at the northwest margin of the Sea. This site appears to be sufficient to produce all of the rockfill and/or riprap needs for the project without using the Eagle Mountain site as a secondary source. Rockfill and/or riprap would be produced within a hard rock quarry operation. Extensive drilling and blasting would be required to produce the rockfill and/or riprap. Because the riprap size would be closely controlled in the 1-foot to 4-foot range, the yield from the quarry would be impacted by the presence of particles less than 1 foot in diameter. In simple terms, the undersized fragments would need to be separated from the riprap production stream. The undersized material would be generated by the same drilling and blasting that creates the riprap. However, for the sand dam embankments, there is no direct alternative use for this smaller material within the project and it would have to be stockpiled or “wasted” from the riprap production line. Crushing the sub-one-foot particles to create Type B materials or stone for the stone columns may be economical and should be evaluated as part of future materials evaluations. For this study, it was assumed that the Coolidge Mountain quarry site would operate at 50-percent yield, in the production of riprap. In other words, 2 cubic yards of material would need to be blasted and screened to create each cubic yard of suitable riprap. In the production of rockfill, this study assumed there would be a very small percentage of wasted material. (A test quarry would be needed to verify this assumption.)

### Alluvial Soil Sources

As described above, the API site and its surrounding deposits appear to represent a promising source for all of the embankment materials (except for rockfill and riprap, which would be quarried from Coolidge Mountain) for the various project

alternatives. There appear to be abundant deposits for Type A, Type B, and filter rock materials. The source is near the northwest shore of the Sea and in close proximity to Highway 86, which would facilitate economical hauling by trucks and transport by barge for at least the closest portions of the work. The close proximity to Highway 86 also provides opportunity for extensive hauling by truck. Transportation for elements that are significant distances from this location would have significantly higher transportation costs. These higher transportation costs have been considered in these appraisal level cost estimates.

### Screening and Crushing

It appears possible that all embankment materials could be mined, crushed, screened, and distributed from a single integrated plant at or near the existing API site. It may also be possible to create a portion of the processing operations at the API site and others at a location adjacent to or at a beach location. Multiple product lines could be used to create Type A, Type B, filter rock, and stone column infill materials. Quality control data provided by API indicate that the source would not require extensive washing to reduce fines content. Depending on the option selected, there appears to be sufficient borrow area to support embankment material production.

### Sorting

Embankment materials could be distributed from the API site using conveyors, trucks, or a combination of these methods. The material handling and processing site(s) would need to be developed to allow suitable stockpiling of Type A, Type B, filter rock, and stone column infill materials necessary to meet project schedule, maintenance, and contingency requirements. Multiple conveyors would likely be needed within the production plant area to move the processed materials from stockpiles to either trucks for land deployment or to barges for over-water conveyance. The sorting operations would have to be sequenced so the different materials could be delivered using the same mainline conveyor to the shore or trucks as needed.

### Waste Materials

As discussed above, the rock quarry operations for riprap production may create a relatively large volume of material that could not be economically used and, consequently, would have to be wasted. It is likely that the API alluvial pit operations could be managed so that unsuitable materials would be kept to a minimum. A materials production evaluation should be performed to determine the most economical and effective systems for the large amounts of materials that would be required.

### Transport and Placement

Using the Coolidge Mountain/API site for the embankment materials would provide opportunities for transport using both over-water and over-land methods.

The Torres Martinez Indian Reservation extends east out into the Sea itself, which allows for creation of barge load-out facilities contiguous to the quarry and pit production facilities. Highway 86 bisects this area. A conveyor system could be used to load barges. The conveyor would be threaded through an elevated CMP casing over the highway so that any materials dislodged from the belts would not impact the traffic. The conveyor would be used to move all of the Type A and Type B sand/gravel, fine rockfill and filter rock that would be placed over-water. Riprap and large rockfill cannot be moved by conveyor but must be transported by truck. A temporary traffic bridge over Highway 86 would likely be required to minimize traffic conflicts between construction traffic and the traveling public. Most of the embankments needed for the various project alternatives call for the creation of a broad crest width to allow for densification of the Type A sand/gravel using stone columns. The broad crest width provides the opportunity to use overland trucks to transport and place the embankment materials. It is possible that up to two-thirds of embankment materials could be placed by overland material handling methods and about one-third could be placed over-water using flexi-float barges. The over-water placement would be needed on the outer edges of the embankments, which cannot be reasonably reached from the edge of the broad crest areas. Temporary causeways would be required to provide access for trucks for construction of the mid-Sea dam, the south-Sea dam, the north-Sea dam, and perimeter dike features. Causeways would vary from 4,000 to 7,000 feet long and would be built out from shore using end dump techniques. Though relatively long, the shallow water depths inhibit the use of barges for constructing the temporary causeways. As described above, all of the dam alternatives would rely heavily on overland hauling of embankment materials. However, it is possible that substantial portions if not the entire mid-Sea barrier could be built with over-water techniques, allowing the barrier to emerge and become effective as the water level drops.

### Suction Dredging

Suction dredging would be performed for removal of the Seafloor deposits from the entire embankment footprint, except in the case of the Geotube® embankments. Dredging would be done with barge-mounted suction dredges, and the slurried waste material would be pumped by flexible pipeline several miles to a designated Sea-bottom discharge location within the Sea. It may be necessary for barges to place a berm of Type B sand/gravel at the outer toe of the dredged zone to prevent migration of the remaining soft deposits back into the excavated embankment footprint.

After removal of the Seafloor deposits, a second pass of suction dredging would remove the soft lacustrine and/or alluvial deposits from the central core area of the various alternative embankments. The slurried materials removed from the foundation area would be similarly discharged outside of the project area.

Dredging would also be performed to acquire material for the filling of the Geotube® embankment central core and foundation mattress features. Seafloor

material would be dredged from areas near the embankment alignments using barge-mounted suction dredges. It is assumed the dredged material would be pumped directly into the Geotube® bladders as it is placed from the barge onto the Sea bottom and allowed to drain. It is also assumed two or more fill-and-drain cycles would be required for the foundation mattress and three or more cycles would be required for the central core. Constructing concentric lakes dikes using Geotubes® would likely result in significant seismic, static, and constructability problems.

### Clamshell Excavation

Construction of the Geotube® embankments would include excavation of Seafloor materials from areas near the embankments using clamshell excavation equipment and barges. The clamshell excavated material would be placed over the Geotube® components of the embankments to form the upstream and downstream shells and the crest of the embankments. It is assumed borrow materials would be excavated from areas within ¼ mile of the constructed embankment location.

### Foundation Treatment

Depending on the alternative, unsuitable foundation materials would be treated by either removal by dredging or by accelerated consolidation using wick drains. Wick drain installation would also be performed using a barge-mounted mandrel system.

### Foundation Excavation

All foundation treatment and dredging for the major embankment alternatives would be performed over-water. However, construction of the habitat pond embankments is expected to be performed “in the dry” as the current Sea shrinks in the future. The habitat pond embankment foundations would be over-excavated using track-mounted excavators. The materials removed would then be spread and aerated using low ground pressure equipment prior to replacement into the over-excavated foundation area.

### Stone Columns

Stone columns would be used to densify the Type A sand/gravel used to construct the various embankments. The crest widths would be overbuilt to allow for over-land access to equipment used for the densification process. Stone (gravel) infill for the stone columns would also be delivered overland as well. Stone column densification would occur once the final embankment prism is in place, including all of the Type A and Type B materials. Placement of the Type B material is needed to provide lateral containment of the Type A sand/gravel during the densification process.

### Soil-Cement-Bentonite Slurry Walls

The SCB slurry walls would be constructed from the embankment crest following installation of the stone columns. The SCB slurry walls would extend up to 125 feet deep and would have a nominal width of 5 feet. The potential benefits of an HDPE membrane inserted into the SCB wall to serve as a redundant seepage protection against "windows" or other potential defects in the wall were evaluated during the risk analysis. The benefits appear to be significant but HDPE membranes have not been installed to this depth. Some technology innovations would be required to derive the potential benefits of the membrane.

## Schedule and Project Duration

A master schedule has not been developed for any of the restoration alternatives under evaluation. Project schedules have been discussed only in very broad terms. Cost estimates have been developed using year 2006 cost data. Further, it has been assumed that each of the alternatives would be bid and constructed as a single continuous project. Project costs are a function of time and market conditions. A master schedule should be developed for each of the alternatives so that future cost values can be better estimated.

## Contracting Methods and Packaging

Many opportunities exist for using alternative contracting methods and packages to optimize the constructability of the various embankment alternatives. The project definition currently available does not provide a basis to identify which options should be considered. The very large size of the project would severely limit the number of potential contractors given the large bonding requirements as well as physical resources necessary to complete the work. Developing a contract packaging strategy early would be a key to accessing as large a contracting pool as possible.

## Project Risks

There are many risks to the completion of construction of the various alternatives. These risks are both physical and economic/contractual. Examples of physical risks included the need to protect workers from the hydrogen sulfide releases that can occur as the Sea turns over in the spring and heavy sea conditions that develop during high wind events. Examples of contractual/economic risks include such items as escalation of fuel prices, labor disputes, and bonding capacity.

# Chapter 2. Embankment Construction Cost Estimates

This chapter summarizes the results of cost estimating work for the embankment included in the restoration alternatives under evaluation. The cost estimating process has consisted of developing quantity models and unit pricing information using a bottoms-up approach. The unit price and quantity data have been merged into a construction cost subtotal for each of the alternatives. The construction cost estimates are presented in the context of 2006 dollars. Davis Bacon labor rates for the Imperial Valley (September 15, 2006) have been used. The project schedule and duration are entirely dependent on the alternative selected, and the schedule-related impacts to the cost estimates have not been included at this time. It should be noted that these are appraisal level cost estimates for planning purposes and should not be used to establish project funding until feasibility level evaluations and designs have been completed.

## Embankment Cost Estimate Development

Cost estimates have been prepared considering: (1) bottoms-up unit price derivations for each of the major construction material and placement requirements, (2) estimates of construction material quantities, (3) costs for the contractor's direct costs, indirect costs and profit, and (4) estimates for mobilization. These were summed to the "Subtotal Construction Costs" level only. These costs do not include allowances and contingencies for design, construction management, permitting, unscheduled items, and changed conditions. Quantity estimations were based on geometric equations that will allow for updating of the overall cost estimates should some of the dimensions of the embankments change.

### Unit Prices

Unit price information has been generated using 2006 cost data for similar size projects in the southern California area. Davis Bacon wage scales (September 15, 2006) were used to estimate labor costs. Equipment rates assume that the contractor will use owned equipment. Given the project duration, it was assumed all of the equipment would be fully depreciated over the project life with zero salvage value. These unit costs have been developed using a resource-loaded model that assigns fixed and variable costs for the construction of the 13 main construction elements that include:

- Type A Sand/Gravel
- Type B Sand/Gravel

- Stone Columns
- Riprap Slope Protection
- Dredging
- Soil-Cement-Bentonite Slurry Wall without Membrane
- Geotubes®
- Geocomposite
- Habitat Pond Embankments
- Wick Drains
- Filter Rock
- Rockfill
- Fine Rockfill

The methodology used to build up these rates is described below.

### *Fixed Direct Costs*

Fixed costs were developed for each of the major cost items. The fixed costs consist of one-time costs that are required but are not a function of the volume of the material produced. For instance, constructing a truck crossing over Highway 86 represents a fixed cost that is independent of the volume of material that would be hauled over this feature. By identifying the fixed costs separately, the fixed cost portion of the unit rates can be allocated depending on the volume of each material needed. An example of this is reflected in the varying cost of Type A material from alternative to alternative. The unit price portion of the fixed direct costs is computed by dividing the fixed direct cost by the estimated quantity of material produced. The unit price portion of the fixed costs decreases as the volume of material produced increases and vice versa.

### *Variable Direct Costs*

Variable costs are defined as those costs that are directly related to the production of each individual unit. For instance, blasting for riprap production can be directly estimated based on the quantity of material produced. In general, the variable unit costs are constant, regardless of the volume of materials created.

### *Total Direct Unit Costs*

Total direct unit costs consist of the sum of the variable unit costs and the fixed unit costs for each material type. This sum is the actual cost that the contractor would expend to produce each of the various material types. Total direct unit costs are the expense accrued to the contractor's operations; they are not the rates that would be charged to the owner.

### *Indirect Costs*

Indirect costs are the overhead expenses that the contractor must absorb incidental to the total direct costs listed above. Items in the indirect cost category include:

- Supervision and project management

- Temporary buildings
- Temporary utilities
- Temporary job construction
- Job transportation
- Office expenses
- Insurance
- Employee move costs
- Bonds
- Equipment contingency
- Summer/Winter protection
- Contractor's "Internal" Contingency
- Surveying

Indirect costs have been estimated as 10 percent of the direct costs.

### *Profit*

The contractor's profit is compounded to the total of direct and indirect expenses. The Salton Sea Restoration Project represents a very large construction project and, therefore, represents a high risk to the contractor charged with its execution. Accordingly, a contractor's target profit may be as high as 20 percent, commensurate with such a high-risk endeavor. Following Reclamation costing protocols, a profit target of 10 percent was used in the cost estimate.

## Mobilization

Mobilization costs include mobilizing contractor personnel and equipment to the project site during initial project start-up. The assumed 5 percent of the subtotal cost used in the appraisal level cost estimates contained in this study is based on past experience. The mobilizations costs are either built into the unit costs or shown as a line item in the estimate worksheets discussed at the end of this chapter.

## Unit Price Escalation

Cost estimates are presented using 2006 dollars, and no allowance for escalation that would occur over an extended construction duration has been included at this time. Escalation will be a significant consideration when developing funding level cost estimates. Future construction costs are dependent on the level of labor and materials inflation. Construction cost inflation averages were between 2 and 3 percent per year prior to 2003. Since then, construction cost inflation has become much more volatile, approaching 10 percent or more per year. It is recommended that a risk-based approach to estimating costs and inflation factors be used during feasibility level cost estimate development.

### Production Rates and Constraints

More detailed project schedules should be developed as the timelines for construction are developed. Once completed, the production rates and constraints listed in the accompanying cost estimates should be appropriately updated.

## Quantity Estimates

Quantity models have been developed for each of the alternatives, except for the Concentric Lakes with Geotubes® Alternative (No. 3C). These models are mathematical in nature and automatically calculate the volume of the various construction elements as described above. The quantity models allow for changes in both the embankment height and length and foundation depth as the input variables. With changes in the input variables, the quantity models automatically recompute the new embankment volumes. The revised volumes are then loaded into the cost estimate sheets, and the new cost estimate is generated.

The estimated costs of the Geotube® embankments are based on quantities provided to Reclamation by the Imperial Group's engineering consultant (Stetson Engineers). The level of detail on the quantities information provided was insufficient for a thorough review and verification of the quantities. Also, the information provided on the design and construction methods was insufficient with regard to development of unit prices. Therefore, the Geotube® embankment costs estimates are at a preliminary level relative to the other embankments costs estimates.

## Cost Estimate Worksheets

Embankment cost estimate worksheets, and other cost estimate worksheets, for each of the alternatives are provided as attachments to this document as follows:

- **Attachment 1A:** Cost Estimate Worksheets for Alternative No. 1A: Mid-Sea Dam with North Marine Lake - Sand Dam with Stone Columns (Salton Sea Authority Alternative - Revised Alignment)

- **Attachment 1B:** Cost Estimate Worksheets for Alternative No. 1B: Mid-Sea Dam with North Marine Lake - SSA Rockfill Dam (Salton Sea Authority Alternative - Original Alignment)

- **Attachment 1C:** Cost Estimate Worksheets for Alternative No. 1C: Mid-Sea Dam with North Marine Lake – Sand Dam with Stone Columns (Salton Sea Authority Alternative - Original Alignment)

- **Attachment 1D:** Cost Estimate Worksheets for Alternative No. 1D: Mid-Sea Dam with North Marine Lake - Rock Notches Dam (Salton Sea Authority Alternative - Original Alignment)

- **Attachment 2A:** Cost Estimate Worksheets for Alternative No. 2A: Mid-Sea Barrier with South Marine Lake – Sand Barrier with Stone Columns

- **Attachment 2B:** Cost Estimate Worksheets for Alternative No. 2B: Mid-Sea Barrier with South Marine Lake – Sand Barrier without Stone Columns

- **Attachment 3A:** Cost Estimate Worksheets for Alternative No. 3A: Concentric Lakes – Sand Dikes with Stone Columns (Imperial Group Alternative)

- **Attachment 3B:** Cost Estimate Worksheets for Alternative No. 3B: Concentric Lakes – Sand Dikes without Stone Columns (Imperial Group Alternative)

- **Attachment 3C:** Cost Estimate Worksheets for Alternative No. 3C: Concentric Lakes - Earthfill Dikes with Geotubes® (Imperial Group Alternative)

- **Attachment 4:** Cost Estimate Worksheets for Alternative No. 4: North-Sea Dam with North Marine Lake – Sand Dam with Stone Columns

- **Attachment 5:** Cost Estimate Worksheets for Alternative No. 5: Habitat Enhancement without Marine Lake

- **Attachment 6:** Cost Estimate Worksheets for Alternative No. 6: No-Project

# Chapter 3. Water Conveyance and Air Quality Construction Cost Estimates

## Air Quality Mitigation

Air quality mitigation (AQM) costs would be incurred whether or not any of the restoration features are constructed, as playas are exposed over time as the Sea recedes. No-Project Alternative consists entirely of this cost. AQM costs for all alternatives, except Alternatives 1B, 1C and 1D, were estimated using construction costs consistent with the California Department of Water Resources' Salton Sea Ecosystem Restoration Plan. Construction costs for mitigation using water-efficient vegetation were assumed to be $14,000 per acre. Construction costs for mitigation using other methods was $7,000 per acre. The AQM cost estimates for Alternatives 1B, 1C and 1D were developed by Reclamation based on the SSA's proposed salt-crusting method. It is assumed the State of California will manage AQM in coordination with landowners and other stakeholders as may be applicable by Federal and State laws, regulations, ordinances, and legal agreements. **Attachment 7** summarizes air quality mitigation feature construction costs for each of the alternatives.

## Water Conveyance Facilities

Cost estimates for the water conveyance features included with each alternative are based on quantities and unit prices developed by Reclamation. The various alternative conveyance features consist of river diversion structures, pumping stations, canals, pipelines and appurtenances (bridges, siphons, cross drainage, etc.). These conveyance features are associated with the salinity control, water treatment, and air quality mitigation components of the alternatives. The conveyance features were sized based on estimated future river flows, treatment capacities, air quality mitigation areas, and typical design criteria. It is assumed river diversion structures would be constructed of reinforced concrete, canals would be lined with concrete, and large diameter pipelines would be of steel and reinforced concrete materials.

Water conveyance cost estimate worksheets for each of the alternatives are included in the attachments described in Chapter 2.

# Chapter 4. Operations, Maintenance, Energy, Replacement, and Risk Costs of Alternatives

Annual operations, maintenance, energy, replacement, and risk costs were developed by Reclamation at a relatively low level of detail because those costs for the restoration alternatives, incremental to the No-Project Alternative, are small relative to initial project implementation costs. Costs were included for staff, office space, vehicles, materials, and pumping energy. Reclamation relied on State of California information for operation and replacement costs of air quality mitigation features. For Alternative No. 1 only, Reclamation relied on an estimate for operation of the water treatment facilities prepared by the Salton Sea Authority that is considered by Reclamation to be significantly understated. Operations, maintenance, energy, and replacement cost calculations for the Restoration alternatives are provided in **Attachment 8**.

The Salton Sea is located in an area with a history of earthquakes of sufficient magnitude to cause significant damage to the constructed features of the various alternatives; i.e., the dams, dikes, barriers, habitat pond embankments and islands, conveyance facilities, and treatment facilities. Repair and replacement costs for each of these features were estimated to range from 5 to 50 percent of original project implementation costs. No damage from potential seismic activity was assumed for the air quality mitigation features. The annual probability of failure was estimated for each of the facilities susceptible to earthquake damage for all alternatives, except Alternatives 1B and 1D. The annual probability of failure for each potentially earthquake-damaged feature was multiplied by the estimated repair and replacement costs for that feature to derive the "annual risk cost" associated with its location in an active seismic area. For the Concentric Lakes Alternative with Geotubes® (Alternative No. 3C), an additional annual risk cost was considered for repair and replacement of significant portions of the dikes due to expected foundation piping and erosion problems. **Attachment 9** provides details on the percentages of each component that would have to be replaced upon seismic activity strong enough to result in failure. This attachment also presents the annualized probability of failure of each alternative component and the resulting "annual risk costs."

The annual operation, maintenance, energy and replacement (OME&R) costs were added to the annual risk cost for each alternative, except Alternatives 1B and 1D to derive the total operations, maintenance, energy, replacement, and risk (OMER&Risk) costs, as shown in **Attachment 9**.

# Chapter 5. Total Costs of Alternatives

**Attachment 9** displays appraisal level estimates of initial implementation costs and recurring operational costs of all alternatives, including the No-Project Alternative. All appraisal level cost estimates are expressed in 2006 price levels for comparison purposes. Appraisal level cost estimates are not appropriate for requesting authorization or construction fund appropriations from Congress.

The costs of all alternatives are based on very limited geologic and geotechnical data that were obtained through exploration in years 2003 and 2004. Significant design uncertainties exist as a result of the limited amount of site information. Uncertainties also exist relative to constructability, seismic performance, static performance, and construction costs. These uncertainties can only be reduced by conducting significant geologic and geotechnical design data collection programs.

Specific schedules that take into account the construction duration of each alternative feature have not been developed. Without consideration of construction durations, escalation during construction cannot be properly evaluated. The appraisal level cost estimates provided in this chapter do not include funds for escalation during construction. Escalation during construction is expected to be a very significant dollar amount given the size, probable duration of construction, and cost magnitude of the various restoration alternatives presented here. The appraisal level cost estimates presented in this chapter are not appropriate for requesting authorization or construction funding appropriations from Congress.

The following sections of this chapter describe the various components of the appraisal level cost estimates.

## Total Project Implementation Costs

The cost estimating process for alternative features involved application of models and equations to determine major construction material quantities and placement requirements. Unit prices per physical quantity were developed and then applied to physical quantities to develop the construction cost estimates. Unit prices included a 5-percent additive for initial mobilization of contractor personnel and equipment to the project site during start-up.

Some appraisal level cost estimates for other less costly features were developed in a different manner. The construction costs for the air quality mitigation features for most of the alternatives relied heavily on estimates presented by the State of California in its Salton Sea Ecosystem Restoration Program Draft

Programmatic Environmental Impact Report. The construction costs for the water treatment facilities in Alternative No. 1 were based on estimates developed by the Salton Sea Authority and are considered by Reclamation to be significantly understated.

In accordance with the Reclamation's Cost Estimating Handbook guidelines (Reclamation, 1989), a 10-percent allowance, based upon engineering judgment, was added to construction costs to cover additional unlisted items of work that would appear in the specifications and would be required for a fully finished feature. The sum of construction costs and the allowances for environmental mitigation and unlisted items is termed "contract costs", as shown in **Attachment 9**.

Costs are provided in **Attachment 9** for two mid-Sea barrier alternatives (Alternative Nos. 2A and 2B). Alternative No. 2A includes stone columns to reduce seismic risk; Alternative No. 2B does not include stone columns. These two sets of costs provide for an understanding of the costs associated with reducing seismic risk.

Costs are provided in **Attachment 9** for three different concentric lakes dikes design alternatives (Alternative Nos. 3A, 3B, and 3C). These costs assume three concentric lakes would be required under mean possible inflow. Implementation costs for four concentric lakes, as proposed by the Imperial Group, are provided as a footnote to **Attachment 9**. Alternative No. 3B includes a design that does not include stone columns and, as such, it carries with it seismic risks that would not occur in Alternative No. 3A, which does include stone columns. Alternative No. 3C involves use of Geotubes® as proposed by the Imperial Group. It is Reclamation's opinion that constructing concentric lakes dikes using Geotubes® would result in significant seismic, static, and constructability problems. Based on these identified problems, the Geotube® approach is likely not feasible. These three sets of costs for the Concentric Lakes Alternative provide an understanding of the costs associated with reducing risk.

