

## Bulk Water Exports – Status Report May 11, 2010

*Summary information taken from the report “An Alternative Solution to Water Scarcity in Israel, Palestine, and Jordan?” – January 2010 (Israel/Palestinian Center for Research and Information)*

### **Turkey**

Negotiations and contracts to export bulk water from Turkey have been ongoing since 1986. Israel, Syria, Jordan, Palestine, and the Gulf States have all been interested in purchasing water.

- “Peace Pipeline Project” 1986 – proposal for a surface pipeline through Syria to Israel and Jordan. Cost \$21 billion. Capacity 2.2 billion cubic meters of water per year. At the time there was surplus water from several rivers to feed the pipeline. Political problems ended consideration of this proposal.
- “Medstream Project” – proposal for an undersea multipurpose pipeline through the Mediterranean Sea to Israel was raised due to political difficulty of the “Peace Pipeline Project.” The Medstream Pipeline would be a large conduit for five pipelines: water, natural gas, oil, electricity, and fiber optics. Cost estimate \$2.5-4 billion. Technical feasibility in question due to the depth of the sea between Turkey and Israel. As of 2008, feasibility studies for this project were ongoing.
- “Manavgat River Project” – proposal to transport bulk water using purpose built tankers or water bags. This idea originated in 1999 and \$147 million has been invested in infrastructure needed to export the water. 2004 agreement signed with Turkey for Israel to purchase 50 million cubic meters of water annually for twenty years (price up to \$1 billion = \$0.003 per US gallon). However, the high cost of transporting the water via tankers led to the cancellation of the agreement.
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There were two attempts to transport bulk water using water bags that float at sea level and are towed by tugs. In both cases the distance between the port of export and port of delivery was less than 63 miles (100 kilometers). One of these projects eventually failed after four-years of operation due to technical deficiencies under rough sea conditions. The distance between Turkey and Israel is between 300 and 400 miles.

A newer type of water transport bag, the “Spragg” bag, was developed after the failure of the Turkey to Cyprus export project. The technical feasibility of using the Spragg bag is still being studied.

Estimated cost of loading \$0.13 to \$0.18 per cubic meter (Turkish source estimate)  
(~\$.00038/gallon - ~\$.00068/gallon)

Estimated cost of transport \$0.70 to \$0.80 per cubic meter (Turkish source estimate)  
(~\$.0026/gallon - ~\$.003/gallon)

Final user price of about \$1.00 per cubic meter (264.17 US gallons)  
**(US \$0.03785 per gallon)**

Developers of the Spragg Bag estimate the delivered cost to be substantially lower at \$0.40 to \$0.50 per cubic meter depending on the distance, capital costs, and the number of bags transported at the same time. The developers of the Spragg Bag are negotiating for authorization to conduct a trial demonstration of their technology.

## Spragg Bag Technology

- The patented zipper connection system of the "Spragg Bag".
- Connect waterbags in long trains using the zipper.
- CH2M-Hill, a worldwide engineering firm, has produced five special studies for waterbag loading and off-loading facilities under contract with Spragg & Associates.
- The zipper, fabric, and tow system have all successfully withstood extensive stress and vibration tests of over 1,000 pounds per inch conducted by engineers at the Massachusetts Institute of Technology.
- The maximum strength of the fabric and zipper connection that has been developed for a bag train of fifty 4,500,000 gallon (approximately 17,000 M3) waterbags is over 10 times greater than the maximum bollard pull from a 4,300 HP tug capable of towing this fifty bag train.
- The zipper can be operated manually or driven remotely using a pneumatic, or radio controlled slider, both of which have been developed and demonstrated.
- Bags can vary in size, depending on the loading and off-loading requirements, but would average approximately 43 feet in diameter by 500 ft. in length. Each bag of this size will hold approximately 4,500,000 gallons (17,000 M3) of water.
- A string of as many as 50 bags in single file, several miles in length, or podded together like logbooms, can be towed by a single vessel.
- A water delivery system will consist of the following major parts:
  - (1) shoreside facilities to handle water from the source (i.e., pump stations, water storage structures, etc.) and ocean pipelines to the offshore water-loading platforms;
  - (2) water-loading platforms to fill the bags;
  - (3) bag assembly facility to prepare and deliver empty bags to the water-loading facility;
  - (4) transport system to tow full bags to a marshaling facility;
  - (5) marshaling facility to assemble bags into towing strings for transport to delivery sites;
  - (6) off-loading facility to remove water from the bags;
  - (7) empty bag handling and transport system to rig empty bags for the return trip to the loading facility;
  - (8) mooring and bag handling facilities in the vicinity of the off-loading facility, and
  - (9) ancillary facilities, such as water filtration plants, booster-pump stations, pipelines to municipal reservoirs or wells, and ocean pipelines from the off-loading facilities.
- According to Laborde Marine, a 4,300 horsepower tug with a bollard pull of 110,000 pounds can pull a string of fifty bags, weighing 1,300,000 tons, at a speed of 3 knots. Such an arrangement could deliver over 700 acre feet (228 million gallons/850,000M3) of fresh water per trip. In many cases waterbag trains comprised of only five or less waterbags are economically viable.