



Appendix H

Recycled and Desalination Treatment Plants-Cost Model

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Water Treatment Process Cost Models

Investigation of the Capital Projects Alternatives included development of the costs for water treatment for brackish water desalination and for wastewater treatment. These cost estimates were developed predominately from publications of the Bureau of Reclamation (for desalination) and the Environmental Protection Agency (for wastewater treatment).

Brackish water desalination cost model

The cost model for the treatment process portion of the desalination alternatives was developed primarily from the Bureau of Reclamation's *Desalting Handbook for Planners* dated July 2003. This document is available electronically at <http://www.usbr.gov/pmts/water/media/pdfs/report072.pdf>. For purposes of the IID investigation, the cost data for desalination of brackish water using reverse osmosis (RO) and nano-filtration was used. The handbook develops costs for various elements of a desalination plant as a function of the plant size. These elements include:

- The reverse osmosis process itself with different cost curves for groundwater as a source that does not require filtration prior to the RO process and for surface water as a source that does require filtration prior to the RO process.
- Site development.
- Post-treatment. Alternatives that deliver the product water to the IID distribution system did not include post treatment costs under the assumption that blending with the Colorado River Water in the distribution system eliminated the need and the benefit of post-treatment.
- Power transformers.
- Product water storage. One day's storage was typically included in the cost. Alternatives that deliver the product water to the IID distribution system presume that no storage will be required. Rather, the IID system will provide the necessary regulation.
- Land costs at \$12,500/acre per the IID Definite Plan.
- Indirect costs including freight and insurance, owner's direct expense, construction overhead, and interest during construction.
- Operation and Maintenance costs including labor, chemicals, energy, insurance, replacement parts, and replacement of the RO membranes. Of these costs, energy is the largest. Energy costs were calculated based on IID's Definite Plan cost of \$0.11/kWh.

In addition to these costs from the handbook, a cost for cooling the source water was included. The available groundwater is 180 degrees or hotter. While there is variation among the membrane materials, RO membranes are generally damaged by heats over approximately 100 degrees. The cost estimates include the cost of cooling towers. These costs were developed in discussion with a manufacturer of cooling towers.

The sizing of the process plants includes a calculation of the amount of source water that can be blended into the product water without treatment. This calculation assumes that the product water is to have a TDS level of 650, similar to the Colorado River.

Where appropriate, unit costs from the IID Definite Plan were used.

Wastewater treatment cost model

The wastewater treatment costs developed for the recycled water alternatives were based on the Environmental Protection Agency's, *The National Costs to Implement TMDLs (Draft Report): Support Document #2*. This document is available in hard copy from Diane Publishing Co.

The EPA study includes costs for various treatment levels including cost data for calculating the cost of converting an existing secondary treatment plant to advanced treatment.

The cost calculated using this model for construction of a new tertiary treatment plant were consistent with those developed by Webb Associates for the proposed Keystone Regional Water Reclamation Plant.