A 25-percent allowance for "contingencies", based upon engineering judgment, was added to contract costs to address the differences between actual and estimated quantities, unforeseeable difficulties at the site, possible minor changes in plans, and other uncertainties. As shown in **Attachment 9**, the sum of contract costs and contingencies equals "total field costs."

"Non-contract costs" were estimated to be 20 percent of the total field costs. This allowance was based on typical non-contract costs from past large Reclamation projects. Non-contract costs reflect some or all of the following items: services facilities, investigations and studies including environmental compliance, final designs and specifications, permits, construction engineering and management, and other general expenses.

The sum of total field costs and non-contract costs is equal to the "total project implementation costs", which are the total estimated costs of putting any of the alternatives fully in service. As shown in **Attachment 9**, these costs range from a low of $1.6 billion for the No-Project Alternative to a high of $14.0 billion for Alternative No. 3B, expressed in 2006 prices.

# References

Reclamation, 1999. *A Procedure for Estimating Loss of Life Caused by Dam Failure* by Wayne J. Graham, P.E., DSO-99-06, Dam Safety Office, Denver, Colorado.

Reclamation, 2003. *Guidelines for Achieving Public Protection in Dam Safety Decision Making*, June 15, 2003.

Reclamation, 1989. *Cost Estimating Handbook*, Revised March 1989

# Attachment 1A

## Cost Estimate Worksheets for Alternative No. 1A: Mid-Sea Dam with North Marine Lake - Sand Dam with Stone Columns (Salton Sea Authority Alternative–Revised Alignment)

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# ESTIMATE WORKSHEET

SHEET__1__ OF __5__

***Alternative No. 1A***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal
**REGION:** | **PRICE LEVEL:**
**FILE:** C:\ALL\SEA\2007\[Cost Estimate - usbr - 12-18-06.xls]Alternative 1A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| A | | **Mid-Sea Dam** | | | | | |
| | 1 | **Dredging** | | 38,146,900 | CY | $6.70 | $255,584,230 |
| | 2 | **Type A Sand** | | 59,759,700 | CY | | |
| | | **Type A Sand-Barge Haul** | | 29,879,850 | CY | $13.84 | $413,537,124 |
| | | **Type A Sand-Truck Haul** | | 29,879,850 | CY | $18.77 | $560,844,785 |
| | 3 | **Type B Sand/Gravel** | | 15,275,700 | CY | | |
| | | **Type B Sand/Gravel-Barge Haul** | | 7,637,850 | CY | $13.51 | $103,187,354 |
| | | **Type B Sand/Gravel-Truck Haul** | | 7,637,850 | CY | $18.53 | $141,529,361 |
| | 4 | **Filter Rock (Fine and Coarse)-Barge Haul** | | 1,544,400 | CY | $13.51 | $20,864,844 |
| | 5 | **Riprap** | | 5,777,200 | CY | | |
| | | **Riprap-Barge Haul** | | 3,870,724 | CY | $28.02 | $108,457,686 |
| | | **Riprap-Truck Haul** | | 1,906,476 | CY | $32.22 | $61,426,657 |
| | 6 | **Stone Columns** | | 7,757,200 | FT | $45.92 | $356,210,624 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 6,024,700 | SF | $10.12 | $60,969,964 |
| | 8 | **Wick Drains** | | 24,505,800 | FT | $5.21 | $127,675,218 |
| | | SUBTOTAL (Sheet 1 of 5) | | | | | $2,210,287,846 |

**QUANTITIES**

**BY**
**M. Spears**

**CHECKED**
**D. Wiltshire**

**DATE PREPARED**
**12/20/06**

**PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder, Inc.**

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# ESTIMATE WORKSHEET



***Alternative No. 1A***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate - usbr - 12-18-06.xls]Alternative 1A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | CY | | |
| B | | **South-Sea Dam** | | | | | |
| | 1 | **Dredging** | | 5,683,700 | CY | $6.70 | $38,080,790 |
| | 2 | **Type A Sand-Truck Haul** | | 15,673,900 | CY | $24.12 | $378,054,468 |
| | | ***Thicken Dam Section at Fault Crossing** | | | | | |
| | 3 | **Type B Sand/Gravel-Truck Haul** | | 2,737,900 | CY | $23.88 | $65,381,052 |
| | 4 | **Fine Rock Fill-Truck Haul** | | 1,530,100 | CY | $23.88 | $36,538,788 |
| | 5 | **Riprap-Truck Haul** | | 3,655,300 | CY | $51.04 | $186,566,512 |
| | 6 | **Stone Columns** | | 2,876,500 | FT | $45.92 | $132,088,880 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane (Section A-Fault Resistance)** | | 2,962,300 | SF | $18.00 | $53,321,400 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane (Section B)** | | 3,751,000 | SF | $6.00 | $22,506,000 |
| | | *Triple wide slurry wall at fault crossing | | | | | |
| | 8 | **Wick Drains** | | 8,065,200 | FT | $5.21 | $42,019,692 |
| | | SUBTOTAL (Sheet 2 of 5) | | | | | $954,557,582 |

**QUANTITIES**

**BY** M. Spears | **CHECKED** D. Wiltshire

**DATE PREPARED** 12/20/06 | **PEER REVIEW**

**PRICES**

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# ESTIMATE WORKSHEET

SHEET__3__ OF __5__

***Alternative No. 1A***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:** **Salton Sea Restoration Feasibility Study**

**WOID:** **ESTIMATE LEVEL:** **Appraisal**

**REGION:** **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate - usbr - 12-18-06.xls]Alternative 1A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| C | | **Perimeter Dikes** | | | | | |
| | 1 | **Dredging** | | 6,097,300 | CY | $6.70 | $40,851,910 |
| | 2 | **Type A Sand-Truck Haul** | | 9,479,800 | CY | $21.82 | $206,849,236 |
| | 3 | **Type B Sand/Gravel-Truck Haul** | | 895,400 | CY | $21.59 | $19,331,686 |
| | 4 | **Filter Rock (Fine and Coarse)** | | | CY | | |
| | 5 | **Riprap-Truck Haul** | | 2,570,700 | CY | $37.85 | $97,300,995 |
| | 5 | **Crest Armoring (Additional 3 feet of riprap on top of crest)** | | 125,400 | CY | $37.85 | $4,746,390 |
| | 6 | **Stone Columns** | | 2,065,800 | FT | $45.92 | $94,861,536 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 7,659,300 | SF | $6.00 | $45,955,800 |
| | 8 | **Wick Drains** | | 6,430,600 | FT | $5.21 | $33,503,426 |
| | | SUBTOTAL (Sheet 3 of 5) | | | | | $543,400,979 |

**QUANTITIES**

**BY** M. Spears

**CHECKED** D. Wiltshire

**DATE PREPARED** 12/20/06

**PEER REVIEW**

**PRICES**

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# ESTIMATE WORKSHEET

SHEET__4__ OF __5__

***Alternative No. 1A***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:** **Salton Sea Restoration Feasibility Study**

**WOID:** **ESTIMATE LEVEL:** **Appraisal**

**REGION:** **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate - usbr - 12-18-06.xls]Alternative 1A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| D | | **Habitat Ponds** | | | | | |
| | 1 | **Habitat Ponds** | | 16,000 | ACRE | $13,473.00 | $215,568,000 |
| | | Includes overexcavation geogrid replacement and embankment | | | | | |
| | | SUBTOTAL (Sheet 4 of 5) | | | | | $215,568,000 |

**QUANTITIES**

**BY** M. Spears

**CHECKED** D. Wiltshire

**DATE PREPARED** 12/20/06

**PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder, Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__5__ OF __5__

**FEATURE:**

***Alternative No. 1A***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:**

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| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
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| | | **Notes:** | | | | | |
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| | | SUBTOTAL (Sheet 5 of 5) | | | | | |
| | | SUBTOTAL (Sheet 4 of 5) | | | | | $215,568,000 |
| | | SUBTOTAL (Sheet 3 of 5) | | | | | $543,400,979 |
| | | SUBTOTAL (Sheet 2 of 5) | | | | | $954,557,582 |
| | | SUBTOTAL (Sheet 1 of 5) | | | | | $2,210,287,846 |
| | | | | | | | |
| | | **Subtotal Construction Costs** | | | | | **$3,923,814,407** |
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**QUANTITIES**

**BY**
**M. Spears**

**CHECKED**
**D. Wiltshire**

**DATE PREPARED**
**12/20/06**

**PEER REVIEW**

**PRICES**

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BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

**FEATURE:**

***Alternative No. 1A***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
**Habitat Ponds Deep Excavation**

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL** Appraisal
**REGION:** | **PRICE LEVEL:**
**FILE:** C:\ALL\SEA\2006new\[HabitatPondDeepExc.xls]Alt 1A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | **Habitat Ponds Deep Excavation** | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | **Excavation** | | 36,138,667 | CY | $6.50 | $234,901,333 |
| | | Assumes uniform 7-foot excavation in the dry using | | | | | |
| | | conventional excavation techniques to remove soft | | | | | |
| | | wet material (16,000 acres of ponds with 20 percent | | | | | |
| | | or 320 acres of deep areas) | | | | | |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | **Subtotal Construction Costs** | | | | | $234,901,333 |
| | | | | | | | |
| | | Mobilization 5% (+/-) | | | | | $11,750,000 |
| | | **Subtotal Contract Costs** | | | | | $246,651,333 |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |

**QUANTITIES**

**BY** M. Spears
**CHECKED** J. Cunningham
**DATE PREPARED** 10/12/06
**PEER REVIEW**

**PRICES**

**Unit prices from September 30, 2005 Salton Sea Restoration Project, Feasibility Study - Phase 1, Alternatives and Cost Estimates**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 1A, 1B, 1C & 1D***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 1 SSA est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SE Quadrant** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 13,390 | CY | $90.00 | $1,205,100.00 |
| | | Sheet pile cutoff | | 15,885 | SF | $35.00 | $555,975.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | | 14,855 | CY | $8.00 | $118,840.00 |
| | | Embankment | | 14,420 | CY | $5.00 | $72,100.00 |
| | | Unreinforced concrete canal lining | | 405 | CY | $500.00 | $202,500.00 |
| | | | | | | | |
| | | **Circulation canal, 967 cfs, 19.8 mi** | | | | | |
| | | Excavation | | 1,821,000 | CY | $5.00 | $9,105,000.00 |
| | | Compacted embankment | | 63,600 | CY | $6.00 | $381,600.00 |
| | | Unreinforced concrete canal lining | | 50,800 | CY | $500.00 | $25,400,000.00 |
| | | 17 Siphons, 50' head class | | | | | |
| | | 15.5' dia Precast reinf conc pipe | | 3,400 | LF | $2,500.00 | $8,500,000.00 |
| | | Excavation | | 216,500 | CY | $8.00 | $1,732,000.00 |
| | | Backfill | | 167,900 | CY | $6.00 | $1,007,400.00 |
| | | Reinforced concrete | | 2,150 | CY | $1,000.00 | $2,150,000.00 |
| | | 19 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 3,165 | LF | $300.00 | $949,500.00 |
| | | 10 Bridges | | | | | |
| | | Reinforced concrete | | 1,020 | CY | $1,000.00 | $1,020,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



| FEATURE: | PROJECT: | |
|---|---|---|
| ***Alternative Nos. 1A, 1B, 1C & 1D Mid-Sea Dam/North Marine Lake Salton Sea Authority Alternative Water Conveyance Components*** | **Salton Sea** | |
| | **WOID:** L165C | **ESTIMATE LEVEL:** Appraisal |
| | **REGION:** LC | **PRICE LEVEL:** Apr-06 |
| | **FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 1 SSA est | |

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SE Quadrant** | | | | | |
| | | **South Lake Water Pipeline, 35 cfs, 16.0 mi, 189' head** | | | | | |
| | | 3.0' dia Steel pipe | | 16.0 | Mi | $1,200,000.00 | $19,200,000.00 |
| | | **Regulating tank tower (200,000 gal, 190 ft tall)** | | 1.0 | Ea. | | $1,000,000.00 |
| | | **South Lake Pumping Plant, 35 cfs, 201' TDH** | | 1 | LS | | $4,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Circulation Pump Plant, 967 cfs, 34' TDH** | | 1 | LS | | $35,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Treatment Plant Sludge Conveyance, 29 cfs, 7.6 mi, 25' TD** | | | | | |
| | | 3.5' dia Steel pipe | | 7.6 | Mi | $1,400,000.00 | $10,640,000.00 |
| | | | | | | | |
| | | **NE Quadrant** | | | | | |
| | | **Deep Water Intake Pipe, 608 cfs, 8.4 mi, 25' head** | | | | | |
| | | 12.4' dia Steel pipe | | 8.4 | Mi | $15,000,000.00 | $126,000,000.00 |
| | | **Deep Water Pumping Plant, 608 cfs, 33' TDH** | | 1 | LS | | $21,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Filtration Backflush Conveyance, 30 cfs, 3.1 mi, 25' head** | | | | | |
| | | 2.8' dia Steel pipe | | 3.1 | Mi | $1,100,000.00 | $3,410,000.00 |
| | | | | | | | |
| | | Subtotal | | | | | $272,650,015.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $27,265,002.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $299,915,017.00 |
| | | Mobilization (+/-5%) | | | | | $15,000,000.00 |
| | | Subtotal w/Mobilization | | | | | $314,915,017.00 |
| | | | | | | | |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| **BY** Mark Leavitt Steve Robertson | | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | | **DATE PREPARED** | **PEER REVIEW** |

# Alternative No. 1A, 1B, 1C & 1D
# Salton Sea Authority
# Water Treatment Facilities Costs

Source: "Salton Sea Authority Plan For Multi-Purpose Project" Draft for TAC Review dated 6/9/06
Bob Hamilton spoke with Bill Brownlie of Tetra Tech, Inc. on 9/18/06 and the costs are the most current at that time; Mr. Brownlie stated that he believed these costs were expressed in $2006 and were developed by Mr. Ron Entwiler

| Construction Cost | | $Million |
|---|---|---|
| Treatment & Pumping Plant Costs in Report (page 72) | | 300 |
| adjustment for unlisted items (10%) and contingencies (25%) | | 1.375 |
| Construction Cost for Reclamation Spreadsheet | | 218.1818 |
| (includes 5% mobilization) | rounded | **218** |

| OM&R | $Million |
|---|---|
| Phosphorus Removal Plant in Report (page 73) | 31.1 |
| Filtration/Ozone Plant in Report (page 73) | 13.4 |
| Pumping Plant in Report (page 73) | 0.8 |
| total from Report | **45.3** |

# Attachment 1B

## Cost Estimate Worksheets for Alternative No. 1B: Mid-Sea Dam with North Marine Lake - SSA Rockfill Dam (Salton Sea Authority Alternative - Original Alignment)

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 1B***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***URS Rockfill Embankment Design***

**PROJECT:**

**Salton Sea Restoration**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[SSA Cost Worksheets.xls]URS Rockfill

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Mid-Sea Dam** | | | | | |
| | 1 | Dredging | | 22,459,800 | CY | $6.70 | 150,480,660 |
| | 2 | Rockfill | | 30,049,800 | CY | $23.16 | 695,953,368 |
| | 3 | Sand Core | | 3,487,000 | CY | $16.30 | 56,838,100 |
| | 4 | SCB Slurry Wall | | 4,955,500 | SF | $10.12 | 50,149,660 |
| | 5 | Geocomposite | | 11,859,100 | SF | $6.00 | 71,154,600 |
| | 6 | Fine Rockfill | | 1,317,800 | CY | $13.51 | 17,803,478 |
| | | **Page 1 Subtotal** | | | | | **1,042,379,866** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY: M. Spears | CHECKED: P. Weghorst | BY: D. Donaldson | CHECKED: |
| DATE PREPARED: January 4, 2007 | PEER REVIEW: | DATE PREPARED: January 25, 2007 | PEER REVIEW: |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 1B***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***URS Rockfill Embankment Design***

**PROJECT:**

**Salton Sea Restoration**

**WOID:**

**ESTIMATE LEVEL:** **Appraisal**

**REGION:**

**PRICE LEVEL:** **Oct-06**

**FILE:**

C:\ALL\SEA\2007\[SSA Cost Worksheets.xls]URS Rockfill

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **South-Sea Dam** | | | | | |
| | 1 | Dredging | | 10,967,000 | CY | $6.70 | 73,478,900 |
| | 2 | Rockfill | | 18,223,700 | CY | $31.77 | 578,966,949 |
| | 3 | Sand Core | | 3,633,300 | CY | $24.12 | 87,635,196 |
| | 4 | SCB Slurry Wall | | 6,539,500 | SF | $6.00 | 39,237,000 |
| | 5 | Geocomposite | | 12,060,400 | SF | $6.00 | 72,362,400 |
| | 6 | Fine Rockfill | | 1,339,800 | CY | $23.88 | 31,994,424 |
| | | **Page 2 Subtotal** | | | | | **883,674,869** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| **BY** M. Spears | **CHECKED** P. Weghorst | **BY** D. Donaldson | **CHECKED** |
| **DATE PREPARED** January 4, 2007 | **PEER REVIEW** | **DATE PREPARED** January 25, 2007 | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__3__ OF __3__

**FEATURE:**

***Alternative No. 1B***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***URS Rockfill Embankment Design***

**PROJECT:**

**Salton Sea Restoration**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[SSA Cost Worksheets.xls]URS Rockfill

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Perimeter Dikes** | | | | | |
| | 1 | Dredging | | 12,459,700 | CY | $6.70 | 83,479,990 |
| | 2 | Rockfill | | 14,997,400 | CY | $25.24 | 378,534,376 |
| | 3 | Sand Core | | 3,676,200 | CY | $21.82 | 80,214,684 |
| | 4 | SCB Slurry Wall | | 7,362,300 | SF | $6.00 | 44,173,800 |
| | 5 | Geocomposite | | 12,002,100 | SF | $6.00 | 72,012,600 |
| | 6 | Fine Rockfill | | 1,333,200 | CY | $21.59 | 28,783,788 |
| | | **Page 3 Subtotal** | | | | | **687,199,238** |
| | | Pages 1, 2 and 3 Total | | | | | **2,613,253,973** |

**QUANTITIES**

| BY | CHECKED |
|---|---|
| M. Spears | P. Weghorst |
| **DATE PREPARED** | **PEER REVIEW** |
| January 4, 2007 | |

**PRICES**

| BY | CHECKED |
|---|---|
| D. Donaldson | |
| **DATE PREPARED** | **PEER REVIEW** |
| January 25, 2007 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 1A, 1B, 1C & 1D***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 1 SSA est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SE Quadrant** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 13,390 | CY | $90.00 | $1,205,100.00 |
| | | Sheet pile cutoff | | 15,885 | SF | $35.00 | $555,975.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | | 14,855 | CY | $8.00 | $118,840.00 |
| | | Embankment | | 14,420 | CY | $5.00 | $72,100.00 |
| | | Unreinforced concrete canal lining | | 405 | CY | $500.00 | $202,500.00 |
| | | | | | | | |
| | | **Circulation canal, 967 cfs, 19.8 mi** | | | | | |
| | | Excavation | | 1,821,000 | CY | $5.00 | $9,105,000.00 |
| | | Compacted embankment | | 63,600 | CY | $6.00 | $381,600.00 |
| | | Unreinforced concrete canal lining | | 50,800 | CY | $500.00 | $25,400,000.00 |
| | | 17 Siphons, 50' head class | | | | | |
| | | 15.5' dia Precast reinf conc pipe | | 3,400 | LF | $2,500.00 | $8,500,000.00 |
| | | Excavation | | 216,500 | CY | $8.00 | $1,732,000.00 |
| | | Backfill | | 167,900 | CY | $6.00 | $1,007,400.00 |
| | | Reinforced concrete | | 2,150 | CY | $1,000.00 | $2,150,000.00 |
| | | 19 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 3,165 | LF | $300.00 | $949,500.00 |
| | | 10 Bridges | | | | | |
| | | Reinforced concrete | | 1,020 | CY | $1,000.00 | $1,020,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



| FEATURE: | PROJECT: | |
|---|---|---|
| ***Alternative Nos. 1A, 1B, 1C & 1D Mid-Sea Dam/North Marine Lake Salton Sea Authority Alternative Water Conveyance Components*** | **Salton Sea** | |
| | **WOID:** L165C | **ESTIMATE LEVEL:** Appraisal |
| | **REGION:** LC | **PRICE LEVEL:** Apr-06 |
| | **FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 1 SSA est | |

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SE Quadrant** | | | | | |
| | | **South Lake Water Pipeline, 35 cfs, 16.0 mi, 189' head** | | | | | |
| | | 3.0' dia Steel pipe | | 16.0 | Mi | $1,200,000.00 | $19,200,000.00 |
| | | **Regulating tank tower (200,000 gal, 190 ft tall)** | | 1.0 | Ea. | | $1,000,000.00 |
| | | **South Lake Pumping Plant, 35 cfs, 201' TDH** | | 1 | LS | | $4,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Circulation Pump Plant, 967 cfs, 34' TDH** | | 1 | LS | | $35,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Treatment Plant Sludge Conveyance, 29 cfs, 7.6 mi, 25' TD** | | | | | |
| | | 3.5' dia Steel pipe | | 7.6 | Mi | $1,400,000.00 | $10,640,000.00 |
| | | | | | | | |
| | | **NE Quadrant** | | | | | |
| | | **Deep Water Intake Pipe, 608 cfs, 8.4 mi, 25' head** | | | | | |
| | | 12.4' dia Steel pipe | | 8.4 | Mi | $15,000,000.00 | $126,000,000.00 |
| | | **Deep Water Pumping Plant, 608 cfs, 33' TDH** | | 1 | LS | | $21,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Filtration Backflush Conveyance, 30 cfs, 3.1 mi, 25' head** | | | | | |
| | | 2.8' dia Steel pipe | | 3.1 | Mi | $1,100,000.00 | $3,410,000.00 |
| | | | | | | | |
| | | Subtotal | | | | | $272,650,015.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $27,265,002.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $299,915,017.00 |
| | | Mobilization (+/-5%) | | | | | $15,000,000.00 |
| | | Subtotal w/Mobilization | | | | | $314,915,017.00 |
| | | | | | | | |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| **BY** Mark Leavitt Steve Robertson | | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | | **DATE PREPARED** | **PEER REVIEW** |

# Alternative No. 1A, 1B, 1C & 1D
# Salton Sea Authority
# Water Treatment Facilities Costs

Source: "Salton Sea Authority Plan For Multi-Purpose Project" Draft for TAC Review dated 6/9/06
Bob Hamilton spoke with Bill Brownlie of Tetra Tech, Inc. on 9/18/06 and the costs are the most current at that time; Mr. Brownlie stated that he believed these costs were expressed in $2006 and were developed by Mr. Ron Entwiler

| Construction Cost | | $Million |
|---|---|---|
| Treatment & Pumping Plant Costs in Report (page 72) | | 300 |
| adjustment for unlisted items (10%) and contingencies (25%) | | 1.375 |
| Construction Cost for Reclamation Spreadsheet | | 218.1818 |
| (includes 5% mobilization) | rounded | **218** |

| OM&R | $Million |
|---|---|
| Phosphorus Removal Plant in Report (page 73) | 31.1 |
| Filtration/Ozone Plant in Report (page 73) | 13.4 |
| Pumping Plant in Report (page 73) | 0.8 |
| total from Report | **45.3** |

# Attachment 1C

## Cost Estimate Worksheets for Alternative No. 1C: Mid-Sea Dam with North Marine Lake – Sand Dam with Stone Columns (Salton Sea Authority Alternative - Original Alignment)

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative No. 1C***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 1

