

**SUBMIT OPTION SUBMITTAL FORM BY:**

1. EMAIL TO: [COLORADORIVERBASINSTUDY@USBR.GOV](mailto:COLORADORIVERBASINSTUDY@USBR.GOV)

2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470

3. FACSIMILE TO: 702-293-8418

---

## Option Submittal Form

**Contact Information (optional):**

**Keep my contact information private.**

Contact Name: _____	Title: _____
Affiliation: _____	
Address: _____	
Telephone: _____	E-mail Address: _____

Date Option Submitted: \_\_\_\_\_

**Option Name:**

Water Imports Using Ocean Routes - Water Bags
---

**Description of Option:**

This option involves filling large nylon water bags with water from available sources in Alaska or from northern California, towing the water bags to southern California and discharging the water into the distribution system. System features would include land-based or offshore loading and unloading facilities, a terminal storage reservoir, and pipelines to transport water to and from these facilities to regional treatment and distribution networks.
---

**Location:** Describe location(s) where option could be implemented and other areas that the option would affect, if applicable. Attach a map, if applicable.

Rivers in southern Alaska and/or northern California
--

**Quantity and Timing:** Roughly quantify the range of the potential amount of water that the option could provide over the next 50 years and in what timeframe that amount could be available. If option could be implemented in phases, include quantity estimates associated with each phase. If known, specify any important seasonal (e.g., more water could be available in winter) and/or frequency (e.g., more water could likely be available during above-average hydrologic years) considerations. If known, describe any key assumptions made in order to quantify the potential amount.

It is estimated that up to 1 million AF of water may be available for water export. The specific amount available will depend on the rivers used and the water rights agreements. Water bags are expected to have capacities of about 13 MG (40AF) up to 25 MG (75AF) per bag.
--

**SUBMIT OPTION SUBMITTAL FORM BY:**

1. EMAIL TO: [COLORADORIVERBASINSTUDY@USBR.GOV](mailto:COLORADORIVERBASINSTUDY@USBR.GOV)

2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470

3. FACSIMILE TO: 702-293-8418

---

## Additional Information

**Technical Feasibility:** Describe the maturity and feasibility of the concept/technology being proposed, and what research and/or technological development might first be needed.

Water bags are currently used in the Mediterranean and Aegean Seas to transport water. Companies using this technology are working to build bigger bags, potentially up to 25 MG (75AF) and to design ways to tow more bags at one time. The bags, made of a polyester fabric coated with plastic, are 2.0 millimeters thick and have been compared to the fabric used in car seatbelts.

Use of water bags has had some technical problems. Bags have broken away from the tug boat during transport. Most are now equipped with a radar beacon to help other ships avoid collision. The routes currently used are relatively short. To be transported along the west coast of the US, bags would have to withstand the strain of an ocean voyage. Bags have ripped open during transport on several occasions, especially at unloading terminals.

**Costs:** Provide cost and funding information, if available, including capital, operations, maintenance, repair, replacement, and any other costs and sources of funds (e.g., public, private, or both public and private). Identify what is and is not included in the provided cost numbers and provide references used for cost justification. Methodologies for calculating unit costs (e.g., \$/acre-foot or \$/million gallons) vary widely; therefore, do not provide unit costs without also providing the assumed capital and annual costs for the option, and the methodology used to calculate unit costs.

Cost reported in 2007 is \$1,300-\$2,700 per AF. Cost adjusted to 2012 costs are \$1,500-3,100 per AF.

**Permitting:** List the permits and/or approvals required and status of any permits and/or approvals received.

The most significant permit required would be the water rights permit. The State of Alaska passed legislation in 1992 to facilitate water exports. If water were to be transported from northern California to southern California it would require approval from the State Water Resources Control Board and other agencies. Recent application to withdraw water from the Gualala and Albion Rivers in northern California met with considerable opposition. The California Coastal Commission required that additional environmental studies be conducted, and the applications were withdrawn.

**Legal / Public Policy Considerations:** Describe legal/public policy considerations associated with the option. Describe any agreements necessary for implementation and any potential water rights issues, if known.

The specific amount available will depend on the rivers used and the long term water rights agreements that are made. Water transport from northern California rivers would have significant opposition.

**Implementation Risk / Uncertainty:** Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Water transport from northern California rivers would have significant opposition. Previous record of bags tearing.

**Reliability:** Describe the anticipated reliability of the option and any known risks to supply or demand, such as: drought risk, water contamination risk, risk of infrastructure failure, etc.

**SUBMIT OPTION SUBMITTAL FORM BY:**

1. EMAIL TO: [COLORADORIVERBASINSTUDY@USBR.GOV](mailto:COLORADORIVERBASINSTUDY@USBR.GOV)
2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470
3. FACSIMILE TO: 702-293-8418

Water bags have been used for about 10 years to augment the water supply of water scarce areas. In 1997, Aquarius Water Transportation began dilivering water in 500,000 gallon bags (1.5 AF) from mainland Greece to nearby resort islands. In 2000, nordic Water Supply began using 5 million gallon bags (15 AF) to transport water from Turkey to Cyprus. The bags are sausage-shaped and about 200 meters long. In 2002, Nordic Water supply transported about 1.6 billion gallons of water using their water bags. They plan to build larger bags up to 350 meters long that would carry 25 million gallons of water. Another developer has developed a system to link water bags together so several could be towed at the same time.

**Water Quality:** Identify key water quality implications (salinity and other constituents) associated with the option in all of the locations the option may affect.

Specific source rivers in Alaska have not been identified for transport via tanker. Most rivers in southern Alaska have generally good water quality although some have been degraded due to minimng activities, and some have heavy sediment loads.

**Energy Needs:** Describe, and quantify if known, the energy needs associated with the option. Include any energy required to obtain, treat, and deliver the water to the defined location at the defined quality.

Energy Required	Source(s) of Energy
A concern is the energy consumption required to transport the water. Fuel costs are a major expense for the water bag option.	

**Hydroelectric Energy Generation:** Describe, and quantify if known, any anticipated increases or decreases in hydroelectric energy generation as a result of the option.

Location of Generation	Impact to Generation
	No Effect

**Recreation:** Describe any anticipated positive or negative effects on recreation.

Location(s)	Anticipate Benefits or Impacts
	No Effect

**Environment:** Describe any anticipated positive or negative effects on ecosystems within or outside of the Colorado River Basin.

Location(s)	Anticipated Benefits or Impacts
	Primary concern is emissions from tug boats during transport.
	A primary concern is the effect that water withdrawal would have on the biological resources of the area, particularly on anadromous fish population. There would also be the potential to have short-term adverse impacts associated with construction activities. The potential for transport of exotic or invasive species should be evaluated, although this concern is minimized if the imported water is only discharged to dedicated new storage facilities.

**SUBMIT OPTION SUBMITTAL FORM BY:**

1. EMAIL TO: [COLORADORIVERBASINSTUDY@USBR.GOV](mailto:COLORADORIVERBASINSTUDY@USBR.GOV)

2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470

3. FACSIMILE TO: 702-293-8418

---

**Socioeconomics:** Describe anticipated positive or negative socioeconomic (social and economic factors) effects.

No Effect

**Other Information:** Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.