

**Client Contact:**

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Sanitation District  
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**Services Provided:**

- **Repair  
Recommendations**

**Project Summary:**

Cesare, Inc. (Cesare) recommended a repair for the leakage flows at The Pinery Dam which were coming out of the existing outlet conduit and were continuous and measured over 60 gallons per minute (gpm) with small amounts of embankment material. An attempt was made using an inflated flexible tube type lining set in place with epoxy resin from the downstream end. The Pinery Dam (a.k.a. Bingham Lake Dam), located near Parker, Colorado, is a zoned embankment dam over 50 feet high, constructed in the early 1970's. The Class 2 dam has a 350 foot long, 18-inch diameter reinforced concrete pipe (RCP) outlet conduit with a reinforced concrete cradle. A remote controlled video camera was used to locate the source found to be a 3-inch vertical offset at a pipe joint about 260 feet from the downstream end of the outlet conduit. Draining the reservoir was to be avoided, so a repair solution had to be performed either underwater on the upstream side or entirely from the downstream end. The leakage flow in the pipe and associated pressures, caused the flexible tube lining to be forced back out of the outlet conduit. Cesare recommended repair using a high density polyethylene pipe (HDPE) slip lining with annular grouting, after evaluating several alternatives. Although the HDPE slip lining was the least expensive alternative, the leakage flows and the distance to the vertical offset joint presented a risk with this approach. The slip lining solution required an inflatable Packer, remote controlled video camera, and 12 1-inch diameter grout lines up to 300 feet long. Twelve grout cells filled with non-shrink grout were constructed in the annular space between the HDPE and the RCP along the slip lining length. After the successful installation, the measured leakage flow was reduced to about 4.8 gpm.