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| A | | **Mid-Sea Dam** | | | | | |
| | 1 | **Dredging** | | 27,802,500 | CY | $6.70 | $186,276,750 |
| | 2 | **Type A Sand** | | 44,295,900 | CY | | |
| | | **Type A Sand-Barge Haul** | | 22,147,950 | CY | $13.84 | $306,527,628 |
| | | **Type A Sand-Truck Haul** | | 22,147,950 | CY | $18.77 | $415,717,022 |
| | 3 | **Type B Sand/Gravel** | | 10,777,800 | CY | | |
| | | **Type B Sand/Gravel-Barge Haul** | | 5,388,900 | CY | $13.51 | $72,804,039 |
| | | **Type B Sand/Gravel-Truck Haul** | | 5,388,900 | CY | $18.53 | $99,856,317 |
| | 4 | **Filter Rock (Fine and Coarse)-Barge Haul** | | 1,219,900 | CY | $13.51 | $16,480,849 |
| | 5 | **Riprap** | | 4,527,600 | CY | | |
| | | **Riprap-Barge Haul** | | 3,033,492 | CY | $28.02 | $84,998,446 |
| | | **Riprap-Truck Haul** | | 1,494,108 | CY | $32.22 | $48,140,160 |
| | 6 | **Stone Columns** | | 7,757,200 | FT | $45.92 | $356,210,624 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 4,955,500 | SF | $10.12 | $50,149,660 |
| | 8 | **Wick Drains** | | 18,905,700 | FT | $5.21 | $98,498,697 |
| | | SUBTOTAL (Sheet 1 of 5) | | | | | $1,735,660,191 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| J. Yu | R. Allen/C. Spandau | M. Pauletto | P. Martinson |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 08/25/06 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative No. 1C***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 1

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | CY | | |
| B | | **South-Sea Dam** | | | | | |
| | 1 | **Dredging** | | 5,683,700 | CY | $6.70 | $38,080,790 |
| | 2 | **Type A Sand-Truck Haul** | | 15,673,900 | CY | $24.12 | $378,054,468 |
| | | ***Thicken Dam Section at Fault Crossing** | | | | | |
| | 3 | **Type B Sand/Gravel-Truck Haul** | | 2,737,900 | CY | $23.88 | $65,381,052 |
| | 4 | **Fine Rock Fill-Truck Haul** | | 1,530,100 | CY | $23.88 | $36,538,788 |
| | 5 | **Riprap-Truck Haul** | | 3,655,300 | CY | $51.04 | $186,566,512 |
| | 6 | **Stone Columns** | | 2,876,500 | FT | $45.92 | $132,088,880 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane (Section A-Fault Resistance)** | | 2,962,300 | SF | $18.00 | $53,321,400 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane (Section B)** | | 3,751,000 | SF | $6.00 | $22,506,000 |
| | | *Triple wide slurry wall at fault crossing | | | | | |
| | 8 | **Wick Drains** | | 8,065,200 | FT | $5.21 | $42,019,692 |
| | | SUBTOTAL (Sheet 2 of 5) | | | | | $954,557,582 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| **BY** J. Yu | **CHECKED** R. Allen/C. Spandau | **BY** M. Pauletto | **CHECKED** P. Martinson |
| **DATE PREPARED** 08/25/06 | **PEER REVIEW** | **DATE PREPARED** 01/25/07 | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__3__ OF __5__

***Alternative No. 1C***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 1

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| C | | **Perimeter Dikes** | | | | | |
| | 1 | **Dredging** | | 5,473,600 | CY | $6.70 | $36,673,120 |
| | 2 | **Type A Sand-Truck Haul** | | 8,493,100 | CY | $21.82 | $185,319,442 |
| | 3 | **Type B Sand/Gravel-Truck Haul** | | 797,500 | CY | $21.59 | $17,218,025 |
| | 4 | **Filter Rock (Fine and Coarse)** | | | CY | | |
| | 5 | **Riprap-Truck Haul** | | 2,291,300 | CY | $37.85 | $86,725,705 |
| | 5 | **Crest Armoring (Additional 3 feet of riprap on top of crest)** | | 114,400 | CY | $37.85 | $4,330,040 |
| | 6 | **Stone Columns** | | 1,859,000 | FT | $45.92 | $85,365,280 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 6,856,300 | SF | $6.00 | $41,137,800 |
| | 8 | **Wick Drains** | | 5,835,500 | FT | $5.21 | $30,402,955 |
| | | SUBTOTAL (Sheet 3 of 5) | | | | | $487,172,367 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| J. Yu | R. Allen/C. Spandau | M. Pauletto | P. Martinson |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 08/25/06 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__4__ OF __5__

***Alternative No. 1C***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 1

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| D | | **Habitat Ponds** | | | | | |
| | 1 | **Habitat Ponds** | | 12,000 | ACRE | $13,473.00 | $161,676,000 |
| | | Includes overexcavation geogrid replacement and embankment | | | | | |
| | | SUBTOTAL (Sheet 4 of 5) | | | | | $161,676,000 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| J. Yu | R. Allen/C. Spandau | M. Pauletto | P. Martinson |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 8/25/20006 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__5__ OF __5__

| FEATURE: | PROJECT: |
|---|---|
| ***Alternative No. 1C*** | **Salton Sea Restoration Feasibility Study** |
| ***Mid-Sea Dam/North Marine Lake*** | **WOID:** / **ESTIMATE LEVEL:** **Appraisal** |
| ***Salton Sea Authority Alternative*** | **REGION:** / **PRICE LEVEL:** |
| ***Sand Dam with Stone Columns Embankment Design*** | **FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 1 |

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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| | | **Notes:** | | | | | |
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| | | | | | | | |
| | | SUBTOTAL (Sheet 5 of 5) | | | | | |
| | | SUBTOTAL (Sheet 4 of 5) | | | | | $161,676,000 |
| | | SUBTOTAL (Sheet 3 of 5) | | | | | $487,172,367 |
| | | SUBTOTAL (Sheet 2 of 5) | | | | | $954,557,582 |
| | | SUBTOTAL (Sheet 1 of 5) | | | | | $1,735,660,191 |
| | | | | | | | |
| | | **Subtotal Construction Costs** | | | | | **$3,339,066,140** |
| | | | | | | | |
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| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| J. Yu | R. Allen/C. Spandau | M. Pauletto | P. Martinson |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 08/25/06 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 1A, 1B, 1C & 1D***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 1 SSA est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SE Quadrant** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 13,390 | CY | $90.00 | $1,205,100.00 |
| | | Sheet pile cutoff | | 15,885 | SF | $35.00 | $555,975.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | | 14,855 | CY | $8.00 | $118,840.00 |
| | | Embankment | | 14,420 | CY | $5.00 | $72,100.00 |
| | | Unreinforced concrete canal lining | | 405 | CY | $500.00 | $202,500.00 |
| | | | | | | | |
| | | **Circulation canal, 967 cfs, 19.8 mi** | | | | | |
| | | Excavation | | 1,821,000 | CY | $5.00 | $9,105,000.00 |
| | | Compacted embankment | | 63,600 | CY | $6.00 | $381,600.00 |
| | | Unreinforced concrete canal lining | | 50,800 | CY | $500.00 | $25,400,000.00 |
| | | 17 Siphons, 50' head class | | | | | |
| | | 15.5' dia Precast reinf conc pipe | | 3,400 | LF | $2,500.00 | $8,500,000.00 |
| | | Excavation | | 216,500 | CY | $8.00 | $1,732,000.00 |
| | | Backfill | | 167,900 | CY | $6.00 | $1,007,400.00 |
| | | Reinforced concrete | | 2,150 | CY | $1,000.00 | $2,150,000.00 |
| | | 19 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 3,165 | LF | $300.00 | $949,500.00 |
| | | 10 Bridges | | | | | |
| | | Reinforced concrete | | 1,020 | CY | $1,000.00 | $1,020,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



| FEATURE: | PROJECT: | |
|---|---|---|
| ***Alternative Nos. 1A, 1B, 1C & 1D Mid-Sea Dam/North Marine Lake Salton Sea Authority Alternative Water Conveyance Components*** | **Salton Sea** | |
| | **WOID:** L165C | **ESTIMATE LEVEL:** Appraisal |
| | **REGION:** LC | **PRICE LEVEL:** Apr-06 |
| | **FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 1 SSA est | |

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SE Quadrant** | | | | | |
| | | **South Lake Water Pipeline, 35 cfs, 16.0 mi, 189' head** | | | | | |
| | | 3.0' dia Steel pipe | | 16.0 | Mi | $1,200,000.00 | $19,200,000.00 |
| | | **Regulating tank tower (200,000 gal, 190 ft tall)** | | 1.0 | Ea. | | $1,000,000.00 |
| | | **South Lake Pumping Plant, 35 cfs, 201' TDH** | | 1 | LS | | $4,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Circulation Pump Plant, 967 cfs, 34' TDH** | | 1 | LS | | $35,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Treatment Plant Sludge Conveyance, 29 cfs, 7.6 mi, 25' TD** | | | | | |
| | | 3.5' dia Steel pipe | | 7.6 | Mi | $1,400,000.00 | $10,640,000.00 |
| | | | | | | | |
| | | **NE Quadrant** | | | | | |
| | | **Deep Water Intake Pipe, 608 cfs, 8.4 mi, 25' head** | | | | | |
| | | 12.4' dia Steel pipe | | 8.4 | Mi | $15,000,000.00 | $126,000,000.00 |
| | | **Deep Water Pumping Plant, 608 cfs, 33' TDH** | | 1 | LS | | $21,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Filtration Backflush Conveyance, 30 cfs, 3.1 mi, 25' head** | | | | | |
| | | 2.8' dia Steel pipe | | 3.1 | Mi | $1,100,000.00 | $3,410,000.00 |
| | | | | | | | |
| | | Subtotal | | | | | $272,650,015.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $27,265,002.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $299,915,017.00 |
| | | Mobilization (+/-5%) | | | | | $15,000,000.00 |
| | | Subtotal w/Mobilization | | | | | $314,915,017.00 |
| | | | | | | | |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| **BY** Mark Leavitt Steve Robertson | | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | | **DATE PREPARED** | **PEER REVIEW** |

# Alternative No. 1A, 1B, 1C & 1D
# Salton Sea Authority
# Water Treatment Facilities Costs

Source: "Salton Sea Authority Plan For Multi-Purpose Project" Draft for TAC Review dated 6/9/06
Bob Hamilton spoke with Bill Brownlie of Tetra Tech, Inc. on 9/18/06 and the costs are the most current at that time; Mr. Brownlie stated that he believed these costs were expressed in $2006 and were developed by Mr. Ron Entwiler

| Construction Cost | | $Million |
|---|---|---|
| Treatment & Pumping Plant Costs in Report (page 72) | | 300 |
| adjustment for unlisted items (10%) and contingencies (25%) | | 1.375 |
| Construction Cost for Reclamation Spreadsheet | | 218.1818 |
| (includes 5% mobilization) | rounded | **218** |

| OM&R | $Million |
|---|---|
| Phosphorus Removal Plant in Report (page 73) | 31.1 |
| Filtration/Ozone Plant in Report (page 73) | 13.4 |
| Pumping Plant in Report (page 73) | 0.8 |
| total from Report | **45.3** |

# Attachment 1D

## Cost Estimate Worksheets for Alternative No. 1D: Mid-Sea Dam with North Marine Lake - Rock Notches Dam (Salton Sea Authority Alternative - Original Alignment)

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 1D***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Rock Notches Dams***

**PROJECT:**

**Salton Sea Restoration**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[SSA Cost Worksheets.xls] Rock Notches

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Mid-Sea Dam** | | | | | |
| | 1 | Dredging | | 44,198,000 | CY | $6.70 | 296,126,600 |
| | 2 | Rockfill | | 55,706,200 | CY | $23.16 | 1,290,155,592 |
| | 3 | Fine Rockfill | | 7,862,800 | CY | $13.51 | 106,226,428 |
| | 4 | Sand/Gravel Type A | | 5,024,800 | CY | $16.30 | 81,904,240 |
| | 5 | SCB Slurry Wall | | 4,955,500 | SF | $10.12 | 50,149,660 |
| | 6 | Wick Drains | | 9,032,100 | LF | $5.21 | 47,057,241 |
| | | **Page 1 Subtotal** | | | | | **1,871,619,761** |

**QUANTITIES**

| BY | CHECKED |
|---|---|
| M. Spears | P. Weghorst |
| **DATE PREPARED** | **PEER REVIEW** |
| January 4, 2007 | |

**PRICES**

| BY | CHECKED |
|---|---|
| D. Donaldson | |
| **DATE PREPARED** | **PEER REVIEW** |
| January 25, 2007 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 1D***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Rock Notches Dams***

**PROJECT:**

**Salton Sea Restoration**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[SSA Cost Worksheets.xls] Rock Notches

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **South-Sea Dam** | | | | | |
| | 1 | Dredging | | 31,076,100 | CY | $6.70 | 208,209,870 |
| | 2 | Rockfill | | 34,311,200 | CY | $31.77 | 1,090,066,824 |
| | 3 | Fine Rockfill | | 8,607,500 | CY | $23.88 | 205,547,100 |
| | 4 | Sand/Gravel Type A | | 6,435,000 | CY | $24.12 | 155,212,200 |
| | 5 | SCB Slurry Wall | | 6,539,500 | SF | $6.00 | 39,237,000 |
| | 6 | Wick Drains | | 10,201,400 | LF | $5.21 | 53,149,294 |
| | | **Page 2 Subtotal** | | | | | **1,751,422,288** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY: M. Spears | CHECKED: P. Weghorst | BY: D. Donaldson | CHECKED: |
| DATE PREPARED: January 4, 2007 | PEER REVIEW: | DATE PREPARED: January 25, 2007 | PEER REVIEW: |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 1A, 1B, 1C & 1D***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 1 SSA est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SE Quadrant** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 13,390 | CY | $90.00 | $1,205,100.00 |
| | | Sheet pile cutoff | | 15,885 | SF | $35.00 | $555,975.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | | 14,855 | CY | $8.00 | $118,840.00 |
| | | Embankment | | 14,420 | CY | $5.00 | $72,100.00 |
| | | Unreinforced concrete canal lining | | 405 | CY | $500.00 | $202,500.00 |
| | | | | | | | |
| | | **Circulation canal, 967 cfs, 19.8 mi** | | | | | |
| | | Excavation | | 1,821,000 | CY | $5.00 | $9,105,000.00 |
| | | Compacted embankment | | 63,600 | CY | $6.00 | $381,600.00 |
| | | Unreinforced concrete canal lining | | 50,800 | CY | $500.00 | $25,400,000.00 |
| | | 17 Siphons, 50' head class | | | | | |
| | | 15.5' dia Precast reinf conc pipe | | 3,400 | LF | $2,500.00 | $8,500,000.00 |
| | | Excavation | | 216,500 | CY | $8.00 | $1,732,000.00 |
| | | Backfill | | 167,900 | CY | $6.00 | $1,007,400.00 |
| | | Reinforced concrete | | 2,150 | CY | $1,000.00 | $2,150,000.00 |
| | | 19 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 3,165 | LF | $300.00 | $949,500.00 |
| | | 10 Bridges | | | | | |
| | | Reinforced concrete | | 1,020 | CY | $1,000.00 | $1,020,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



| FEATURE: | PROJECT: | |
|---|---|---|
| ***Alternative Nos. 1A, 1B, 1C & 1D Mid-Sea Dam/North Marine Lake Salton Sea Authority Alternative Water Conveyance Components*** | **Salton Sea** | |
| | **WOID:** L165C | **ESTIMATE LEVEL:** Appraisal |
| | **REGION:** LC | **PRICE LEVEL:** Apr-06 |
| | **FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 1 SSA est | |

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SE Quadrant** | | | | | |
| | | **South Lake Water Pipeline, 35 cfs, 16.0 mi, 189' head** | | | | | |
| | | 3.0' dia Steel pipe | | 16.0 | Mi | $1,200,000.00 | $19,200,000.00 |
| | | **Regulating tank tower (200,000 gal, 190 ft tall)** | | 1.0 | Ea. | | $1,000,000.00 |
| | | **South Lake Pumping Plant, 35 cfs, 201' TDH** | | 1 | LS | | $4,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Circulation Pump Plant, 967 cfs, 34' TDH** | | 1 | LS | | $35,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Treatment Plant Sludge Conveyance, 29 cfs, 7.6 mi, 25' TD** | | | | | |
| | | 3.5' dia Steel pipe | | 7.6 | Mi | $1,400,000.00 | $10,640,000.00 |
| | | | | | | | |
| | | **NE Quadrant** | | | | | |
| | | **Deep Water Intake Pipe, 608 cfs, 8.4 mi, 25' head** | | | | | |
| | | 12.4' dia Steel pipe | | 8.4 | Mi | $15,000,000.00 | $126,000,000.00 |
| | | **Deep Water Pumping Plant, 608 cfs, 33' TDH** | | 1 | LS | | $21,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **Filtration Backflush Conveyance, 30 cfs, 3.1 mi, 25' head** | | | | | |
| | | 2.8' dia Steel pipe | | 3.1 | Mi | $1,100,000.00 | $3,410,000.00 |
| | | | | | | | |
| | | Subtotal | | | | | $272,650,015.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $27,265,002.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $299,915,017.00 |
| | | Mobilization (+/-5%) | | | | | $15,000,000.00 |
| | | Subtotal w/Mobilization | | | | | $314,915,017.00 |
| | | | | | | | |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| **BY** Mark Leavitt Steve Robertson | | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 1D***
***Mid-Sea Dam/North Marine Lake***
***Salton Sea Authority Alternative***
***Rock Notches Dams***

**PROJECT:**

**Salton Sea Restoration**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[SSA Cost Worksheets.xls] Rock Notches

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Perimeter Dikes** | | | | | |
| | 1 | Dredging | | 32,084,800 | CY | $6.70 | 214,968,160 |
| | 2 | Rockfill | | 25,502,400 | CY | $25.24 | 643,680,576 |
| | 3 | Fine Rockfill | | 8,195,000 | CY | $21.59 | 176,930,050 |
| | 4 | Sand/Gravel Type A | | 7,108,200 | CY | $21.82 | 155,100,924 |
| | 5 | SCB Slurry Wall | | 7,362,300 | SF | $6.00 | 44,173,800 |
| | 6 | Wick Drains | | 13,741,200 | LF | $5.21 | 71,591,652 |
| | | **Page 3 Subtotal** | | | | | **1,306,445,162** |
| | | **Pages 1, 2 and 3 Total** | | | | | **4,929,487,211** |

**QUANTITIES**

| BY | CHECKED |
|---|---|
| M. Spears | P. Weghorst |
| **DATE PREPARED** | **PEER REVIEW** |
| January 4, 2007 | |

**PRICES**

| BY | CHECKED |
|---|---|
| D. Donaldson | |
| **DATE PREPARED** | **PEER REVIEW** |
| January 25, 2007 | |

# Alternative No. 1A, 1B, 1C & 1D
# Salton Sea Authority
# Water Treatment Facilities Costs

Source: "Salton Sea Authority Plan For Multi-Purpose Project" Draft for TAC Review dated 6/9/06
Bob Hamilton spoke with Bill Brownlie of Tetra Tech, Inc. on 9/18/06 and the costs are the most current at that time; Mr. Brownlie stated that he believed these costs were expressed in $2006 and were developed by Mr. Ron Entwiler

| Construction Cost | | $Million |
|---|---|---|
| Treatment & Pumping Plant Costs in Report (page 72) | | 300 |
| adjustment for unlisted items (10%) and contingencies (25%) | | 1.375 |
| Construction Cost for Reclamation Spreadsheet | | 218.1818 |
| (includes 5% mobilization) | rounded | **218** |

| OM&R | $Million |
|---|---|
| Phosphorus Removal Plant in Report (page 73) | 31.1 |
| Filtration/Ozone Plant in Report (page 73) | 13.4 |
| Pumping Plant in Report (page 73) | 0.8 |
| total from Report | **45.3** |

# Attachment 2A

## Cost Estimate Worksheets for Alternative No. 2A: Mid-Sea Barrier with South Marine Lake – Sand Barrier with Stone Columns

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__1__ OF __2__

***Alternative No. 2A***
***Mid-Sea Barrier/South Marine Lake***
***Sand Barrier with Stone Columns Embankment Design***

**PROJECT:** **Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** **Appraisal**

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 2A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| A | | **Mid-Sea Barrier** | | | | | |
| | 1 | **Dredging** | | 11,099,000 | CY | $6.70 | $74,363,300 |
| | 2 | **Type A Sand** | | 13,037,200 | CY | | |
| | | **Type A Sand-Barge Haul** | | 6,518,600 | CY | $15.24 | $99,343,464 |
| | | **Type A Sand-Truck Haul** | | 6,518,600 | CY | $19.78 | $128,937,908 |
| | 3 | **Type B Sand/Gravel** | | 1,020,800 | CY | | |
| | | **Type B Sand/Gravel-Barge Haul** | | 510,400 | CY | $13.51 | $6,895,504 |
| | | **Type B Sand/Gravel-Truck Haul** | | 510,400 | CY | $18.53 | $9,457,712 |
| | 4 | **Filter Rock (Fine and Coarse)** | | 0 | CY | $0.00 | $0 |
| | 5 | **Riprap** | | 2,896,300 | CY | | |
| | | **Riprap-Barge Haul** | | 1,940,521 | CY | $29.98 | $58,176,820 |
| | | **Riprap-Truck Haul** | | 955,779 | CY | $33.55 | $32,066,385 |
| | 6 | **Stone Columns** | | 2,651,000 | FT | $45.92 | $121,733,920 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 3,791,700 | SF | $10.12 | $38,372,004 |
| | 8 | **Wick Drains** | | 6,736,400 | FT | $5.40 | $36,376,560 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $605,723,577 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY<br>J. Yu | CHECKED<br>R. Allen/C. Spandau | BY<br>M. Pauletto | CHECKED<br>P. Martinson |
| DATE PREPARED<br>08/25/06 | PEER REVIEW | DATE PREPARED<br>01/25/07 | PEER REVIEW |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative No. 2A***
***Mid-Sea Barrier/South Marine Lake***
***Sand Barrier with Stone Columns Embankment Design***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** **Appraisal**

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 2A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| B | | **Habitat Ponds** | | | | | |
| | 1 | **Habitat Ponds** | | 21,700 | ACRE | $13,473.00 | $292,364,100 |
| | | Includes overexcavation geogrid replacement and embankment | | | | | |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $292,364,100 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $605,723,577 |
| | | **Subtotal Construction Costs** | | | | | **$898,087,677** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY<br>J. Yu | CHECKED<br>R. Allen/C. Spandau | BY<br>M. Pauletto | CHECKED<br>P. Martinson |
| DATE PREPARED<br>08/25/06 | PEER REVIEW | DATE PREPARED<br>01/25/07 | PEER REVIEW |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

**FEATURE:**

***Alternative Nos. 2A and 2B***
***Mid-Sea Barrier/South Marine Lake***
**Habitat Ponds Deep Excavation**

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2006new\[HabitatPondDeepExc.xls]Alt 2A & 2B

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | **Habitat Ponds Deep Excavation** | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | **Excavation** | | 49,013,067 | CY | $6.50 | $318,584,933 |
| | | Assumes uniform 7-foot excavation in the dry using | | | | | |
| | | conventional excavation techniques to remove soft | | | | | |
| | | wet material (500 acres deep excavation per 2,500 | | | | | |
| | | (acres of ponds) | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | **Subtotal Construction Costs** | | | | | $318,584,933 |
| | | | | | | | |
| | | Mobilization 5% (+/-) | | | | | $15,930,000 |
| | | **Subtotal Contract Costs** | | | | | $334,514,933 |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |

**QUANTITIES** | **PRICES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06 | **PEER REVIEW**

**Unint prices from September 30, 2005 Salton Sea Restoration Project, Feasibility Study - Phase 1, Alternatives and Cost Estimates**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SW Left Quadrant** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 335 | CY | $90.00 | $30,150.00 |
| | | Sheet pile cutoff | | 2,900 | SF | $35.00 | $101,500.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 11,200 | CY | $8.00 | $89,600.00 |
| | | Embankment | | 40,600 | CY | $5.00 | $203,000.00 |
| | | Unreinforced concrete canal lining | | 910 | CY | $500.00 | $455,000.00 |
| | | | | | | | |
| | | **River Water Channel, 69 cfs, 10.0 mi** | | | | | |
| | | Excavation | | 147,800 | CY | $7.00 | $1,034,600.00 |
| | | Compacted embankment | | 10,950 | CY | $6.00 | $65,700.00 |
| | | Unreinforced concrete canal lining | | 7,160 | CY | $500.00 | $3,580,000.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 2,400 | LF | $300.00 | $720,000.00 |
| | | Excavation | | 36,100 | CY | $8.00 | $288,800.00 |
| | | Backfill | | 34,500 | CY | $6.00 | $207,000.00 |
| | | Reinforced concrete | | 120 | CY | $1,000.00 | $120,000.00 |
| | | 2 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 200 | LF | $300.00 | $60,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 12.6 mi** | | | | | |
| | | Excavation | | 186,250 | CY | $7.00 | $1,303,750.00 |
| | | Compacted embankment | | 13,800 | CY | $6.00 | $82,800.00 |
| | | Unreinforced concrete canal lining | | 9,050 | CY | $500.00 | $4,525,000.00 |
| | | 8 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 1,600 | LF | $300.00 | $480,000.00 |
| | | Excavation | | 24,000 | CY | $8.00 | $192,000.00 |
| | | Backfill | | 23,000 | CY | $6.00 | $138,000.00 |
| | | Reinforced concrete | | 100 | CY | $1,000.00 | $100,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 500 | LF | $300.00 | $150,000.00 |
| | | 9 Bridges | | | | | |
| | | Reinforced concrete | | 280 | CY | $1,000.00 | $280,000.00 |
| | | | | | | | |
| | | **Pup Fish Channel, 0 cfs, 10.0 mi** | | | | | |
| | | Excavation | | 10,900 | CY | $7.00 | $76,300.00 |
| | | Compacted embankment | | 8,550 | CY | $6.00 | $51,300.00 |
| | | Unreinforced concrete canal lining | | 6,900 | CY | $500.00 | $3,450,000.00 |
| | | | | | | | |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | | BY | CHECKED |
| Mark Leavitt | Steve Robertson | Dan Mar | |
| DATE PREPARED | | DATE PREPARED | PEER REVIEW |
| April 20, 2006 | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 330 | CY | $90.00 | $29,700.00 |
| | | Sheet pile cutoff | | 2,900 | SF | $35.00 | $101,500.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 2,200 | CY | $10.00 | $22,000.00 |
| | | Embankment | | 8,300 | CY | $5.00 | $41,500.00 |
| | | Unreinforced concrete canal lining | | 200 | CY | $500.00 | $100,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 6.4 mi** | | | | | |
| | | Excavation | | 95,000 | CY | $7.00 | $665,000.00 |
| | | Compacted embankment | | 7,000 | CY | $6.00 | $42,000.00 |
| | | Unreinforced concrete canal lining | | 4,600 | CY | $500.00 | $2,300,000.00 |
| | | 10 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 2,000 | LF | $300.00 | $600,000.00 |
| | | Excavation | | 30,000 | CY | $8.00 | $240,000.00 |
| | | Backfill | | 29,000 | CY | $6.00 | $174,000.00 |
| | | Reinforced concrete | | 100 | CY | $1,000.00 | $100,000.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 30 | CY | $1,000.00 | $30,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 4,300 | CY | $90.00 | $387,000.00 |
| | | Sheet pile cutoff | | 13,300 | SF | $35.00 | $465,500.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | | 5,700 | CY | $10.00 | $57,000.00 |
| | | Embankment | | 10,500 | CY | $5.00 | $52,500.00 |
| | | Unreinforced concrete canal lining | | 270 | CY | $500.00 | $135,000.00 |
| | | **River Water Channel, 274 cfs, 6.7 mi** | | | | | |
| | | Excavation | | 241,150 | CY | $7.00 | $1,688,050.00 |
| | | Compacted embankment | | 12,500 | CY | $6.00 | $75,000.00 |
| | | Unreinforced concrete canal lining | | 9,400 | CY | $500.00 | $4,700,000.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 8.5' dia Precast reinf conc pipe | | 2,400 | LF | $1,200.00 | $2,880,000.00 |
| | | Excavation | | 72,250 | CY | $8.00 | $578,000.00 |
| | | Backfill | | 65,350 | CY | $6.00 | $392,100.00 |
| | | Reinforced concrete | | 450 | CY | $1,000.00 | $450,000.00 |
| | | 6 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 760 | LF | $300.00 | $228,000.00 |
| | | **River Water Distrib'n Channel, 274 cfs, 8.0 mi** | | | | | |
| | | Excavation | | 288,000 | CY | $7.00 | $2,016,000.00 |
| | | Compacted embankment | | 15,000 | CY | $6.00 | $90,000.00 |
| | | Unreinforced concrete canal lining | | 11,150 | CY | $500.00 | $5,575,000.00 |
| | | 5 Siphons, 50' head class | | | | | |
| | | 8.5' dia Precast reinf conc pipe | | 1,000 | LF | $1,200.00 | $1,200,000.00 |
| | | Excavation | | 30,100 | CY | $8.00 | $240,800.00 |
| | | Backfill | | 27,300 | CY | $6.00 | $163,800.00 |
| | | Reinforced concrete | | 190 | CY | $1,000.00 | $190,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 660 | LF | $300.00 | $198,000.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 60 | CY | $1,000.00 | $60,000.00 |
| | | **River Water Distrib'n Channel, 69 cfs, 7.4 mi** | | | | | |
| | | Excavation | | 109,400 | CY | $7.00 | $765,800.00 |
| | | Compacted embankment | | 8,100 | CY | $6.00 | $48,600.00 |
| | | Unreinforced concrete canal lining | | 5,300 | CY | $500.00 | $2,650,000.00 |
| | | 12 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 1,200 | LF | $300.00 | $360,000.00 |
| | | 9 Bridges | | | | | |
| | | Reinforced concrete | | 300 | CY | $1,000.00 | $300,000.00 |

| **QUANTITIES** | **PRICES** | |
|---|---|---|
| **BY** Mark Leavitt Steve Robertson | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **Pup Fish Channel, 0 cfs, 6.7 mi** | | | | | |
| | | Excavation | | 73,000 | CY | $7.00 | $511,000.00 |
| | | Compacted embankment | | 5,800 | CY | $6.00 | $34,800.00 |
| | | Unreinforced concrete canal lining | | 4,650 | CY | $500.00 | $2,325,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** Mark Leavitt, Steve Robertson | | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 1,200 | CY | $90.00 | $108,000.00 |
| | | Sheet pile cutoff | | 7,500 | SF | $35.00 | $262,500.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | | 2,900 | CY | $10.00 | $29,000.00 |
| | | Embankment | | 8,800 | CY | $5.00 | $44,000.00 |
| | | Unreinforced concrete canal lining | | 205 | CY | $500.00 | $102,500.00 |
| | | **River Water Channel, 100 cfs, 4.2 mi** | | | | | |
| | | Excavation | | 83,200 | CY | $7.00 | $582,400.00 |
| | | Compacted embankment | | 4,875 | CY | $6.00 | $29,250.00 |
| | | Unreinforced concrete canal lining | | 3,575 | CY | $500.00 | $1,787,500.00 |
| | | 3 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 360 | LF | $300.00 | $108,000.00 |
| | | 2 Bridges | | | | | |
| | | Reinforced concrete | | 75 | CY | $1,000.00 | $75,000.00 |
| | | **River Water Channel, 69 cfs, 2.9 mi** | | | | | |
| | | Excavation | | 42,900 | CY | $7.00 | $300,300.00 |
| | | Compacted embankment | | 3,200 | CY | $6.00 | $19,200.00 |
| | | Unreinforced concrete canal lining | | 2,100 | CY | $500.00 | $1,050,000.00 |
| | | 3 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 600 | LF | $300.00 | $180,000.00 |
| | | Excavation | | 9,000 | CY | $8.00 | $72,000.00 |
| | | Backfill | | 8,600 | CY | $6.00 | $51,600.00 |
| | | Reinforced concrete | | 30 | CY | $1,000.00 | $30,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 100 | LF | $300.00 | $30,000.00 |
| | | 2 Bridges | | | | | |
| | | Reinforced concrete | | 65 | CY | $1,000.00 | $65,000.00 |
| | | **River Water Distrib'n Channel, 69 cfs, 14.7 mi** | | | | | |
| | | Excavation | | 217,500 | CY | $7.00 | $1,522,500.00 |
| | | Compacted embankment | | 16,100 | CY | $6.00 | $96,600.00 |
| | | Unreinforced concrete canal lining | | 10,600 | CY | $500.00 | $5,300,000.00 |
| | | 9 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 1,800 | LF | $300.00 | $540,000.00 |
| | | Excavation | | 27,000 | CY | $8.00 | $216,000.00 |
| | | Backfill | | 26,000 | CY | $6.00 | $156,000.00 |
| | | Reinforced concrete | | 85 | CY | $1,000.00 | $85,000.00 |
| | | 11 Bridges | | | | | |
| | | Reinforced concrete | | 350 | CY | $1,000.00 | $350,000.00 |

**QUANTITIES** | **PRICES**

| | | |
|---|---|---|
| **BY** Mark Leavitt, Steve Robertson | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **Pup Fish Channel, 0 cfs, 7.1 mi** | | | | | |
| | | Excavation | | 77,250 | CY | $7.00 | $540,750.00 |
| | | Compacted embankment | | 6,100 | CY | $6.00 | $36,600.00 |
| | | Unreinforced concrete canal lining | | 4,885 | CY | $500.00 | $2,442,500.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**CHECKED**

**DATE PREPARED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 1,200 | CY | $90.00 | $108,000.00 |
| | | Sheet pile cutoff | | 7,500 | SF | $35.00 | $262,500.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | | 2,900 | CY | $10.00 | $29,000.00 |
| | | Embankment | | 8,800 | CY | $5.00 | $44,000.00 |
| | | Unreinforced concrete canal lining | | 205 | CY | $500.00 | $102,500.00 |
| | | **River Water Channel, 100 cfs, 4.7 mi** | | | | | |
| | | Excavation | | 93,100 | CY | $7.00 | $651,700.00 |
| | | Compacted embankment | | 5,500 | CY | $6.00 | $33,000.00 |
| | | Unreinforced concrete canal lining | | 4,000 | CY | $500.00 | $2,000,000.00 |
| | | 5 Siphons, 50' head class | | | | | |
| | | 5.0' dia Precast reinf conc pipe | | 1,000 | LF | $380.00 | $380,000.00 |
| | | Excavation | | 18,000 | CY | $8.00 | $144,000.00 |
| | | Backfill | | 17,000 | CY | $6.00 | $102,000.00 |
| | | Reinforced concrete | | 70 | CY | $1,000.00 | $70,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 110 | LF | $300.00 | $33,000.00 |
| | | 3 Bridges | | | | | |
| | | Reinforced concrete | | 110 | CY | $1,000.00 | $110,000.00 |
| | | **River Water Channel, 69 cfs, 11.2 mi** | | | | | |
| | | Excavation | | 165,500 | CY | $7.00 | $1,158,500.00 |
| | | Compacted embankment | | 12,250 | CY | $6.00 | $73,500.00 |
| | | Unreinforced concrete canal lining | | 8,000 | CY | $500.00 | $4,000,000.00 |
| | | 4 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 800 | LF | $300.00 | $240,000.00 |
| | | Excavation | | 12,000 | CY | $8.00 | $96,000.00 |
| | | Backfill | | 11,500 | CY | $6.00 | $69,000.00 |
| | | Reinforced concrete | | 40 | CY | $1,000.00 | $40,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 500 | LF | $300.00 | $150,000.00 |
| | | 7 Bridges | | | | | |
| | | Reinforced concrete | | 220 | CY | $1,000.00 | $220,000.00 |
| | | **River Water Distrib'n Channel, 69 cfs, 1.0 mi** | | | | | |
| | | Excavation | | 14,800 | CY | $7.00 | $103,600.00 |
| | | Compacted embankment | | 1,100 | CY | $6.00 | $6,600.00 |
| | | Unreinforced concrete canal lining | | 720 | CY | $500.00 | $360,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 100 | LF | $300.00 | $30,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Pup Fish Channel, 0 cfs, 15.9 mi** | | | | | |
| | | Excavation | | 173,000 | CY | $7.00 | $1,211,000.00 |
| | | Compacted embankment | | 13,600 | CY | $6.00 | $81,600.00 |
| | | Unreinforced concrete canal lining | | 11,000 | CY | $500.00 | $5,500,000.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**DATE PREPARED**

**CHECKED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **SE Quadrant** | | | | | |
| | | **Sea Water Pipeline, 85 cfs, 15.2 mi, 136' head** | | | | | |
| | | 4.5' dia Steel pipe | | 15.2 | Mi | $2,500,000.00 | $38,000,000.00 |
| | | **Regulating tank tower (200,000 gal, 135 ft tall)** | | 1.0 | Ea. | | $980,000.00 |
| | | **Sea Water Pumping Plant, 85 cfs, 178' TDH** | | | LS | | $8,500,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | | | | | | |
| | | **NE Quadrant** | | | | | |
| | | **Sea Water Pipeline, 26 cfs, 27.8 mi, 104' head** | | | | | |
| | | 3.5' dia Steel pipe | | 27.8 | Mi | $1,400,000.00 | $38,920,000.00 |
| | | **Regulating tank tower (200,000 gal, 105 ft tall)** | | 1.0 | Ea. | | $950,000.00 |
| | | **Sea Water Pumping Plant, 26 cfs, 146' TDH** | | | LS | | $2,600,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | Subtotal | | | | | $174,618,850.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $17,461,885.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $192,080,735.00 |
| | | Mobilization (+/-5%) | | | | | $9,600,000.00 |
| | | Subtotal w/Mobilization | | | | | $201,680,735.00 |
| | | | | | | | |
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| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

# Attachment 2B

## Cost Estimate Worksheets for Alternative No. 2B: Mid-Sea Barrier with South Marine Lake – Sand Barrier without Stone Columns

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__1__ OF __2__

***Alternative No. 2B***
***Mid-Sea Barrier/South Marine Lake***
***Sand Barrier w/o Stone Columns Embankment Design***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 2B

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| A | | **Mid-Sea Barrier** | | | | | |
| | 1 | **Dredging** | | 10,111,200 | CY | $6.70 | $67,745,040 |
| | 2 | **Type A Sand** | | 6,696,800 | CY | | |
| | | **Type A Sand-Barge Haul** | | 3,348,400 | CY | $16.88 | $56,520,992 |
| | | **Type A Sand-Truck Haul** | | 3,348,400 | CY | $20.96 | $70,182,464 |
| | 3 | **Type B Sand/Gravel** | | 3,217,500 | CY | | |
| | | **Type B Sand/Gravel-Barge Haul** | | 1,608,750 | CY | $13.51 | $21,734,213 |
| | | **Type B Sand/Gravel-Truck Haul** | | 1,608,750 | CY | $18.83 | $30,292,763 |
| | 4 | **Filter Rock (Fine and Coarse)** | | 0 | CY | $0.00 | $0 |
| | 5 | **Riprap** | | 2,816,000 | CY | | |
| | | **Riprap-Barge Haul** | | 1,886,720 | CY | $30.08 | $56,752,538 |
| | | **Riprap-Truck Haul** | | 929,280 | CY | $33.60 | $31,223,808 |
| | 6 | **Stone Columns** | | 0 | FT | $0.00 | $0 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 3,791,700 | SF | $10.12 | $38,372,004 |
| | 8 | **Wick Drains** | | 7,803,400 | FT | $5.37 | $41,904,258 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $414,728,079 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY<br>J. Yu | CHECKED<br>R. Allen/C. Spandau | BY<br>M. Pauletto | CHECKED<br>P. Martinson |
| DATE PREPARED<br>08/25/06 | PEER REVIEW | DATE PREPARED<br>01/25/07 | PEER REVIEW |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative No. 2B***
***Mid-Sea Barrier/South Marine Lake***
***Sand Barrier w/o Stone Columns Embankment Design***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:**

C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 2B

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| B | | **Habitat Ponds** | | | | | |
| | 1 | **Habitat Ponds** | | 21,700 | ACRE | $13,473.00 | $292,364,100 |
| | | Includes overexcavation geogrid replacement and embankment | | | | | |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $292,364,100 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $414,728,079 |
| | | **Subtotal Construction Costs** | | | | | **$707,092,179** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| J. Yu | R. Allen/C. Spandau | M. Pauletto | P. Martinson |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 08/25/06 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

**FEATURE:**

***Alternative Nos. 2A and 2B***
***Mid-Sea Barrier/South Marine Lake***
**Habitat Ponds Deep Excavation**

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2006new\[HabitatPondDeepExc.xls]Alt 2A & 2B

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | **Habitat Ponds Deep Excavation** | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | **Excavation** | | 49,013,067 | CY | $6.50 | $318,584,933 |
| | | Assumes uniform 7-foot excavation in the dry using | | | | | |
| | | conventional excavation techniques to remove soft | | | | | |
| | | wet material (500 acres deep excavation per 2,500 | | | | | |
| | | (acres of ponds) | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | **Subtotal Construction Costs** | | | | | $318,584,933 |
| | | | | | | | |
| | | Mobilization 5% (+/-) | | | | | $15,930,000 |
| | | **Subtotal Contract Costs** | | | | | $334,514,933 |
| | | | | | | | |
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**QUANTITIES** | **PRICES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06 | **PEER REVIEW**

**Unint prices from September 30, 2005 Salton Sea Restoration Project, Feasibility Study - Phase 1, Alternatives and Cost Estimates**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SW Left Quadrant** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 335 | CY | $90.00 | $30,150.00 |
| | | Sheet pile cutoff | | 2,900 | SF | $35.00 | $101,500.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 11,200 | CY | $8.00 | $89,600.00 |
| | | Embankment | | 40,600 | CY | $5.00 | $203,000.00 |
| | | Unreinforced concrete canal lining | | 910 | CY | $500.00 | $455,000.00 |
| | | | | | | | |
| | | **River Water Channel, 69 cfs, 10.0 mi** | | | | | |
| | | Excavation | | 147,800 | CY | $7.00 | $1,034,600.00 |
| | | Compacted embankment | | 10,950 | CY | $6.00 | $65,700.00 |
| | | Unreinforced concrete canal lining | | 7,160 | CY | $500.00 | $3,580,000.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 2,400 | LF | $300.00 | $720,000.00 |
| | | Excavation | | 36,100 | CY | $8.00 | $288,800.00 |
| | | Backfill | | 34,500 | CY | $6.00 | $207,000.00 |
| | | Reinforced concrete | | 120 | CY | $1,000.00 | $120,000.00 |
| | | 2 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 200 | LF | $300.00 | $60,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 12.6 mi** | | | | | |
| | | Excavation | | 186,250 | CY | $7.00 | $1,303,750.00 |
| | | Compacted embankment | | 13,800 | CY | $6.00 | $82,800.00 |
| | | Unreinforced concrete canal lining | | 9,050 | CY | $500.00 | $4,525,000.00 |
| | | 8 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 1,600 | LF | $300.00 | $480,000.00 |
| | | Excavation | | 24,000 | CY | $8.00 | $192,000.00 |
| | | Backfill | | 23,000 | CY | $6.00 | $138,000.00 |
| | | Reinforced concrete | | 100 | CY | $1,000.00 | $100,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 500 | LF | $300.00 | $150,000.00 |
| | | 9 Bridges | | | | | |
| | | Reinforced concrete | | 280 | CY | $1,000.00 | $280,000.00 |
| | | | | | | | |
| | | **Pup Fish Channel, 0 cfs, 10.0 mi** | | | | | |
| | | Excavation | | 10,900 | CY | $7.00 | $76,300.00 |
| | | Compacted embankment | | 8,550 | CY | $6.00 | $51,300.00 |
| | | Unreinforced concrete canal lining | | 6,900 | CY | $500.00 | $3,450,000.00 |
| | | | | | | | |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | | BY | CHECKED |
| Mark Leavitt | Steve Robertson | Dan Mar | |
| DATE PREPARED | | DATE PREPARED | PEER REVIEW |
| April 20, 2006 | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 330 | CY | $90.00 | $29,700.00 |
| | | Sheet pile cutoff | | 2,900 | SF | $35.00 | $101,500.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 2,200 | CY | $10.00 | $22,000.00 |
| | | Embankment | | 8,300 | CY | $5.00 | $41,500.00 |
| | | Unreinforced concrete canal lining | | 200 | CY | $500.00 | $100,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 6.4 mi** | | | | | |
| | | Excavation | | 95,000 | CY | $7.00 | $665,000.00 |
| | | Compacted embankment | | 7,000 | CY | $6.00 | $42,000.00 |
| | | Unreinforced concrete canal lining | | 4,600 | CY | $500.00 | $2,300,000.00 |
| | | 10 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 2,000 | LF | $300.00 | $600,000.00 |
| | | Excavation | | 30,000 | CY | $8.00 | $240,000.00 |
| | | Backfill | | 29,000 | CY | $6.00 | $174,000.00 |
| | | Reinforced concrete | | 100 | CY | $1,000.00 | $100,000.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 30 | CY | $1,000.00 | $30,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 4,300 | CY | $90.00 | $387,000.00 |
| | | Sheet pile cutoff | | 13,300 | SF | $35.00 | $465,500.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | | 5,700 | CY | $10.00 | $57,000.00 |
| | | Embankment | | 10,500 | CY | $5.00 | $52,500.00 |
| | | Unreinforced concrete canal lining | | 270 | CY | $500.00 | $135,000.00 |
| | | **River Water Channel, 274 cfs, 6.7 mi** | | | | | |
| | | Excavation | | 241,150 | CY | $7.00 | $1,688,050.00 |
| | | Compacted embankment | | 12,500 | CY | $6.00 | $75,000.00 |
| | | Unreinforced concrete canal lining | | 9,400 | CY | $500.00 | $4,700,000.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 8.5' dia Precast reinf conc pipe | | 2,400 | LF | $1,200.00 | $2,880,000.00 |
| | | Excavation | | 72,250 | CY | $8.00 | $578,000.00 |
| | | Backfill | | 65,350 | CY | $6.00 | $392,100.00 |
| | | Reinforced concrete | | 450 | CY | $1,000.00 | $450,000.00 |
| | | 6 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 760 | LF | $300.00 | $228,000.00 |
| | | **River Water Distrib'n Channel, 274 cfs, 8.0 mi** | | | | | |
| | | Excavation | | 288,000 | CY | $7.00 | $2,016,000.00 |
| | | Compacted embankment | | 15,000 | CY | $6.00 | $90,000.00 |
| | | Unreinforced concrete canal lining | | 11,150 | CY | $500.00 | $5,575,000.00 |
| | | 5 Siphons, 50' head class | | | | | |
| | | 8.5' dia Precast reinf conc pipe | | 1,000 | LF | $1,200.00 | $1,200,000.00 |
| | | Excavation | | 30,100 | CY | $8.00 | $240,800.00 |
| | | Backfill | | 27,300 | CY | $6.00 | $163,800.00 |
| | | Reinforced concrete | | 190 | CY | $1,000.00 | $190,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 660 | LF | $300.00 | $198,000.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 60 | CY | $1,000.00 | $60,000.00 |
| | | **River Water Distrib'n Channel, 69 cfs, 7.4 mi** | | | | | |
| | | Excavation | | 109,400 | CY | $7.00 | $765,800.00 |
| | | Compacted embankment | | 8,100 | CY | $6.00 | $48,600.00 |
| | | Unreinforced concrete canal lining | | 5,300 | CY | $500.00 | $2,650,000.00 |
| | | 12 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 1,200 | LF | $300.00 | $360,000.00 |
| | | 9 Bridges | | | | | |
| | | Reinforced concrete | | 300 | CY | $1,000.00 | $300,000.00 |

| **QUANTITIES** | **PRICES** | |
|---|---|---|
| **BY** Mark Leavitt Steve Robertson | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **Pup Fish Channel, 0 cfs, 6.7 mi** | | | | | |
| | | Excavation | | 73,000 | CY | $7.00 | $511,000.00 |
| | | Compacted embankment | | 5,800 | CY | $6.00 | $34,800.00 |
| | | Unreinforced concrete canal lining | | 4,650 | CY | $500.00 | $2,325,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** Mark Leavitt, Steve Robertson | | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 1,200 | CY | $90.00 | $108,000.00 |
| | | Sheet pile cutoff | | 7,500 | SF | $35.00 | $262,500.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | | 2,900 | CY | $10.00 | $29,000.00 |
| | | Embankment | | 8,800 | CY | $5.00 | $44,000.00 |
| | | Unreinforced concrete canal lining | | 205 | CY | $500.00 | $102,500.00 |
| | | **River Water Channel, 100 cfs, 4.2 mi** | | | | | |
| | | Excavation | | 83,200 | CY | $7.00 | $582,400.00 |
| | | Compacted embankment | | 4,875 | CY | $6.00 | $29,250.00 |
| | | Unreinforced concrete canal lining | | 3,575 | CY | $500.00 | $1,787,500.00 |
| | | 3 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 360 | LF | $300.00 | $108,000.00 |
| | | 2 Bridges | | | | | |
| | | Reinforced concrete | | 75 | CY | $1,000.00 | $75,000.00 |
| | | **River Water Channel, 69 cfs, 2.9 mi** | | | | | |
| | | Excavation | | 42,900 | CY | $7.00 | $300,300.00 |
| | | Compacted embankment | | 3,200 | CY | $6.00 | $19,200.00 |
| | | Unreinforced concrete canal lining | | 2,100 | CY | $500.00 | $1,050,000.00 |
| | | 3 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 600 | LF | $300.00 | $180,000.00 |
| | | Excavation | | 9,000 | CY | $8.00 | $72,000.00 |
| | | Backfill | | 8,600 | CY | $6.00 | $51,600.00 |
| | | Reinforced concrete | | 30 | CY | $1,000.00 | $30,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 100 | LF | $300.00 | $30,000.00 |
| | | 2 Bridges | | | | | |
| | | Reinforced concrete | | 65 | CY | $1,000.00 | $65,000.00 |
| | | **River Water Distrib'n Channel, 69 cfs, 14.7 mi** | | | | | |
| | | Excavation | | 217,500 | CY | $7.00 | $1,522,500.00 |
| | | Compacted embankment | | 16,100 | CY | $6.00 | $96,600.00 |
| | | Unreinforced concrete canal lining | | 10,600 | CY | $500.00 | $5,300,000.00 |
| | | 9 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 1,800 | LF | $300.00 | $540,000.00 |
| | | Excavation | | 27,000 | CY | $8.00 | $216,000.00 |
| | | Backfill | | 26,000 | CY | $6.00 | $156,000.00 |
| | | Reinforced concrete | | 85 | CY | $1,000.00 | $85,000.00 |
| | | 11 Bridges | | | | | |
| | | Reinforced concrete | | 350 | CY | $1,000.00 | $350,000.00 |

**QUANTITIES** | **PRICES**

| | | |
|---|---|---|
| **BY** Mark Leavitt, Steve Robertson | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **Pup Fish Channel, 0 cfs, 7.1 mi** | | | | | |
| | | Excavation | | 77,250 | CY | $7.00 | $540,750.00 |
| | | Compacted embankment | | 6,100 | CY | $6.00 | $36,600.00 |
| | | Unreinforced concrete canal lining | | 4,885 | CY | $500.00 | $2,442,500.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**CHECKED**

**DATE PREPARED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 1,200 | CY | $90.00 | $108,000.00 |
| | | Sheet pile cutoff | | 7,500 | SF | $35.00 | $262,500.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | | 2,900 | CY | $10.00 | $29,000.00 |
| | | Embankment | | 8,800 | CY | $5.00 | $44,000.00 |
| | | Unreinforced concrete canal lining | | 205 | CY | $500.00 | $102,500.00 |
| | | **River Water Channel, 100 cfs, 4.7 mi** | | | | | |
| | | Excavation | | 93,100 | CY | $7.00 | $651,700.00 |
| | | Compacted embankment | | 5,500 | CY | $6.00 | $33,000.00 |
| | | Unreinforced concrete canal lining | | 4,000 | CY | $500.00 | $2,000,000.00 |
| | | 5 Siphons, 50' head class | | | | | |
| | | 5.0' dia Precast reinf conc pipe | | 1,000 | LF | $380.00 | $380,000.00 |
| | | Excavation | | 18,000 | CY | $8.00 | $144,000.00 |
| | | Backfill | | 17,000 | CY | $6.00 | $102,000.00 |
| | | Reinforced concrete | | 70 | CY | $1,000.00 | $70,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 110 | LF | $300.00 | $33,000.00 |
| | | 3 Bridges | | | | | |
| | | Reinforced concrete | | 110 | CY | $1,000.00 | $110,000.00 |
| | | **River Water Channel, 69 cfs, 11.2 mi** | | | | | |
| | | Excavation | | 165,500 | CY | $7.00 | $1,158,500.00 |
| | | Compacted embankment | | 12,250 | CY | $6.00 | $73,500.00 |
| | | Unreinforced concrete canal lining | | 8,000 | CY | $500.00 | $4,000,000.00 |
| | | 4 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 800 | LF | $300.00 | $240,000.00 |
| | | Excavation | | 12,000 | CY | $8.00 | $96,000.00 |
| | | Backfill | | 11,500 | CY | $6.00 | $69,000.00 |
| | | Reinforced concrete | | 40 | CY | $1,000.00 | $40,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 500 | LF | $300.00 | $150,000.00 |
| | | 7 Bridges | | | | | |
| | | Reinforced concrete | | 220 | CY | $1,000.00 | $220,000.00 |
| | | **River Water Distrib'n Channel, 69 cfs, 1.0 mi** | | | | | |
| | | Excavation | | 14,800 | CY | $7.00 | $103,600.00 |
| | | Compacted embankment | | 1,100 | CY | $6.00 | $6,600.00 |
| | | Unreinforced concrete canal lining | | 720 | CY | $500.00 | $360,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 100 | LF | $300.00 | $30,000.00 |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Pup Fish Channel, 0 cfs, 15.9 mi** | | | | | |
| | | Excavation | | 173,000 | CY | $7.00 | $1,211,000.00 |
| | | Compacted embankment | | 13,600 | CY | $6.00 | $81,600.00 |
| | | Unreinforced concrete canal lining | | 11,000 | CY | $500.00 | $5,500,000.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**DATE PREPARED**

**CHECKED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 2A & 2B***
***Mid-Sea Barrier/South Marine Lake***
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 2 MSB est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **SE Quadrant** | | | | | |
| | | **Sea Water Pipeline, 85 cfs, 15.2 mi, 136' head** | | | | | |
| | | 4.5' dia Steel pipe | | 15.2 | Mi | $2,500,000.00 | $38,000,000.00 |
| | | **Regulating tank tower (200,000 gal, 135 ft tall)** | | 1.0 | Ea. | | $980,000.00 |
| | | **Sea Water Pumping Plant, 85 cfs, 178' TDH** | | | LS | | $8,500,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | | | | | | |
| | | **NE Quadrant** | | | | | |
| | | **Sea Water Pipeline, 26 cfs, 27.8 mi, 104' head** | | | | | |
| | | 3.5' dia Steel pipe | | 27.8 | Mi | $1,400,000.00 | $38,920,000.00 |
| | | **Regulating tank tower (200,000 gal, 105 ft tall)** | | 1.0 | Ea. | | $950,000.00 |
| | | **Sea Water Pumping Plant, 26 cfs, 146' TDH** | | | LS | | $2,600,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | Subtotal | | | | | $174,618,850.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $17,461,885.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $192,080,735.00 |
| | | Mobilization (+/-5%) | | | | | $9,600,000.00 |
| | | Subtotal w/Mobilization | | | | | $201,680,735.00 |
| | | | | | | | |
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| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** | | **BY** | **CHECKED** |
| **Mark Leavitt** | **Steve Robertson** | **Dan Mar** | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| **April 20, 2006** | | | |

# Attachment 3A

## Cost Estimate Worksheets for Alternative No. 3A: Concentric Lakes – Sand Dikes with Stone Columns (Imperial Group Alternative)

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__1__ OF __2__

***Alternative No. 3A***
***Concentric Lakes***
***Sand Dikes with Stone Columns Embankment Design***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate - usbr - 12-18-06.xls]Alternative 3A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Concentric Dikes** | | | | | |
| | 1 | **Dredging** | | 129,245,600 | CY | $6.70 | $865,945,520 |
| | 2 | **Type A Sand-Truck Haul** | | 120,887,800 | CY | $31.93 | $3,859,947,454 |
| | 3 | **Type B Sand/Gravel-Truck Haul** | | 10,803,716 | CY | $31.80 | $343,558,169 |
| | 4 | **Filter Rock (Fine and Coarse)-Truck Haul** | | 0 | CY | $0.00 | $0 |
| | 5 | **Riprap-Truck Haul** | | 32,070,500 | CY | $50.70 | $1,625,974,350 |
| | 6 | **Stone Columns** | | 27,325,100 | FT | $45.92 | $1,254,768,592 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 99,328,900 | SF | $6.00 | $595,973,400 |
| | 8 | **Wick Drains** | | 87,642,720 | FT | $5.17 | $453,112,862 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $8,999,280,347 |

**QUANTITIES**

**BY** M. Spears | **CHECKED** D. Wiltshire

**DATE PREPARED** 12/20/06 | **PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder, Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative No. 3A***
***Concentric Lakes***
***Sand Dikes with Stone Columns Embankment Design***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate - usbr - 12-18-06.xls]Alternative 3A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $0 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $8,999,280,347 |
| | | **Subtotal Construction Costs - 4-Rings** | | | | | **$8,999,280,347** |
| | | **Subtotal Construction Costs - 3-Rings (75% of 4-Rings Costs)** | | | | | **$6,749,460,260** |
| | | **Note**: Elimination of the fourth ring reduces the construction quantities by 25 percent. | | | | | |

**QUANTITIES**

**BY** M. Spears | **CHECKED** D. Wiltshire

**DATE PREPARED** 12/20/06 | **PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder, Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative No. 3A***
***Concentric Lakes***
***Cell Dividers Earthfill Dikes with Stone Columns***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[CellDividersCosts-12-28-06.xls]Alternative 3A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Cell Dividers** | | | | | |
| | 1 | **Dredging** | | 633,600 | CY | $6.70 | $4,245,120 |
| | 2 | **Type A Sand** | | 371,800 | CY | $31.99 | $11,893,882 |
| | 3 | **Type B Sand/Gravel** | | 234,300 | CY | $31.80 | $7,450,740 |
| | 4 | **Filter Rock (Fine and Coarse)** | | | CY | | |
| | 5 | **Riprap** | | 169,400 | CY | $50.70 | $8,588,580 |
| | 6 | **Stone Columns** | | 124,300 | FT | $45.92 | $5,707,856 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 445,500 | SF | $6.00 | $2,673,000 |
| | 8 | **Wick Drains** | | 324,500 | FT | $5.17 | $1,677,665 |
| | 9 | **Habitat Ponds** | | | ACRE | | |
| | | Includes overexcavation geogrid replacement and embankment | | | | | |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $42,236,843 |

**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06 | **PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder, Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative No. 3A***
***Concentric Lakes***
***Cell Dividers Earthfill Dikes with Stone Columns***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** **Appraisal**

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[CellDividersCosts-12-28-06.xls]Alternative 3A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
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| | | | | | | | |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $42,236,843 |
| | | | | | | | |
| | | **Subtotal Construction Costs** | | | | | **$42,236,843** |
| | | | | | | | |
| | | Mobilization 5% (+/-) | | | | | $2,110,000 |
| | | **Subtotal Contract Costs** | | | | | **$44,346,843** |
| | | | | | | | |
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**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06 | **PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder, Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__1__ OF __1__

***Alternative Nos. 3A, 3B & 3C***
***Concentric Lakes***
***Habitat Islands and Deep Areas***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2006new\[HabitatIslandsCosts.xls]Alternative 3A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Habitat Islands and Deep Areas** | | | | | |
| | 1 | **Dredging** | | 22,402,488 | CY | $6.70 | $150,096,668 |
| | | Sea floor deposits and soft lacustrine materials suction dredged and placed on adjacent Sea floor to create islands. | | | | | |
| | | **Subtotal Construction Costs** | | | | | **$172,499,163** |
| | | Mobilization 5% (+/-) | | | | | $8,620,000 |
| | | **Subtotal Contract Costs** | | | | | **$181,119,163** |

**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06 | **PEER REVIEW**

**PRICES**

**Unit prices are from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative Nos. 3A, 3B and 3C***
***Concentric Lakes***
***Conveyance Canals***

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal
**REGION:** | **PRICE LEVEL:**
**FILE:** C:\ALL\SEA\2007\[ConcentricLakesConveyanceCosts-12-29-06.xls]Alternative 3

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Concentric Lakes Conveyance Canals** | | | | | |
| | 1 | Dredging | | 12,683,336 | CY | $6.70 | $84,978,352 |
| | 2 | Type A Sand | | 9,613,344 | CY | $31.99 | $307,530,873 |
| | 3 | Type B Sand/Gravel | | 859,142 | CY | $31.80 | $27,320,729 |
| | 4 | Filter Rock (Fine and Coarse) | | | CY | | |
| | 5 | Riprap | | 2,550,338 | CY | $50.70 | $129,302,135 |
| | 6 | Stone Columns | | 2,172,970 | FT | $45.92 | $99,782,791 |
| | 7 | Soil-cement-bentonite slurry wall without membrane | | 7,898,918 | SF | $6.00 | $47,393,511 |
| | 8 | Wick Drains | | 6,969,600 | FT | $5.17 | $36,032,832 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $732,341,222 |

**QUANTITIES**

**BY** M. Spears
**CHECKED** J. Cunningham
**DATE PREPARED** 10/18/06
**PEER REVIEW**

**PRICES**

**All unit prices, except for Item 9, are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**
**Unit price for Item 9 is from Reclamation's June 22, 2006 Approved Conveyance Estimate Worksheets.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative Nos. 3A, 3B and 3C***
***Concentric Lakes***
***Conveyance Canals***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[ConcentricLakesConveyanceCosts-12-29-06.xls]Alternative 3

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | 9 | 3.5" Unreinforced Concrete Canal Lining | | 58,967 | CY | $500.00 | $29,483,462 |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $29,483,462 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $732,341,222 |
| | | **Subtotal Construction Costs** | | | | | **$761,824,684** |
| | | Mobilization 5% (+/-) | | | | | $38,090,000 |
| | | **Alternative 3A Subtotal Contract Costs** | | | | | **$799,914,684** |
| | | **Alternative 3B Subtotal Contract Costs (77% of Alternative 3A Costs)** | | | | | **$617,309,280** |
| | | **Alternative 3C Subtotal Contract Costs (25% of Alternative 3A Costs)** | | | | | **$202,783,291** |
| | | **Note:** Specific quantities and costs calculated for Alternative 3A. Alternative 3B and 3C costs calculated relative to that of Alternative 3A. Percentages applied (77% and 25%) are based on the ratio of the 3B and 3C total dike embankment costs to that of 3A. | | | | | |

**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/18/06 | **PEER REVIEW**

**PRICES**

**All unit prices, except for Item 9, are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**
**Unit price for Item 9 is from Reclamation's June 22, 2006 Approved Conveyance Estimate Worksheets.**

# Attachment 3B

## Cost Estimate Worksheets for Alternative No. 3B: Concentric Lakes – Sand Dikes without Stone Columns (Imperial Group Alternative)

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__1__ OF __2__

***Alternative No. 3B***
***Concentric Lakes***
***Sand Dikes w/o Stone Columns Embankment Design***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate - usbr - 12-18-06.xls]Alternative 3B

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Concentric Dikes** | | | | | |
| | 1 | **Dredging** | | 129,245,600 | CY | $6.70 | $865,945,520 |
| | 2 | **Type A Sand-Truck Haul** | | 85,668,000 | CY | $31.99 | $2,740,519,320 |
| | 3 | **Type B Sand/Gravel-Truck Haul** | | 21,310,300 | CY | $31.80 | $677,667,540 |
| | 4 | **Filter Rock (Fine and Coarse)** | | 0 | CY | $0.00 | $0 |
| | 5 | **Riprap-Truck Haul** | | 31,788,900 | CY | $50.70 | $1,611,697,230 |
| | 6 | **Stone Columns** | | | FT | $0.00 | $0 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 99,328,900 | SF | $6.00 | $595,973,400 |
| | 8 | **Wick Drains** | | 87,642,500 | FT | $5.17 | $453,111,725 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $6,944,914,735 |

**QUANTITIES**

**BY** M. Spears | **CHECKED** D. Wiltshire

**DATE PREPARED** 12/20/06 | **PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative No. 3B***
***Concentric Lakes***
***Sand Dikes w/o Stone Columns Embankment Design***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate - usbr - 12-18-06.xls]Alternative 3B

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $0 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $6,944,914,735 |
| | | **Subtotal Construction Costs - 4-Rings** | | | | | **$6,944,914,735** |
| | | **Subtotal Construction Costs - 3-Rings (75% of 4-Rings Costs)** | | | | | **$5,208,686,051** |

**QUANTITIES**

**BY** M. Spears | **CHECKED** D. Wiltshire

**DATE PREPARED** 12/20/06 | **PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative No. 3B***
***Concentric Lakes***
***Cell Dividers Earthfill Dikes without Stone Columns***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[CellDividersCosts-12-28-06.xls]Alternative 3B

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Cell Dividers** | | | | | |
| | 1 | **Dredging** | | 633,600 | CY | $6.70 | $4,245,120 |
| | 2 | **Type A Sand** | | 530,200 | CY | $31.99 | $16,961,098 |
| | 3 | **Type B Sand/Gravel** | | 52,008 | CY | $31.80 | $1,653,854 |
| | 4 | **Filter Rock (Fine and Coarse)** | | | CY | | |
| | 5 | **Riprap** | | 169,400 | CY | $50.70 | $8,588,580 |
| | 6 | **Stone Columns** | | | FT | | |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 445,500 | SF | $6.00 | $2,673,000 |
| | 8 | **Wick Drains** | | 325,248 | FT | $5.17 | $1,681,532 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $35,803,185 |

**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06 | **PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder, Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative No. 3B***
***Concentric Lakes***
***Cell Dividers Earthfill Dikes without Stone Columns***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** **Appraisal**

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[CellDividersCosts-12-28-06.xls]Alternative 3B

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
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| | | SUBTOTAL (Sheet 2 of 2) | | | | | |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $35,803,185 |
| | | | | | | | |
| | | **Subtotal Construction Costs** | | | | | **$35,803,185** |
| | | | | | | | |
| | | Mobilization 5% (+/-) | | | | | $1,790,000 |
| | | **Subtotal Contract Costs** | | | | | **$37,593,185** |
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**QUANTITIES**

**BY** M. Spears

**CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06

**PEER REVIEW**

**PRICES**

**Unit prices are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Kleinfelder, Inc.**

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# ESTIMATE WORKSHEET

SHEET__1__ OF __1__

***Alternative Nos. 3A, 3B & 3C***
***Concentric Lakes***
***Habitat Islands and Deep Areas***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2006new\[HabitatIslandsCosts.xls]Alternative 3A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Habitat Islands and Deep Areas** | | | | | |
| | 1 | **Dredging** | | 22,402,488 | CY | $6.70 | $150,096,668 |
| | | Sea floor deposits and soft lacustrine materials suction dredged and placed on adjacent Sea floor to create islands. | | | | | |
| | | **Subtotal Construction Costs** | | | | | **$172,499,163** |
| | | Mobilization 5% (+/-) | | | | | $8,620,000 |
| | | **Subtotal Contract Costs** | | | | | **$181,119,163** |

**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06 | **PEER REVIEW**

**PRICES**

**Unit prices are from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**

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# ESTIMATE WORKSHEET



***Alternative Nos. 3A, 3B and 3C***
***Concentric Lakes***
***Conveyance Canals***

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal
**REGION:** | **PRICE LEVEL:**
**FILE:** C:\ALL\SEA\2007\[ConcentricLakesConveyanceCosts-12-29-06.xls]Alternative 3

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Concentric Lakes Conveyance Canals** | | | | | |
| | 1 | Dredging | | 12,683,336 | CY | $6.70 | $84,978,352 |
| | 2 | Type A Sand | | 9,613,344 | CY | $31.99 | $307,530,873 |
| | 3 | Type B Sand/Gravel | | 859,142 | CY | $31.80 | $27,320,729 |
| | 4 | Filter Rock (Fine and Coarse) | | | CY | | |
| | 5 | Riprap | | 2,550,338 | CY | $50.70 | $129,302,135 |
| | 6 | Stone Columns | | 2,172,970 | FT | $45.92 | $99,782,791 |
| | 7 | Soil-cement-bentonite slurry wall without membrane | | 7,898,918 | SF | $6.00 | $47,393,511 |
| | 8 | Wick Drains | | 6,969,600 | FT | $5.17 | $36,032,832 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $732,341,222 |

**QUANTITIES**

**BY** M. Spears
**CHECKED** J. Cunningham
**DATE PREPARED** 10/18/06
**PEER REVIEW**

**PRICES**

**All unit prices, except for Item 9, are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**
**Unit price for Item 9 is from Reclamation's June 22, 2006 Approved Conveyance Estimate Worksheets.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative Nos. 3A, 3B and 3C***
***Concentric Lakes***
***Conveyance Canals***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[ConcentricLakesConveyanceCosts-12-29-06.xls]Alternative 3

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | 9 | 3.5" Unreinforced Concrete Canal Lining | | 58,967 | CY | $500.00 | $29,483,462 |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $29,483,462 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $732,341,222 |
| | | **Subtotal Construction Costs** | | | | | **$761,824,684** |
| | | Mobilization 5% (+/-) | | | | | $38,090,000 |
| | | **Alternative 3A Subtotal Contract Costs** | | | | | **$799,914,684** |
| | | **Alternative 3B Subtotal Contract Costs (77% of Alternative 3A Costs)** | | | | | **$617,309,280** |
| | | **Alternative 3C Subtotal Contract Costs (25% of Alternative 3A Costs)** | | | | | **$202,783,291** |
| | | **Note:** Specific quantities and costs calculated for Alternative 3A. Alternative 3B and 3C costs calculated relative to that of Alternative 3A. Percentages applied (77% and 25%) are based on the ratio of the 3B and 3C total dike embankment costs to that of 3A. | | | | | |

**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/18/06 | **PEER REVIEW**

**PRICES**

**All unit prices, except for Item 9, are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**
**Unit price for Item 9 is from Reclamation's June 22, 2006 Approved Conveyance Estimate Worksheets.**

# Attachment 3C

## Cost Estimate Worksheets for Alternative No. 3C: Concentric Lakes - Earthfill Dikes with Geotubes® (Imperial Group Alternative)

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative No. 3C***
***Concentric Lakes***
***Earthfill Dikes with Geotubes® Embankment Design***

**PROJECT:** Salton Sea Restoration Study

**WOID:** L165C **ESTIMATE LEVEL:** Appraisal

**REGION** LC **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[FINAL Geotube Dikes Est Alt 3C 12-5-06.xls]Alternative 3C

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Concentric Dikes - Total Length 255 Miles** | | | | | |
| | 1 | **Borrow Area Stripping** | | 54,648,000 | CY | $3.50 | $191,268,000 |
| | | Strip borrow area using suction dredge and discharge | | | | | |
| | | waste 0.25-mile away on Sea bottom, assume 1/3 no mud | | | | | |
| | | volume, 1/3 shallow mud, & 1/3 deep mud volume cases | | | | | |
| | 2 | **Construct Geotube Foundation Bund - Four Dikes** | | | | | |
| | | Foundation Bund 130 ft wide by 2 ft thick, geotextile tube filled with | | | | | |
| | | soil material suction dredged near ring dike alignments - assume soil | | | | | |
| | | material consists of clay, silt, and sand - assume two tube fillings | | | | | |
| | | required | | | | | |
| | 2A | **Geotextile** - assume 10% waste, assume five tubes joined together | | 281,166,000 | SF | $1.90 | $534,215,400 |
| | | horizontally, assume five tubes horizontally, perform stitching of | | | | | |
| | | geotextile to form tubes | | | | | |
| | 2B | **Tube Filling** - assume two tube fillings and 10% loss, material | | 10,256,000 | CY | $14.50 | $148,712,000 |
| | | suction dredged from adjacent borrow area, assume 0.25-mile | | | | | |
| | | pumping of filling soil material | | | | | |
| | 3 | **Construct Geotube Core - Four Dikes** | | | | | |
| | | Geotube core - 60 ft circumference geotube filled with soil material | | | | | |
| | | suction dredged near ring dike aligments - assume soil material | | | | | |
| | | consists of clay, silt, and sand - assume three tube fillings required | | | | | |
| | 3A | **Geotextile** - assume 10% waste, assume geotube formed by | | 88,932,000 | SF | $1.60 | $142,291,200 |
| | | stitching geotextile to form single tube | | | | | |
| | 3B | **Tube Filling** - assume three tube fillings and 10% loss, material | | 7,967,000 | CY | $14.50 | $115,521,500 |
| | | suction dredged from adjacent borrow area, assume 0.25-mile | | | | | |
| | | pumping of filling soil material | | | | | |
| | 4 | **Construct Dike Earthfill Cover - Four Dikes** | | | | | |
| | | Place earthfill cover by barge/clamshell using soil material from near | | | | | |
| | | dike alignments - assume soil material consists of clay, silt, and sand | | | | | |
| | | assume two placements required, allowing soil to consolidate, shape | | | | | |
| | | dike surface after earthfill cover has consolidated | | | | | |
| | 4A | **Earthfill Dredging and Placement** - assume a 1 cy loss for every | | 39,266,000 | CY | $25.00 | $981,650,000 |
| | | 1 cy soil placed due to slope runoff. Material placed w/3 cy clamshell | | | | | |
| | | or modified dragline operation. Bucket fill factor assumed at 65%. | | | | | |
| | 4B | **Dike Surface Shaping** - shape final dike surface to 5:1 (H:V) slopes | | 178,041,000 | SF | $0.30 | $53,412,300 |
| | | **SUBTOTAL (Sheet 1 of 2)** | | | | | **$2,167,070,400** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| R. Wiltshire | M. Spears | D. Donaldson | |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 12/04/06 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

***Alternative No. 3C***
***Concentric Lakes***
***Earthfill Dikes with Geotubes® Embankment Design***

**PROJECT:**
**Salton Sea Restoration Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal
**REGION:** | **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[FINAL Geotube Dikes Est Alt 3C 12-5-06.xls]Alternative 3C

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | 5 | **Slope Protection - Four Dikes** | | 3,517,000 | TN | $32.50 | $114,302,500 |
| | | Place rock riprap 2 ft thick and 4 ft high on upstream slope, assume | | | | | |
| | | rock size 6-inch to 2 feet, rock 1.60 tons/cubic yard, assume 10% | | | | | |
| | | loss, purchase rock from Coolidge Mountain source, transport 5 miles | | | | | |
| | | to Sea shore, transfer to barge, transport to dike alignment - average | | | | | |
| | | barge transport of 20 miles, place from barge onto upstream slope of | | | | | |
| | | dike | | | | | |
| | | **SUBTOTAL (Sheet 2 of 2)** | | | | | **$114,302,500** |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $2,167,070,400 |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $114,302,500 |
| | | **Subtotal Construction Costs** | | | | | **$2,281,372,900** |

**Technical concerns with this alternative:** It is Reclamation's opinion that constructing Concentric Lake dikes using Geotubes would result in significant seismic, static, and constructability problems. Also, a major concern is the Geotube's ability to control seepage. **Based on these identified problems, the Geotube approach is probably not feasible.**

**Because of the technical concerns noted, this appraisal level cost estimate should be considered with caution.**

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| R. Wiltshire | M. Spears | D. Donaldson | |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 12/04/06 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative No. 3C***
***Concentric Lakes***
***Cell Dividers Earthfill Dikes With Geotubes®***

**PROJECT:** Salton Sea Restoration Study

**WOID:** L165C **ESTIMATE LEVEL:** Appraisal

**REGION** LC **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[FINAL GeotubeCellDividerCosts 12-5-06.xls]Alternative 3C

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Cell Dividers - Total Length 1.5 Miles** | | | | | |
| | 1 | **Borrow Area Stripping** | | 215,000 | CY | $3.50 | $752,500 |
| | | Strip borrow area using suction dredge and discharge | | | | | |
| | | waste 0.25-mile away on Sea bottom, assume 1/3 no mud | | | | | |
| | | volume, 1/3 shallow mud, & 1/3 deep mud volume cases | | | | | |
| | 2 | **Construct Geotube Foundation Bund** | | | | | |
| | | Foundation Bund 130 ft wide by 2 ft thick, geotextile tube filled with | | | | | |
| | | soil material suction dredged near ring dike alignments - assume soil | | | | | |
| | | material consists of clay, silt, and sand - assume two tube fillings | | | | | |
| | | required | | | | | |
| | 2A | **Geotextile** - assume 10% waste, assume five tubes joined together | | 1,108,000 | SF | $1.90 | $2,105,200 |
| | | horizontally, assume five tubes horizontally, perform stitching of | | | | | |
| | | geotextile to form tubes | | | | | |
| | 2B | **Tube Filling** - assume two tube fillings and 10% loss, material | | 40,000 | CY | $14.50 | $580,000 |
| | | suction dredged from adjacent borrow area, assume 0.25-mile | | | | | |
| | | pumping of filling soil material | | | | | |
| | 3 | **Construct Geotube Core** | | | | | |
| | | Geotube core - 60 ft circumference geotube filled with soil material | | | | | |
| | | suction dredged near ring dike aligments - assume soil material | | | | | |
| | | consists of clay, silt, and sand - assume three tube fillings required | | | | | |
| | 3A | **Geotextile** - assume 10% waste, assume geotube formed by | | 350,000 | SF | $1.60 | $560,000 |
| | | stitching geotextile to form single tube | | | | | |
| | 3B | **Tube Filling** - assume three tube fillings and 10% loss, material | | 31,000 | CY | $14.50 | $449,500 |
| | | suction dredged from adjacent borrow area, assume 0.25-mile | | | | | |
| | | pumping of filling soil material | | | | | |
| | 4 | **Construct Dike Earthfill Cover** | | | | | |
| | | Place earthfill cover using soil material suction dredged near ring dike | | | | | |
| | | alignments - assume soil material consists of clay, silt, and sand - | | | | | |
| | | assume two placements required, allowing soil to consolidate, shape | | | | | |
| | | dike surface after earthfill cover has consolidated | | | | | |
| | 4A | **Earthfill Dredging and Placement - assume a 1 cy loss for every** | | 155,000 | CY | $25.00 | $3,875,000 |
| | | 1 cy soil placed due to slope runoff. Material placed w/3 cy clamshell | | | | | |
| | | or modified dragline operation. Bucket fill factor assumed at 65%. | | | | | |
| | 4B | **Dike Surface Shaping** - shape final dike surface to 5:1 (H:V) slopes | | 702,000 | SF | $0.30 | $210,600 |
| | | **SUBTOTAL (Sheet 1 of 2)** | | | | | **$8,532,800** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| M. Spears | R. Wiltshire | D. Donaldson | |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 12/05/06 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative No. 3C***
***Concentric Lakes***
***Cell Dividers Earthfill Dikes With Geotubes®***

**PROJECT:** Salton Sea Restoration Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:** Oct-06

**FILE:** C:\ALL\SEA\2007\[FINAL GeotubeCellDividerCosts 12-5-06.xls]Alternative 3C

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | 5 | **Slope Protection** | | 14,000 | TN | $32.50 | $455,000 |
| | | Place rock riprap 2 ft thick and 4 ft high on upstream slope, assume | | | | | |
| | | rock size 6-inch to 2 feet, rock 1.60 tons/cubic yard, assume 10% | | | | | |
| | | loss, purchase rock from Coolidge Mountain source, transport 5 miles | | | | | |
| | | to Sea shore, transfer to barge, transport to dike alignment - average | | | | | |
| | | barge transport of 20 miles, place from barge onto upstream slope of | | | | | |
| | | dike | | | | | |
| | | **SUBTOTAL (Sheet 2 of 2)** | | | | | **$455,000** |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $8,532,800 |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $455,000 |
| | | **Subtotal Construction Costs** | | | | | **$8,987,800** |

**Technical concerns with this alternative:** It is Reclamation's opinion that constructing Concentric Lake dikes using Geotubes would result in significant seismic, static, and constructability problems. Also, a major concern is the Geotube's ability to control seepage. **Based on these identified problems, the Geotube approach is probably not feasible.**

**Because of the technical concerns noted, this appraisal level cost estimate should be considered with caution.**

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | CHECKED | BY | CHECKED |
| M. Spears | R. Wiltshire | D. Donaldson | |
| DATE PREPARED | PEER REVIEW | DATE PREPARED | PEER REVIEW |
| 12/05/06 | | 01/25/07 | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__1__ OF __1__

***Alternative Nos. 3A, 3B & 3C***
***Concentric Lakes***
***Habitat Islands and Deep Areas***

**PROJECT:** Salton Sea Restoration Feasibility Study

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2006new\[HabitatIslandsCosts.xls]Alternative 3A

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Habitat Islands and Deep Areas** | | | | | |
| | 1 | **Dredging** | | 22,402,488 | CY | $6.70 | $150,096,668 |
| | | Sea floor deposits and soft lacustrine materials suction dredged and placed on adjacent Sea floor to create islands. | | | | | |
| | | **Subtotal Construction Costs** | | | | | **$172,499,163** |
| | | Mobilization 5% (+/-) | | | | | $8,620,000 |
| | | **Subtotal Contract Costs** | | | | | **$181,119,163** |

**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/12/06 | **PEER REVIEW**

**PRICES**

**Unit prices are from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



***Alternative Nos. 3A, 3B and 3C***
***Concentric Lakes***
***Conveyance Canals***

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal
**REGION:** | **PRICE LEVEL:**
**FILE:** C:\ALL\SEA\2007\[ConcentricLakesConveyanceCosts-12-29-06.xls]Alternative 3

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Concentric Lakes Conveyance Canals** | | | | | |
| | 1 | Dredging | | 12,683,336 | CY | $6.70 | $84,978,352 |
| | 2 | Type A Sand | | 9,613,344 | CY | $31.99 | $307,530,873 |
| | 3 | Type B Sand/Gravel | | 859,142 | CY | $31.80 | $27,320,729 |
| | 4 | Filter Rock (Fine and Coarse) | | | CY | | |
| | 5 | Riprap | | 2,550,338 | CY | $50.70 | $129,302,135 |
| | 6 | Stone Columns | | 2,172,970 | FT | $45.92 | $99,782,791 |
| | 7 | Soil-cement-bentonite slurry wall without membrane | | 7,898,918 | SF | $6.00 | $47,393,511 |
| | 8 | Wick Drains | | 6,969,600 | FT | $5.17 | $36,032,832 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $732,341,222 |

**QUANTITIES**

**BY** M. Spears
**CHECKED** J. Cunningham
**DATE PREPARED** 10/18/06
**PEER REVIEW**

**PRICES**

**All unit prices, except for Item 9, are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**
**Unit price for Item 9 is from Reclamation's June 22, 2006 Approved Conveyance Estimate Worksheets.**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative Nos. 3A, 3B and 3C***
***Concentric Lakes***
***Conveyance Canals***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[ConcentricLakesConveyanceCosts-12-29-06.xls]Alternative 3

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | 9 | 3.5" Unreinforced Concrete Canal Lining | | 58,967 | CY | $500.00 | $29,483,462 |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $29,483,462 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $732,341,222 |
| | | **Subtotal Construction Costs** | | | | | **$761,824,684** |
| | | Mobilization 5% (+/-) | | | | | $38,090,000 |
| | | **Alternative 3A Subtotal Contract Costs** | | | | | **$799,914,684** |
| | | **Alternative 3B Subtotal Contract Costs (77% of Alternative 3A Costs)** | | | | | **$617,309,280** |
| | | **Alternative 3C Subtotal Contract Costs (25% of Alternative 3A Costs)** | | | | | **$202,783,291** |
| | | **Note:** Specific quantities and costs calculated for Alternative 3A. Alternative 3B and 3C costs calculated relative to that of Alternative 3A. Percentages applied (77% and 25%) are based on the ratio of the 3B and 3C total dike embankment costs to that of 3A. | | | | | |

**QUANTITIES**

**BY** M. Spears | **CHECKED** J. Cunningham

**DATE PREPARED** 10/18/06 | **PEER REVIEW**

**PRICES**

**All unit prices, except for Item 9, are revised (December 20, 2006) from the September 2006 Restoration of the Salton Sea Volume 2: Embankment Designs and Optimization Study Administrative Draft by Klleinfelder, Inc.**
**Unit price for Item 9 is from Reclamation's June 22, 2006 Approved Conveyance Estimate Worksheets.**

# Attachment 4

## Cost Estimate Worksheets for Alternative No. 4: North-Sea Dam with North Marine Lake – Sand Dam with Stone Columns

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# ESTIMATE WORKSHEET

SHEET__1__ OF __2__

***Alternative No. 4***
***North-Sea Dam/NorthMarine Lake***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal
**REGION:** | **PRICE LEVEL:**
**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 4

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| A | | **North-Sea Dam** | | | | | |
| | 1 | **Dredging** | | 41,925,400 | CY | $6.70 | $280,900,180 |
| | 2 | **Type A Sand-Truck Haul** | | 91,770,800 | CY | $24.06 | $2,208,005,448 |
| | 3 | **Type B Sand/Gravel-Truck Haul** | | 20,625,000 | CY | $23.88 | $492,525,000 |
| | 4 | **Filter Rock (Fine and Coarse)-Truck Haul** | | 3,138,300 | CY | $23.88 | $74,942,604 |
| | 5 | **Riprap-Truck Haul** | | 11,471,900 | CY | $40.94 | $469,659,586 |
| | 6 | **Stone Columns** | | 15,675,000 | FT | $45.92 | $719,796,000 |
| | 7 | **Soil-cement-bentonite slurry wall without membrane** | | 13,208,800 | SF | $6.00 | $79,252,800 |
| | 8 | **Wick Drains** | | 37,478,100 | FT | $5.20 | $194,886,120 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $4,519,967,738 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY<br>J. Yu | CHECKED<br>R. Allen/C. Spandau | BY<br>M. Pauletto | CHECKED<br>P. Martinson |
| DATE PREPARED<br>08/25/06 | PEER REVIEW | DATE PREPARED<br>01/25/07 | PEER REVIEW |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__2__ OF __2__

**FEATURE:**

***Alternative No. 4***
***North Sea Dam/North Marine Lake***
***Sand Dam with Stone Columns Embankment Design***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 4

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| B | | **Habitat Ponds** | | | | | |
| | 1 | **Habitat Ponds** | | 37,200 | ACRE | $13,473.00 | $501,195,600 |
| | | Includes overexcavation geogrid replacement and embankment | | | | | |
| | | SUBTOTAL (Sheet 2 of 2) | | | | | $501,195,600 |
| | | SUBTOTAL (Sheet 1 of 2) | | | | | $4,519,967,738 |
| | | **Subtotal Construction Costs** | | | | | **$5,021,163,338** |

| **QUANTITIES** | | **PRICES** | |
|---|---|---|---|
| **BY** J. Yu | **CHECKED** R. Allen/C. Spandau | **BY** M. Pauletto | **CHECKED** P. Martinson |
| **DATE PREPARED** 08/25/06 | **PEER REVIEW** | **DATE PREPARED** 01/25/07 | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

**FEATURE:**

***Alternative No. 4***
***North-Sea Dam/North Marine Lake***
**Habitat Ponds Deep Excavation**

**PROJECT:**
**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL** Appraisal
**REGION:** | **PRICE LEVEL:**
**FILE:** C:\ALL\SEA\2006new\[HabitatPondDeepExc.xls]Alt 4

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **Habitat Ponds Deep Excavation** | | | | | |
| | | **Excavation** | | 84,022,400 | CY | $6.50 | $546,145,600 |
| | | Assumes uniform 7-foot excavation in the dry using conventional excavation techniques to remove soft wet material (500 acres deep excavation per 2,500 (acres of ponds) | | | | | |
| | | **Subtotal Construction Costs** | | | | | $546,145,600 |
| | | Mobilization 5% (+/-) | | | | | $27,310,000 |
| | | **Subtotal Contract Costs** | | | | | $573,455,600 |

**QUANTITIES**

**BY** M. Spears
**CHECKED** J. Cunningham
**DATE PREPARED** 10/12/06
**PEER REVIEW**

**PRICES**

**Unint prices from September 30, 2005 Salton Sea Restoration Project, Feasibility Study - Phase 1, Alternatives and Cost Estimates**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

**Alternative No. 4**
**North-Sea Dam/North Marine Lake**
**Sand Dam with Stone Columns**
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 4 NS est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SW Left Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 1,050 | CY | $90.00 | $94,500.00 |
| | | Sheet pile cutoff | | 3,250 | SF | $35.00 | $113,750.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 28,220 | CY | $8.00 | $225,760.00 |
| | | Embankment | | 51,235 | CY | $5.00 | $256,175.00 |
| | | Unreinforced concrete canal lining | | 1,285 | CY | $500.00 | $642,500.00 |
| | | | | | | | |
| | | **River Water Channel, 271 cfs, 10.0 mi** | | | | | |
| | | Excavation | | 355,800 | CY | $7.00 | $2,490,600.00 |
| | | Compacted embankment | | 18,530 | CY | $6.00 | $111,180.00 |
| | | Unreinforced concrete canal lining | | 13,805 | CY | $500.00 | $6,902,500.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 8.5' dia Precast reinf conc pipe | | 2,400 | LF | $1,200.00 | $2,880,000.00 |
| | | Excavation | | 72,220 | CY | $8.00 | $577,760.00 |
| | | Backfill | | 65,350 | CY | $6.00 | $392,100.00 |
| | | Reinforced concrete | | 435 | CY | $1,000.00 | $435,000.00 |
| | | 2 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 255 | LF | $300.00 | $76,500.00 |
| | | **River Water Distrib'n Channel, 115 cfs, 12.6 mi** | | | | | |
| | | Excavation | | 268,700 | CY | $7.00 | $1,880,900.00 |
| | | Compacted embankment | | 15,800 | CY | $6.00 | $94,800.00 |
| | | Unreinforced concrete canal lining | | 11,455 | CY | $500.00 | $5,727,500.00 |
| | | 11 Siphons, 50' head class | | | | | |
| | | 5.5' dia Precast reinf conc pipe | | 2,200 | LF | $400.00 | $880,000.00 |
| | | Excavation | | 42,865 | CY | $8.00 | $342,920.00 |
| | | Backfill | | 40,225 | CY | $6.00 | $241,350.00 |
| | | Reinforced concrete | | 170 | CY | $1,000.00 | $170,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 555 | LF | $300.00 | $166,500.00 |
| | | 21 Bridges | | | | | |
| | | Reinforced concrete | | 825 | CY | $1,000.00 | $825,000.00 |
| | | | | | | | |
| | | **Pup Fish Channel, 0 cfs, 10.0 mi** | | | | | |
| | | Excavation | | 108,800 | CY | $7.00 | $761,600.00 |
| | | Compacted embankment | | 8,555 | CY | $6.00 | $51,330.00 |
| | | Unreinforced concrete canal lining | | 6,880 | CY | $500.00 | $3,440,000.00 |
| | | | | | | | |
| | | | | | | | |

**QUANTITIES** | **PRICES**

| BY | | BY | CHECKED |
|---|---|---|---|
| Mark Leavitt | Steve Robertson | Dan Mar | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| April 20, 2006 | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

**Alternative No. 4**
**North-Sea Dam/North Marine Lake**
**Sand Dam with Stone Columns**
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

| | | | |
|---|---|---|---|
| **WOID:** | **L165C** | **ESTIMATE LEVEL:** | **Appraisal** |
| **REGION:** | **LC** | **PRICE LEVEL:** | **Apr-06** |

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 4 NS est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SW Right Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 890 | CY | $90.00 | $80,100.00 |
| | | Sheet pile cutoff | | 3,170 | SF | $35.00 | $110,950.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 4,960 | CY | $10.00 | $49,600.00 |
| | | Embankment | | 10,110 | CY | $5.00 | $50,550.00 |
| | | Unreinforced concrete canal lining | | 250 | CY | $500.00 | $125,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 227 cfs, 6.4 mi** | | | | | |
| | | Excavation | | 201,950 | CY | $7.00 | $1,413,650.00 |
| | | Compacted embankment | | 11,050 | CY | $6.00 | $66,300.00 |
| | | Unreinforced concrete canal lining | | 8,100 | CY | $500.00 | $4,050,000.00 |
| | | 10 Siphons, 50' head class | | | | | |
| | | 7.5' dia Precast reinf conc pipe | | 2,000 | LF | $650.00 | $1,300,000.00 |
| | | Excavation | | 52,605 | CY | $8.00 | $420,840.00 |
| | | Backfill | | 48,150 | CY | $6.00 | $288,900.00 |
| | | Reinforced concrete | | 300 | CY | $1,000.00 | $300,000.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 55 | CY | $1,000.00 | $55,000.00 |

**QUANTITIES**

**BY** Mark Leavitt Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**DATE PREPARED**

**CHECKED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

**Alternative No. 4**
**North-Sea Dam/North Marine Lake**
**Sand Dam with Stone Columns**
***Water Conveyance Components***
***SE Quadrant***

**PROJECT:**

**Salton Sea**

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal
**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 4 NS est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 5,120 | CY | $90.00 | $460,800.00 |
| | | Sheet pile cutoff | | 13,575 | SF | $35.00 | $475,125.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | | 6,590 | CY | $10.00 | $65,900.00 |
| | | Embankment | | 10,990 | CY | $5.00 | $54,950.00 |
| | | Unreinforced concrete canal lining | | 285 | CY | $500.00 | $142,500.00 |
| | | **River Water Channel, 334 cfs, 6.7 mi** | | | | | |
| | | Excavation | | 275,050 | CY | $7.00 | $1,925,350.00 |
| | | Compacted embankment | | 13,450 | CY | $6.00 | $80,700.00 |
| | | Unreinforced concrete canal lining | | 10,260 | CY | $500.00 | $5,130,000.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 9.0' dia Precast reinf conc pipe | | 2,400 | LF | $1,300.00 | $3,120,000.00 |
| | | Excavation | | 77,000 | CY | $8.00 | $616,000.00 |
| | | Backfill | | 69,300 | CY | $6.00 | $415,800.00 |
| | | Reinforced concrete | | 540 | CY | $1,000.00 | $540,000.00 |
| | | 6 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 785 | LF | $300.00 | $235,500.00 |
| | | **River Water Distrib'n Channel, 334 cfs, 8.0 mi** | | | | | |
| | | Excavation | | 328,400 | CY | $7.00 | $2,298,800.00 |
| | | Compacted embankment | | 16,050 | CY | $6.00 | $96,300.00 |
| | | Unreinforced concrete canal lining | | 12,250 | CY | $500.00 | $6,125,000.00 |
| | | 5 Siphons, 50' head class | | | | | |
| | | 9.0' dia Precast reinf conc pipe | | 1,000 | LF | $1,300.00 | $1,300,000.00 |
| | | Excavation | | 32,080 | CY | $8.00 | $256,640.00 |
| | | Backfill | | 28,875 | CY | $6.00 | $173,250.00 |
| | | Reinforced concrete | | 225 | CY | $1,000.00 | $225,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 655 | LF | $300.00 | $196,500.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 65 | CY | $1,000.00 | $65,000.00 |
| | | **River Water Distrib'n Channel, 115 cfs, 8.4 mi** | | | | | |
| | | Excavation | | 179,125 | CY | $7.00 | $1,253,875.00 |
| | | Compacted embankment | | 10,530 | CY | $6.00 | $63,180.00 |
| | | Unreinforced concrete canal lining | | 7,650 | CY | $500.00 | $3,825,000.00 |
| | | 5 Siphons, 50' head class | | | | | |
| | | 5.5' dia Precast reinf conc pipe | | 1,000 | LF | $400.00 | $400,000.00 |
| | | Excavation | | 19,500 | CY | $8.00 | $156,000.00 |
| | | Backfill | | 18,285 | CY | $6.00 | $109,710.00 |
| | | Reinforced concrete | | 80 | CY | $1,000.00 | $80,000.00 |

**QUANTITIES** | **PRICES**

| | | |
|---|---|---|
| **BY** Mark Leavitt Steve Robertson | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

**Alternative No. 4**
**North-Sea Dam/North Marine Lake**
**Sand Dam with Stone Columns**
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 4 NS est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SE Quadrant*** | | | | | |
| | | **River Water Distrib'n Channel, 115 cfs, 8.4 mi** | | | | | |
| | | 6 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 670 | LF | $300.00 | $201,000.00 |
| | | 2 Bridges | | | | | |
| | | Reinforced concrete | | 80 | CY | $1,000.00 | $80,000.00 |
| | | **Pup Fish Channel, 0 cfs, 6.7 mi** | | | | | |
| | | Excavation | | 72,875 | CY | $7.00 | $510,125.00 |
| | | Compacted embankment | | 5,735 | CY | $6.00 | $34,410.00 |
| | | Unreinforced concrete canal lining | | 4,610 | CY | $500.00 | $2,305,000.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**DATE PREPARED**

**CHECKED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

**Alternative No. 4**
**North-Sea Dam/North Marine Lake Sand Dam with Stone Columns**
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 4 NS est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 1,140 | CY | $90.00 | $102,600.00 |
| | | Sheet pile cutoff | | 7,500 | SF | $35.00 | $262,500.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | | 2,855 | CY | $10.00 | $28,550.00 |
| | | Embankment | | 8,775 | CY | $5.00 | $43,875.00 |
| | | Unreinforced concrete canal lining | | 205 | CY | $500.00 | $102,500.00 |
| | | | | | | | |
| | | **Zero grade channel, 0 cfs, 4.2 mi** | | | | | |
| | | Excavation | | 58,460 | CY | $7.00 | $409,220.00 |
| | | Compacted embankment | | 3,600 | CY | $6.00 | $21,600.00 |
| | | Unreinforced concrete canal lining | | 3,470 | CY | $500.00 | $1,735,000.00 |
| | | 2 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 400 | LF | $300.00 | $120,000.00 |
| | | Excavation | | 6,015 | CY | $8.00 | $48,120.00 |
| | | Backfill | | 5,760 | CY | $6.00 | $34,560.00 |
| | | Reinforced concrete | | 30 | CY | $1,000.00 | $30,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 525 | LF | $300.00 | $157,500.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 35 | CY | $1,000.00 | $35,000.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**DATE PREPARED**

**CHECKED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

**Alternative No. 4**
**North-Sea Dam/North Marine Lake Sand Dam with Stone Columns**
***Water Conveyance Components***

**PROJECT:**

**Salton Sea**

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal
**REGION:** LC | **PRICE LEVEL:** Apr-06
**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 4 NS est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SW Left Quadrant** | | | | | |
| | | **Sea Water Pipeline, 91 cfs, 177' head** | | | | | |
| | | 4.8' dia Steel pipe | | 14.7 | Mi | $2,600,000.00 | $38,220,000.00 |
| | | 3.1' dia Steel pipe | | 6.7 | Mi | $900,000.00 | $6,030,000.00 |
| | | **Regulating tank tower (200,000 gal, 180 ft tall)** | | 1.0 | Ea. | | $990,000.00 |
| | | **Sea Water Pumping Plant, 91 cfs, 223' TDH** | | | LS | | $11,000,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **SE Quadrant** | | | | | |
| | | **Sea Water Pipeline, 74 cfs, 14.7 mi, 125' head** | | | | | |
| | | 4.3' dia Steel pipe | | 14.7 | Mi | $1,900,000.00 | $27,930,000.00 |
| | | **Regulating tank tower (200,000 gal, 125 ft tall)** | | 1.0 | Ea. | | $975,000.00 |
| | | **Sea Water Pumping Plant, 74 cfs, 171' TDH** | | | LS | | $8,150,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | Subtotal | | | | | $167,534,555.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $16,753,456.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $184,288,011.00 |
| | | Mobilization (+/-5%) | | | | | $9,200,000.00 |
| | | Subtotal w/Mobilization | | | | | $193,488,011.00 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | | BY | CHECKED |
| Mark Leavitt | Steve Robertson | Dan Mar | |
| DATE PREPARED | | DATE PREPARED | PEER REVIEW |
| April 20, 2006 | | | |

# Attachment 5

## Cost Estimate Worksheets for Alternative No. 5: Habitat Enhancement without Marine Lake

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

SHEET__1__ OF __1__

**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement Without Marine Lake***

**PROJECT:**

**Salton Sea Restoration Feasibility Study**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[Cost Estimate by Kleinfelder 12-18-06.xls]Alternative 5

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| A | | **Habitat Ponds** | | | | | |
| | | | | | | | |
| | 9 | **Habitat Ponds** | | 42,200 | ACRE | $13,473.00 | $568,560,600 |
| | | Includes overexcavation geogrid replacement and embankment | | | | | |
| | | SUBTOTAL (Sheet 1 of 1) | | | | | $568,560,600 |
| | | **Subtotal Construction Costs** | | | | | **$568,560,600** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY<br>J. Yu | CHECKED<br>R. Allen/C. Spandau | BY<br>M. Pauletto | CHECKED<br>P. Martinson |
| DATE PREPARED<br>08/25/06 | PEER REVIEW | DATE PREPARED<br>01/25/07 | PEER REVIEW |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET

| | |
|---|---|
| **FEATURE:**<br>***Alternative No. 5***<br>***Habitat Enhancement***<br>**Without Marine Lake**<br>**Habitat Ponds Deep Excavation** | **PROJECT:**<br>**Salton Sea Restoration Feasibility Study**<br>**WOID:** **ESTIMATE LEVEL** **Appraisal**<br>**REGION:** **PRICE LEVEL:**<br>**FILE:** C:\ALL\SEA\2006new\[HabitatPondDeepExc.xls]Alt 5 |

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | **Habitat Ponds Deep Excavation** | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | **Excavation** | | 95,315,733 | CY | $6.50 | $619,552,267 |
| | | Assumes uniform 7-foot excavation in the dry using | | | | | |
| | | conventional excavation techniques to remove soft | | | | | |
| | | wet material (500 acres deep excavation per 2,500 | | | | | |
| | | (acres of ponds) | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | **Subtotal Construction Costs** | | | | | $619,552,267 |
| | | | | | | | |
| | | Mobilization 5% (+/-) | | | | | $30,980,000 |
| | | **Subtotal Contract Costs** | | | | | $650,532,267 |
| | | | | | | | |
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| | | | | | | | |

| QUANTITIES | | PRICES |
|---|---|---|
| **BY** M. Spears | **CHECKED** J. Cunningham | **Unint prices from September 30, 2005 Salton Sea Restoration Project, Feasibility Study - Phase 1, Alternatives and Cost Estimates** |
| **DATE PREPARED** 10/12/06 | **PEER REVIEW** | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement***
***Without Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 5 HE est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SW Left Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 885 | CY | $90.00 | $79,650.00 |
| | | Sheet pile cutoff | | 3,170 | SF | $35.00 | $110,950.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 24,800 | CY | $8.00 | $198,400.00 |
| | | Embankment | | 49,370 | CY | $5.00 | $246,850.00 |
| | | Unreinforced concrete canal lining | | 1,220 | CY | $500.00 | $610,000.00 |
| | | | | | | | |
| | | **River Water Channel, 225 cfs, 10.0 mi** | | | | | |
| | | Excavation | | 315,020 | CY | $7.00 | $2,205,140.00 |
| | | Compacted embankment | | 17,185 | CY | $6.00 | $103,110.00 |
| | | Unreinforced concrete canal lining | | 12,620 | CY | $500.00 | $6,310,000.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 7.5' dia Precast reinf conc pipe | | 2,400 | LF | $650.00 | $1,560,000.00 |
| | | Excavation | | 63,125 | CY | $8.00 | $505,000.00 |
| | | Backfill | | 57,780 | CY | $6.00 | $346,680.00 |
| | | Reinforced concrete | | 360 | CY | $1,000.00 | $360,000.00 |
| | | 2 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 245 | LF | $300.00 | $73,500.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 12.6 mi** | | | | | |
| | | Excavation | | 186,225 | CY | $7.00 | $1,303,575.00 |
| | | Compacted embankment | | 13,770 | CY | $6.00 | $82,620.00 |
| | | Unreinforced concrete canal lining | | 9,025 | CY | $500.00 | $4,512,500.00 |
| | | 8 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 1,600 | LF | $300.00 | $480,000.00 |
| | | Excavation | | 24,045 | CY | $8.00 | $192,360.00 |
| | | Backfill | | 23,035 | CY | $6.00 | $138,210.00 |
| | | Reinforced concrete | | 80 | CY | $1,000.00 | $80,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 505 | LF | $300.00 | $151,500.00 |
| | | 9 Bridges | | | | | |
| | | Reinforced concrete | | 285 | CY | $1,000.00 | $285,000.00 |
| | | | | | | | |
| | | **Pup Fish Channel, 0 cfs, 10.0 mi** | | | | | |
| | | Excavation | | 108,770 | CY | $7.00 | $761,390.00 |
| | | Compacted embankment | | 8,555 | CY | $6.00 | $51,330.00 |
| | | Unreinforced concrete canal lining | | 6,880 | CY | $500.00 | $3,440,000.00 |
| | | | | | | | |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | | BY | CHECKED |
| Mark Leavitt | Steve Robertson | Dan Mar | |
| DATE PREPARED | | DATE PREPARED | PEER REVIEW |
| April 20, 2006 | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement***
***Without Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 5 HE est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SW Right Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 735 | CY | $90.00 | $66,150.00 |
| | | Sheet pile cutoff | | 3,100 | SF | $35.00 | $108,500.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 4,250 | CY | $10.00 | $42,500.00 |
| | | Embankment | | 9,690 | CY | $5.00 | $48,450.00 |
| | | Unreinforced concrete canal lining | | 235 | CY | $500.00 | $117,500.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 181 cfs, 6.4 mi** | | | | | |
| | | Excavation | | 176,165 | CY | $7.00 | $1,233,155.00 |
| | | Compacted embankment | | 10,015 | CY | $6.00 | $60,090.00 |
| | | Unreinforced concrete canal lining | | 7,255 | CY | $500.00 | $3,627,500.00 |
| | | 10 Siphons, 50' head class | | | | | |
| | | 7.0' dia Precast reinf conc pipe | | 2,000 | LF | $600.00 | $1,200,000.00 |
| | | Excavation | | 49,005 | CY | $8.00 | $392,040.00 |
| | | Backfill | | 45,125 | CY | $6.00 | $270,750.00 |
| | | Reinforced concrete | | 240 | CY | $1,000.00 | $240,000.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 50 | CY | $1,000.00 | $50,000.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**CHECKED**

**DATE PREPARED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement***
***Without Marine Lake***
***Water Conveyance Components***
***SE Quadrant***

**PROJECT:**

**Salton Sea**

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 5 HE est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | 86-68140 | 4,570 | CY | $90.00 | $411,300.00 |
| | | Sheet pile cutoff | 86-68140 | 13,365 | SF | $35.00 | $467,775.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | 86-68140 | 6,000 | CY | $10.00 | $60,000.00 |
| | | Embankment | 86-68140 | 10,680 | CY | $5.00 | $53,400.00 |
| | | Unreinforced concrete canal l | 86-68140 | 270 | CY | $500.00 | $135,000.00 |
| | | **River Water Channel, 288 cfs, 6.7 mi** | | | | | |
| | | Excavation | 86-68140 | 249,650 | CY | $7.00 | $1,747,550.00 |
| | | Compacted embankment | 86-68140 | 12,720 | CY | $6.00 | $76,320.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 9,565 | CY | $500.00 | $4,782,500.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 8.5' dia Precast reinf conc pip | 86-68140 | 2,400 | LF | $1,200.00 | $2,880,000.00 |
| | | Excavation | 86-68140 | 72,200 | CY | $8.00 | $577,600.00 |
| | | Backfill | 86-68140 | 65,350 | CY | $6.00 | $392,100.00 |
| | | Reinforced concrete | 86-68140 | 455 | CY | $1,000.00 | $455,000.00 |
| | | 6 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced co | 86-68140 | 770 | LF | $300.00 | $231,000.00 |
| | | **River Water Distrib'n Channel, 288 cfs, 8.0 mi** | | | | | |
| | | Excavation | 86-68140 | 298,090 | CY | $7.00 | $2,086,630.00 |
| | | Compacted embankment | 86-68140 | 15,180 | CY | $6.00 | $91,080.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 11,420 | CY | $500.00 | $5,710,000.00 |
| | | 5 Siphons, 50' head class | | | | | |
| | | 8.5' dia Precast reinf conc pip | 86-68140 | 1,000 | LF | $1,200.00 | $1,200,000.00 |
| | | Excavation | 86-68140 | 30,090 | CY | $8.00 | $240,720.00 |
| | | Backfill | 86-68140 | 27,230 | CY | $6.00 | $163,380.00 |
| | | Reinforced concrete | 86-68140 | 190 | CY | $1,000.00 | $190,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced co | 86-68140 | 640 | LF | $300.00 | $192,000.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | 86-68140 | 60 | CY | $1,000.00 | $60,000.00 |
| | | **River Water Distrib'n Channel, 69 cfs, 7.4 mi** | | | | | |
| | | Excavation | 86-68140 | 109,375 | CY | $7.00 | $765,625.00 |
| | | Compacted embankment | 86-68140 | 8,090 | CY | $6.00 | $48,540.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 5,300 | CY | $500.00 | $2,650,000.00 |
| | | 12 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced co | 86-68140 | 1,205 | LF | $300.00 | $361,500.00 |
| | | 9 Bridges | | | | | |
| | | Reinforced concrete | 86-68140 | 285 | CY | $1,000.00 | $285,000.00 |
| | | | | | | | |
| | | | | | | | |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**CHECKED**

**DATE PREPARED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement***
***Without Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 5 HE est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SE Quadrant*** | | | | | |
| | | **Pup Fish Channel, 0 cfs, 6.7 mi** | | | | | |
| | | Excavation | 86-68140 | 72,875 | CY | $7.00 | $510,125.00 |
| | | Compacted embankment | 86-68140 | 5,735 | CY | $6.00 | $34,410.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 4,610 | CY | $500.00 | $2,305,000.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**DATE PREPARED**

**CHECKED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement***
***Without Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 5 HE est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***NW Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | 86-68140 | 1,140 | CY | $90.00 | $102,600.00 |
| | | Sheet pile cutoff | 86-68140 | 7,500 | SF | $35.00 | $262,500.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | 86-68140 | 2,855 | CY | $10.00 | $28,550.00 |
| | | Embankment | 86-68140 | 8,775 | CY | $5.00 | $43,875.00 |
| | | Unreinforced concrete canal l | 86-68140 | 205 | CY | $500.00 | $102,500.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 102 cfs, 4.2 mi** | | | | | |
| | | Excavation | 86-68140 | 83,520 | CY | $7.00 | $584,640.00 |
| | | Compacted embankment | 86-68140 | 4,950 | CY | $6.00 | $29,700.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 3,680 | CY | $500.00 | $1,840,000.00 |
| | | 3 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced co | 86-68140 | 33 | LF | $300.00 | $9,900.00 |
| | | 2 Bridges | | | | | |
| | | Reinforced concrete | 86-68140 | 75 | CY | $1,000.00 | $75,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 10.5 mi** | | | | | |
| | | Excavation | 86-68140 | 155,200 | CY | $7.00 | $1,086,400.00 |
| | | Compacted embankment | 86-68140 | 11,475 | CY | $6.00 | $68,850.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 7,520 | CY | $500.00 | $3,760,000.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pip | 86-68140 | 2,400 | LF | $300.00 | $720,000.00 |
| | | Excavation | 86-68140 | 36,070 | CY | $8.00 | $288,560.00 |
| | | Backfill | 86-68140 | 34,500 | CY | $6.00 | $207,000.00 |
| | | Reinforced concrete | 86-68140 | 115 | CY | $1,000.00 | $115,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced co | 86-68140 | 100 | LF | $300.00 | $30,000.00 |
| | | 13 Bridges | | | | | |
| | | Reinforced concrete | 86-68140 | 410 | CY | $1,000.00 | $410,000.00 |

**QUANTITIES** | **PRICES**

| | | |
|---|---|---|
| **BY** Mark Leavitt, Steve Robertson | **BY** Dan Mar | **CHECKED** |
| **DATE PREPARED** April 20, 2006 | **DATE PREPARED** | **PEER REVIEW** |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement***
***Without Marine Lake***
***Water Conveyance Components***
***NE Quadrant***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 5 HE est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | 86-68140 | 1,140 | CY | $90.00 | $102,600.00 |
| | | Sheet pile cutoff | 86-68140 | 7,495 | SF | $35.00 | $262,325.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | 86-68140 | 2,850 | CY | $10.00 | $28,500.00 |
| | | Embankment | 86-68140 | 8,775 | CY | $5.00 | $43,875.00 |
| | | Unreinforced concrete canal l | 86-68140 | 205 | CY | $500.00 | $102,500.00 |
| | | **River Water Channel, 102 cfs, 4.2 mi** | | | | | |
| | | Excavation | 86-68140 | 83,520 | CY | $7.00 | $584,640.00 |
| | | Compacted embankment | 86-68140 | 4,930 | CY | $6.00 | $29,580.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 3,580 | CY | $500.00 | $1,790,000.00 |
| | | 5 Siphons, 50' head class | | | | | |
| | | 5.0' dia Precast reinf conc pip | 86-68140 | 1,000 | LF | $380.00 | $380,000.00 |
| | | Excavation | 86-68140 | 17,935 | CY | $8.00 | $143,480.00 |
| | | Backfill | 86-68140 | 16,945 | CY | $6.00 | $101,670.00 |
| | | Reinforced concrete | 86-68140 | 70 | CY | $1,000.00 | $70,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced co | 86-68140 | 110 | LF | $300.00 | $33,000.00 |
| | | 3 Bridges | | | | | |
| | | Reinforced concrete | 86-68140 | 115 | CY | $1,000.00 | $115,000.00 |
| | | **River Water Channel, 69 cfs, 11.0 mi** | | | | | |
| | | Excavation | 86-68140 | 162,580 | CY | $7.00 | $1,138,060.00 |
| | | Compacted embankment | 86-68140 | 12,020 | CY | $6.00 | $72,120.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 7,880 | CY | $500.00 | $3,940,000.00 |
| | | 4 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pip | 86-68140 | 800 | LF | $300.00 | $240,000.00 |
| | | Excavation | 86-68140 | 12,025 | CY | $8.00 | $96,200.00 |
| | | Backfill | 86-68140 | 11,520 | CY | $6.00 | $69,120.00 |
| | | Reinforced concrete | 86-68140 | 40 | CY | $1,000.00 | $40,000.00 |
| | | 5 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced co | 86-68140 | 505 | LF | $300.00 | $151,500.00 |
| | | 7 Bridges | | | | | |
| | | Reinforced concrete | 86-68140 | 220 | CY | $1,000.00 | $220,000.00 |
| | | **River Water Distrib'n Channel, 69 cfs, 1.1 mi** | | | | | |
| | | Excavation | 86-68140 | 16,260 | CY | $7.00 | $113,820.00 |
| | | Compacted embankment | 86-68140 | 1,205 | CY | $6.00 | $7,230.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 790 | CY | $500.00 | $395,000.00 |
| | | 1 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced co | 86-68140 | 100 | LF | $300.00 | $30,000.00 |

**QUANTITIES** | **PRICES**

| BY | | BY | CHECKED |
|---|---|---|---|
| Mark Leavitt | Steve Robertson | Dan Mar | |
| **DATE PREPARED** | | **DATE PREPARED** | **PEER REVIEW** |
| April 20, 2006 | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement***
***Without Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 5 HE est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***NE Quadrant*** | | | | | |
| | | **Pup Fish Channel, 0 cfs, 15.2 mi** | | | | | |
| | | Excavation | 86-68140 | 165,325 | CY | $7.00 | $1,157,275.00 |
| | | Compacted embankment | 86-68140 | 13,005 | CY | $6.00 | $78,030.00 |
| | | Unreinforced concrete canal lining | 86-68140 | 10,455 | CY | $500.00 | $5,227,500.00 |

**QUANTITIES**

BY: Mark Leavitt, Steve Robertson

DATE PREPARED: April 20, 2006

**PRICES**

BY: Dan Mar

DATE PREPARED:

CHECKED:

PEER REVIEW:

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 5***
***Habitat Enhancement***
***Without Marine Lake***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 5 HE est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **SW Left Quadrant** | | | | | |
| | | **Sea Water Pipeline, 91 cfs, 22.2 mi, 157' head** | | | | | |
| | | 4.8' dia Steel pipe | 86-68140 | 22.2 | Mi | $2,700,000.00 | $59,940,000.00 |
| | | **Regulating tank tower (200,000 gal, 160 ft tall)** | 86-68140 | 1.0 | Ea. | | $985,000.00 |
| | | **Sea Water Pumping Plant, 91 cfs, 201' TDH** | | 1 | LS | | $10,500,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **SE Quadrant** | | | | | |
| | | **Sea Water Pipeline, 74 cfs, 16.4 mi, 135' head** | | | | | |
| | | 4.3' dia Steel pipe | 86-68140 | 16.4 | Mi | $1,900,000.00 | $31,160,000.00 |
| | | **Regulating tank tower (200,000 gal, 135 ft tall)** | 86-68140 | 1.0 | Ea. | | $980,000.00 |
| | | **Sea Water Pumping Plant, 74 cfs, 179' TDH** | | 1 | LS | | $8,150,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | **NE Quadrant** | | | | | |
| | | **Sea Water Pipeline, 22 cfs, 27.4 mi, 133' head** | | | | | |
| | | 3.1' dia Steel pipe | 86-68140 | 27.4 | Mi | $1,200,000.00 | $32,880,000.00 |
| | | **Regulating tank tower (200,000 gal, 135 ft tall)** | 86-68140 | 1.0 | Ea. | | $980,000.00 |
| | | **Sea Water Pumping Plant, 22 cfs, 177' TDH** | | 1 | LS | | $2,800,000.00 |
| | | Structure Improvements | | | | | |
| | | Waterways | | | | | |
| | | Pumps and motors | | | | | |
| | | Access electrical | | | | | |
| | | Misc. equipment | | | | | |
| | | Switchyard | | | | | |
| | | Subtotal | | | | | $235,711,055.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $23,571,106.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $259,282,161.00 |
| | | Mobilization (+/-5%) | | | | | $13,000,000.00 |
| | | Subtotal w/Mobilization | | | | | $272,282,161.00 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY Mark Leavitt Steve Robertson | | BY Dan Mar | CHECKED |
| DATE PREPARED April 20, 2006 | | DATE PREPARED | PEER REVIEW |

# Attachment 6

## Cost Estimate Worksheets for Alternative No. 6: No-Project

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 6***
***No-Project Alternative***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 6 NP est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SW Left Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 330 | CY | $90.00 | $29,700.00 |
| | | Sheet pile cutoff | | 2,875 | SF | $35.00 | $100,625.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 2,235 | CY | $10.00 | $22,350.00 |
| | | Embankment | | 8,315 | CY | $5.00 | $41,575.00 |
| | | Unreinforced concrete canal lining | | 190 | CY | $500.00 | $95,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 22.7 mi** | | | | | |
| | | Excavation | | 335,505 | CY | $7.00 | $2,348,535.00 |
| | | Compacted embankment | | 24,810 | CY | $6.00 | $148,860.00 |
| | | Unreinforced concrete canal lining | | 16,260 | CY | $500.00 | $8,130,000.00 |
| | | 20 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 4,000 | LF | $300.00 | $1,200,000.00 |
| | | Excavation | | 60,115 | CY | $8.00 | $480,920.00 |
| | | Backfill | | 57,585 | CY | $6.00 | $345,510.00 |
| | | Reinforced concrete | | 190 | CY | $1,000.00 | $190,000.00 |
| | | 7 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 705 | LF | $300.00 | $211,500.00 |
| | | 9 Bridges | | | | | |
| | | Reinforced concrete | | 285 | CY | $1,000.00 | $285,000.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**CHECKED**

**DATE PREPARED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 6***
***No-Project Alternative***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 6 NP est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SW Right Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 330 | CY | $90.00 | $29,700.00 |
| | | Sheet pile cutoff | | 2,875 | SF | $35.00 | $100,625.00 |
| | | New River settling basin | | | | | |
| | | Excavation | | 2,235 | CY | $10.00 | $22,350.00 |
| | | Embankment | | 8,320 | CY | $5.00 | $41,600.00 |
| | | Unreinforced concrete canal lining | | 190 | CY | $500.00 | $95,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 6.3 mi** | | | | | |
| | | Excavation | | 93,115 | CY | $7.00 | $651,805.00 |
| | | Compacted embankment | | 6,885 | CY | $6.00 | $41,310.00 |
| | | Unreinforced concrete canal lining | | 4,515 | CY | $500.00 | $2,257,500.00 |
| | | 10 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 2,000 | LF | $300.00 | $600,000.00 |
| | | Excavation | | 30,055 | CY | $8.00 | $240,440.00 |
| | | Backfill | | 28,800 | CY | $6.00 | $172,800.00 |
| | | Reinforced concrete | | 95 | CY | $1,000.00 | $95,000.00 |
| | | 1 Bridges | | | | | |
| | | Reinforced concrete | | 35 | CY | $1,000.00 | $35,000.00 |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | | BY | CHECKED |
| Mark Leavitt | Steve Robertson | Dan Mar | |
| DATE PREPARED | | DATE PREPARED | PEER REVIEW |
| April 20, 2006 | | | |

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 6***
***No-Project Alternative***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 6 NP est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***SE Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 1,355 | CY | $90.00 | $121,950.00 |
| | | Sheet pile cutoff | | 11,775 | SF | $35.00 | $412,125.00 |
| | | Alamo River settling basin | | | | | |
| | | Excavation | | 2,235 | CY | $10.00 | $22,350.00 |
| | | Embankment | | 8,315 | CY | $5.00 | $41,575.00 |
| | | Unreinforced concrete canal lining | | 190 | CY | $500.00 | $95,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 19.8 mi** | | | | | |
| | | Excavation | | 292,645 | CY | $7.00 | $2,048,515.00 |
| | | Compacted embankment | | 21,640 | CY | $6.00 | $129,840.00 |
| | | Unreinforced concrete canal lining | | 14,180 | CY | $500.00 | $7,090,000.00 |
| | | 17 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 3,400 | LF | $300.00 | $1,020,000.00 |
| | | Excavation | | 51,100 | CY | $8.00 | $408,800.00 |
| | | Backfill | | 48,950 | CY | $6.00 | $293,700.00 |
| | | Reinforced concrete | | 165 | CY | $1,000.00 | $165,000.00 |
| | | 23 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 2,305 | LF | $300.00 | $691,500.00 |
| | | 10 Bridges | | | | | |
| | | Reinforced concrete | | 315 | CY | $1,000.00 | $315,000.00 |

**QUANTITIES**

BY: Mark Leavitt, Steve Robertson

DATE PREPARED: April 20, 2006

**PRICES**

BY: Dan Mar

CHECKED:

DATE PREPARED:

PEER REVIEW:

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 6***
***No-Project Alternative***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 6 NP est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***NW Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 840 | CY | $90.00 | $75,600.00 |
| | | Sheet pile cutoff | | 7,300 | SF | $35.00 | $255,500.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | | 2,235 | CY | $10.00 | $22,350.00 |
| | | Embankment | | 8,315 | CY | $5.00 | $41,575.00 |
| | | Unreinforced concrete canal lining | | 190 | CY | $500.00 | $95,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 15.8 mi** | | | | | |
| | | Excavation | | 233,525 | CY | $7.00 | $1,634,675.00 |
| | | Compacted embankment | | 17,270 | CY | $6.00 | $103,620.00 |
| | | Unreinforced concrete canal lining | | 11,315 | CY | $500.00 | $5,657,500.00 |
| | | 12 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 2,400 | LF | $300.00 | $720,000.00 |
| | | Excavation | | 36,075 | CY | $8.00 | $288,600.00 |
| | | Backfill | | 34,550 | CY | $6.00 | $207,300.00 |
| | | Reinforced concrete | | 115 | CY | $1,000.00 | $115,000.00 |
| | | 4 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 405 | LF | $300.00 | $121,500.00 |
| | | 15 Bridges | | | | | |
| | | Reinforced concrete | | 470 | CY | $1,000.00 | $470,000.00 |

**QUANTITIES**

**BY** Mark Leavitt, Steve Robertson

**DATE PREPARED** April 20, 2006

**PRICES**

**BY** Dan Mar

**CHECKED**

**DATE PREPARED**

**PEER REVIEW**

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative No. 6***
***No-Project Alternative***
***Water Conveyance Components***

**PROJECT:** Salton Sea

**WOID:** L165C | **ESTIMATE LEVEL:** Appraisal

**REGION:** LC | **PRICE LEVEL:** Apr-06

**FILE:** C:\ALL\SEA\2007\[Conveyance_Worksheets1-10.xls]Alternative 6 NP est

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | ***NE Quadrant*** | | | | | |
| | | **River Diversion** | | | | | |
| | | Diversion structure | | | | | |
| | | 48" Rock riprap | | 840 | CY | $90.00 | $75,600.00 |
| | | Sheet pile cutoff | | 7,305 | SF | $35.00 | $255,675.00 |
| | | Whitewater River settling basin | | | | | |
| | | Excavation | | 2,235 | CY | $10.00 | $22,350.00 |
| | | Embankment | | 8,320 | CY | $5.00 | $41,600.00 |
| | | Unreinforced concrete canal lining | | 190 | CY | $500.00 | $95,000.00 |
| | | | | | | | |
| | | **River Water Distrib'n Channel, 69 cfs, 18.9 mi** | | | | | |
| | | Excavation | | 279,340 | CY | $7.00 | $1,955,380.00 |
| | | Compacted embankment | | 20,655 | CY | $6.00 | $123,930.00 |
| | | Unreinforced concrete canal lining | | 13,535 | CY | $500.00 | $6,767,500.00 |
| | | 9 Siphons, 50' head class | | | | | |
| | | 4.0' dia Precast reinf conc pipe | | 1,800 | LF | | |
| | | Excavation | | 27,055 | CY | $8.00 | $216,440.00 |
| | | Backfill | | 25,915 | CY | $6.00 | $155,490.00 |
| | | Reinforced concrete | | 85 | CY | $1,000.00 | $85,000.00 |
| | | 7 Cross drainage structures | | | | | |
| | | 48" dia Precast reinforced concrete pipe | | 705 | LF | $300.00 | $211,500.00 |
| | | 10 Bridges | | | | | |
| | | Reinforced concrete | | 315 | CY | $1,000.00 | $315,000.00 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | Subtotal | | | | | $50,996,745.00 |
| | | Alternative Specific Unlisted Items (+/-10%) | | | | | $5,099,675.00 |
| | | Total w/ Alt. Specific Unlisted Items | | | | | $56,096,420.00 |
| | | Mobilization (+/-5%) | | | | | $2,800,000.00 |
| | | Subtotal w/Mobilization | | | | | $58,896,420.00 |
| | | | | | | | |
| | | | | | | | |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY | | BY | CHECKED |
| Mark Leavitt | Steve Robertson | Dan Mar | |
| DATE PREPARED | | DATE PREPARED | PEER REVIEW |
| April 20, 2006 | | | |

# Attachment 7

## Air Quality Mitigation Project Feature Construction Costs

## Salton Sea Restoration

# Exposed Lake Playa Surface Areas and Associated Estimated Air Quality Mitigation Costs[1/]

**(Based on Mean Future Stochastic Model Results for year 2040)**

| Alternative Description | Exposed Lake Playa Surface Areas (acres) | Air Quality Mitigation Construction Costs by WEV (Millions $) | Air Quality Mitigation Construction Costs by Other Methods (Millions $) | Total Air Quality Mitigation Construction Costs (Millions $) |
|---|---|---|---|---|
| **Alternative 1A - Mid-Sea Dam/North Marine Lake (Salton Sea Authority Alternative)** | 103,800 | 727 | 145 | 872 |
| **Alternatives 1B, 1C & 1D - Mid-Sea Dam/North Marine Lake (Salton Sea Authority Alternative)** | 61,433 | | 6.6 | 6.6 |
| **Alternatives 2A & 2B Mid-Sea Barrier/South Marine Lake** | 73,600 | 515 | 103 | 618 |
| **Alternatives 3A, 3B & 3C Concentric Lakes (Imperial Group Alternative)** | 65,000 | 455 | 91 | 546 |
| **Alternative 4 - North-Sea Dam/ North Marine Lake** | 91,800 | 643 | 129 | 771 |
| **Alternative 5 Habitat Enhancement Without Marine Lake** | 81,200 | 568 | 114 | 682 |
| **Alternative 6 No-Project with Air Quality Mitigation** | 92,200 | 645 | 129 | 774 |
| **Progressive Habitat Development [2/]** | 92,200 | 645 | 129 | 774 |

1/ Water conveyance costs associated with AQM are not included.

All costs, except those for Alternatives 1B, 1C and 1D, do not include 5% adjustment for mobilization and are based on the DWR Plan which assumes 50% exposed playa AQM by WEV at $14,000/acre and 20% by other at $7,000/acre.

Costs for Alternatives 1B, 1C and 1D include 5% adjustment for mobilization as shown in the attached cost estimate worksheet.

2/ Estimated as being the same as No-Project Alternative and will be revised as PHDA is further developed.

BUREAU OF RECLAMATION

# ESTIMATE WORKSHEET



**FEATURE:**

***Alternative Nos. 1B, 1C, & 1D***
***Salton Sea Authority Alternative***
**Air Quality Mititgation Construction Costs**

**PROJECT:**

**Salton Sea Restoration**

**WOID:** | **ESTIMATE LEVEL:** Appraisal

**REGION:** | **PRICE LEVEL:**

**FILE:** C:\ALL\SEA\2007\[AQM - Estimate Worksheet - 1-10-07.xls]Alternative 1 Salt Ponds

| PLANT ACCOUNT | PAY ITEM | DESCRIPTION | CODE | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|---|
| | | **AQM - Salt Pond Embankments** | | | | | |
| | 1 | Construct salt pond embankments - use low ground | | 2,024,000 | CY | $3.25 | 6,578,000 |
| | | pressure bulldozer to strip adjacent surficial soil, | | | | | |
| | | move to embankment alignment, place, and compact | | | | | |
| | | by crawler-tracking 6-inch layers. Embankments | | | | | |
| | | have 5-foot crest width, 2:1 (H:V) side slopes, are | | | | | |
| | | 2.5 feet high and total length of 414 miles. | | | | | |
| | | Subtotal (includes 5% mobilization) | | | | | **6,578,000** |

| QUANTITIES | | PRICES | |
|---|---|---|---|
| BY: M. Spears | CHECKED: R. Wiltshire | BY: | CHECKED: |
| DATE PREPARED: January 10, 2007 | PEER REVIEW: | DATE PREPARED: | PEER REVIEW: |

# Attachment 8

## Annual Operations, Energy, Maintenance, and Replacement Costs for Restoration Alternatives

## Salton Sea Restoration
# Estimated Embankment and Conveyance O&M Costs

**Baseline Estimated Dam/Dike/Barrier/Canal Operations and Maintenance Costs:**

| | | | |
|---|---|---|---|
| 6 Employees = | $ | 600,000 | Assume 50k per year for 6 people with a 2.0 multiplier |
| 2 Vehicles = | $ | 7,200 | Assume lease at $300/month for 2 vehicles for 12 months |
| Boat = | $ | 3,600 | Assume lease at $300/month for 1 boat for 12 months |
| Office Space = | $ | 12,000 | Assume rent at $1000/month for 12 months |
| Marina = | $ | 900 | Assume rent at $75/month for 12 months |
| Materials/Contract Budget = | $ | 250,000 | Assume Materials and Supplies at $10000/month for 12 months |
| Total | $ | 873,700 | |
| Rounded ($million) | | **0.9** | |

**Total Estimated Alternative Dam/Dike/Barrier/Canal Operations and Maintenance Costs[1/]:**

| Alternative | Multiplier | Costs ($M) |
|---|---|---|
| Alternatives 1A,1B,1C&1D: Mid-Sea Dam/North Marine Lake (SSA Alternative) | 2*baseline | **1.75** |
| Alternative 2A: Mid-Sea Barrier with Stone Coulmns and with Habitat Enhancements | 1*baseline | **0.87** |
| Alternative 2B: Mid-Sea Barrier without Stone Columns and with Habitat Enhancements | 1*baseline | **0.87** |
| Alternative 3A: Concentric Lakes Dikes Without Stone Columns (Imperial Group Alternative) | 4*baseline | **3.49** |
| Alternative 3B: Concentric Lakes Dikes With Stone Columns (Imperial Group Alternative) | 4*baseline | **3.49** |
| Alternative 3C: Concentric Lakes Dikes with Geotubes (Imperial Group Alternative) | 6*baseline | **5.24** |
| Alternative 4: North-Sea Dam with Habitat Enhancements | 1*baseline | **0.87** |
| Alternative 5: Habitat Enhancement Without Marine Lake | 1*baseline | **0.87** |
| Alternative 6: No Project | | **0.00** |

1/ Total Estimated Alternative O&M Costs equal baseline times multiplier

## Salton Sea Restoration
# Annual Power Costs Calculations

| Alt. No. | Description | Flowrate (cfs) | TDH (ft) | Inst.[1] Power Rqmt. (kW) | Annual Power Rqmt. (kW-hrs) | Annual[2] Power Cost |
|---|---|---|---|---|---|---|
| 1 | South Lake Pumping Plant | 35 | 201 | 851 | 7,453,964 | $447,238 |
| 1 | Circulation Pump Plant | 967 | 34 | 3977 | 34,836,022 | $2,090,161 |
| 1 | Deep Water Pumping Plant | 608 | 33 | 2427 | 21,258,895 | $1,275,534 |
| | Alternative 1 Total | | | | 63,548,881 | **$3,812,933** |
| 2 | Sea Water Pumping Plant | 85 | 178 | 1830 | 16,031,055 | $961,863 |
| 2 | Sea Water Pumping Plant | 26 | 146 | 459 | 4,022,068 | $241,324 |
| | Alternative 2 Total | | | | 20,053,122 | **$1,203,187** |
| 4 | Sea Water Pumping Plant | 91 | 223 | 2455 | 21,501,533 | $1,290,092 |
| 4 | Sea Water Pumping Plant | 74 | 171 | 1531 | 13,407,599 | $804,456 |
| | Alternative 4 Total | | | | 34,909,131 | **$2,094,548** |
| 5 | Sea Water Pumping Plant | 91 | 201 | 2212 | 19,380,305 | $1,162,818 |
| 5 | Sea Water Pumping Plant | 74 | 179 | 1602 | 14,034,855 | $842,091 |
| 5 | Sea Water Pumping Plant | 22 | 177 | 471 | 4,125,904 | $247,554 |
| | Alternative 5 Total | | | | 37,541,064 | **$2,252,464** |

1 - Assumes 70% net pump/motor efficiency

2 - Assumes a power cost of **$0.0600** per kW-hour (see below)

| | | |
|---|---|---|
| Average peak and off-peak monthly prices from Sept., 2003 thru Aug., 2006 | | 0.04762 |
| (derived from Dow Jones data) | rounded up | 0.048 |
| Assumed allowance for transmission and other delivery costs at | 20% | 0.00960 |
| | rounded up | 0.010 |
| | TOTAL | 0.058 |
| | rounded up | **0.060** |

# Alternative No. 1A, 1B, 1C & 1D
# Salton Sea Authority
# Water Treatment Facilities Costs

Source: "Salton Sea Authority Plan For Multi-Purpose Project" Draft for TAC Review dated 6/9/06
Bob Hamilton spoke with Bill Brownlie of Tetra Tech, Inc. on 9/18/06 and the costs are the most current at that time; Mr. Brownlie stated that he believed these costs were expressed in $2006 and were developed by Mr. Ron Entwiler

| Construction Cost | | $Million |
|---|---|---|
| Treatment & Pumping Plant Costs in Report (page 72) | | 300 |
| adjustment for unlisted items (10%) and contingencies (25%) | | 1.375 |
| Construction Cost for Reclamation Spreadsheet | | 218.1818 |
| (includes 5% mobilization) | rounded | **218** |

| OM&R | $Million |
|---|---|
| Phosphorus Removal Plant in Report (page 73) | 31.1 |
| Filtration/Ozone Plant in Report (page 73) | 13.4 |
| Pumping Plant in Report (page 73) | 0.8 |
| total from Report | **45.3** |

## Salton Sea Restoration

# Exposed Lake Playa Surface Areas and Associated Estimated Air Quality Mitigation Costs

## Annual Operation, Maintenance & Replacement Costs

**(Based on Mean Future Stochastic Model Results for year 2040)**

| Alternative Description | Exposed Lake Playa Area (acres) | Annual[1/] OM & R Costs (Millions $) |
|---|---|---|
| **Alternative 1A - Mid-Sea Dam/North Marine Lake (Salton Sea Authority Alternative)** | 103,800 | 184.2 |
| **Alternatives 1B, 1C & 1D - Mid-Sea Dam/North Marine Lake (Salton Sea Authority Alternative)** | 61,433 | 2.1 |
| **Alternatives 2A & 2B Mid-Sea Barrier/South Marine Lake** | 73,600 | 130.6 |
| **Alternatives 3A, 3B & 3C Concentric Lakes (Imperial Group Alternative)** | 65,000 | 115.3 |
| **Alternative 4 - North-Sea Dam/ North Marine Lake** | 91,800 | 162.9 |
| **Alternative 5 Habitat Enhancement Without Marine Lake** | 81,200 | 144.1 |
| **Alternative 6 No-Project with Air Quality Mitigation** | 92,200 | 163.6 |
| **Progressive Habitat Development [2/]** | 92,200 | 163.6 |

1/ O&M costs for all alternatives, except 1B, 1C and 1D, are based on WEV (50%), gravel, SWB and paliatives (20%) low range O&M values in Summary tab of DCM cos ERS.xls (attached) and annual replacement assumed at 10 % of construction cost.

2/ O&M costs for Alternatives 1B, 1C and 1D are 2 times Reclamation's baseline embankment O&M cost estimate summarized below and annual replace cost is 1/20 of the construction cost.

**Baseline Estimated Dam/Dike/Barrier/Canal Operations and Maintenance Costs:**

| | | | |
|---|---|---|---|
| 6 Employees = | $ | 600,000 | Assume 50k per year for 6 people with a 2.0 multiplier |
| 2 Vehicles = | $ | 7,200 | Assume lease at $300/month for 2 vehicles for 12 months |
| Boat = | $ | 3,600 | Assume lease at $300/month for 1 boat for 12 months |
| Office Space = | $ | 12,000 | Assume rent at $1000/month for 12 months |
| Marina = | $ | 900 | Assume rent at $75/month for 12 months |
| Materials/Contract Budget = | $ | 250,000 | Assume Materials at $10000/month for 12 months |
| Total | $ | 873,700 | |
| Rounded ($million) | | **0.9** | |

## From Summary Tab of DCM cos ERS.xls file provided by California Department of Water Resources

Water demand and rough order-of-magnitude costs for playa dust control

| DCM | Construction costs | | | Construction costs | | | Ops and maintenance | | | | Water[a] | | | | | Replacement Cost in 10yrs[c] | | | | Replacement Cost in 20yrs[c] | | | | Replacement Cost in 30yrs[c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Owens | SS estimate | | Owens | SS estimate | | | | | | | | | | | | | | | | | | | | | | | |
| | Low | High | | Low | High | | Low | High | Low | High | Low | High | Low | High | Source | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High |
| | ($M/sq mi) | | | ($/acre) | | | ($/sq mi-year) | | ($/acre-year) | | (f/y) | | ($/a-y) | | | ($M/sq mi) | | ($/acre) | | ($M/sq mi) | | ($/acre) | | ($M/sq mi) | | ($/acre) | |
| Gravel | | $ 12.0 | $ 21.3 | | $ 18,822 | $ 33,342 | $ 602,311 | $ 1,066,951 | $ 941 | $ 1,667 | 0.0 | | $ - | | | 25 | $ 43 | $ 38,324 | $ 67,889 | 40 | $ 71 | $ 62,426 | $ 110,584 | 65 | $ 115 | $ 101,686 | $ 180,129 |
| SF pond | $ 7.0 | | | $ 10,938 | | | $ 180,000 | $ 250,000 | $ 281 | $ 391 | 4.2 | | $ 1,680 | | Any | | $ 14 | | $ 22,270 | | $ 23 | | $ 36,276 | | $ 38 | | $ 59,089 |
| SF simple | $ 10.0 | | | $ 15,625 | | | $ 220,000 | $ 300,000 | $ 344 | $ 469 | 3.6 | 4.2 | $ 1,440 | $ 1,680 | Any | | $ 20 | | $ 31,814 | | $ 33 | | $ 51,822 | | $ 54 | | $ 84,413 |
| SF uniform | $ 12.0 | | | $ 18,750 | | | $ 310,000 | $ 480,000 | $ 484 | $ 750 | 3.6 | 4.2 | $ 1,440 | $ 1,680 | Any | | $ 24 | | $ 38,177 | | $ 40 | | $ 62,187 | | $ 65 | | $ 101,296 |
| WEV | $ 15.0 | $ 9.0 | $ 14.5 | $ 23,438 | $ 14,063 | $ 22,585 | $ 800,000 | $ 1,000,000 | $ 1,250 | $ 1,563 | 1.0 | | $ 400 | | Inflow | 18 | $ 29 | $ 28,633 | $ 45,986 | 30 | $ 48 | $ 46,640 | $ 74,906 | 49 | $ 78 | $ 75,972 | $ 122,014 |
| SWB | | $ 0.9 | $ 1.1 | | $ 1,406 | $ 1,715 | $ 300,000 | $ 400,000 | $ 469 | $ 625 | 0.5 | 1.7 | $ 200 | $ 667 | Any | 2 | $ 2 | $ 2,863 | $ 3,491 | 3 | $ 4 | $ 4,664 | $ 5,687 | 5 | $ 6 | $ 7,597 | $ 9,263 |
| Paliatives | | $ 0.1 | $ 31.1 | | $ 233 | $ 48,564 | $ 149,349 | $ 31,080,960 | $ 233 | $ 48,564 | 0.003 | 0.045 | $ 1 | $ 18 | Inflow | | | | | | | | | | | | |
| Sandbreaks[a] | | $ 2.3 | $ 3.6 | | $ 3,516 | $ 5,646 | $ 200,000 | $ 250,000 | $ 313 | $ 391 | 0.25 | | $ 100 | | Inflow | | | | | | | | | | | | |

[a]Assumes WEV on 20% of the area, at 25% of the cost and water use

[c]Replacement cost Assumption - 5% yearly increase in initial construction cost plus 25% of escalated cost as cost for taking down older facilities

| 6.0 | 20.0 |
|---|---|

| DCM | Ops and maintenance | | | | Water[a] | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Low | High | Low | High | Low | High | Low | High | Source |
| | ($/sq mi-year) | | ($/acre-year) | | (f/y) | | ($/a-y) | | |
| Gravel[b] | $ 602,311 | $ 1,066,951 | $ 941 | $ 1,667 | 0.0 | | $ - | | |
| SF pond | $ 180,000 | $ 250,000 | $ 281 | $ 391 | 4.2 | | $ 1,680 | | Any |
| SF simple | $ 220,000 | $ 300,000 | $ 344 | $ 469 | 3.6 | 4.2 | $ 1,440 | $ 1,680 | Any |
| SF uniform | $ 310,000 | $ 480,000 | $ 484 | $ 750 | 3.6 | 4.2 | $ 1,440 | $ 1,680 | Any |
| WEV | $ 800,000 | $ 1,000,000 | $ 1,250 | $ 1,563 | 1.0 | | $ 400 | | Inflow |
| SWB | $ 300,000 | $ 400,000 | $ 469 | $ 625 | 0.5 | 1.7 | $ 200 | $ 667 | Any |
| Paliatives | $ 149,349 | $ 31,080,960 | $ 233 | $ 48,564 | 0.003 | 0.045 | $ 1 | $ 18 | Inflow |
| Sandbreaks[c] | $ 200,000 | $ 250,000 | $ 313 | $ 391 | 0.25 | | $ 100 | | Inflow |

[a]Assumed water cost: $ 400

[b]Assumes 1/20 of gravelled area needs to be recovered with additional gravel each year

[c]Assumes WEV on 20% of the area, at 25% of the cost and water use

# Attachment 9

## Total Costs of Restoration Alternatives: Implementation Costs, OME&R Costs, Annual Risk Costs, and Total OMER&R Costs