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Environmental Protection
Agency
Region 8

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EPA

Fact Sheet

YAK TUNNEL CLEANUP
CALIFORNIA GULCH SUPERFUND SITE

EXPLANATION OF SIGNIFICANT DIFFERENCES

APRIL, 1989

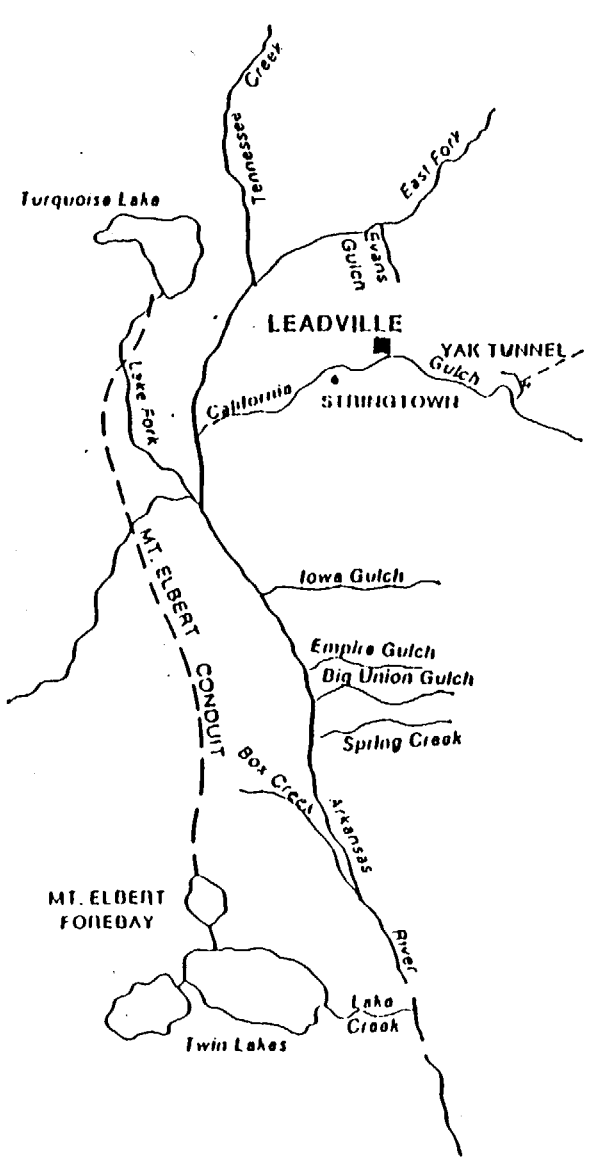
INTRODUCTION

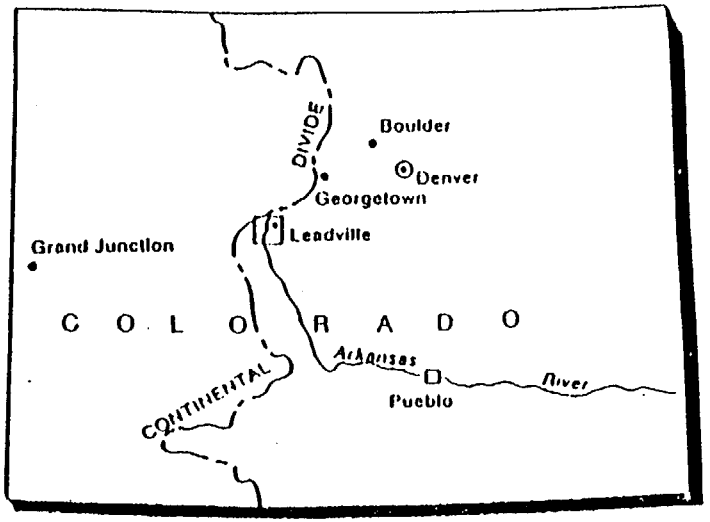
The U.S. Environmental Protection Agency (EPA), in consultation with the State of Colorado, has issued an administrative order requiring ASARCO Incorporated, Newmont Mining Corporation, Resurrection Mining Company, and the Res-ASARCO Joint Venture to implement a remedy for the Yak Tunnel Operable Unit of the California Gulch Superfund site in Leadville, Colorado. The remedy to be implemented differs to a limited extent from the remedy selected by EPA in its March 1988 Record of Decision (ROD) for the Yak Tunnel cleanup. When the remedial action to be conducted at a Superfund site is different from the cleanup plan outlined in the ROD, EPA is required by law to explain the significant differences and the reasons that changes were made.*

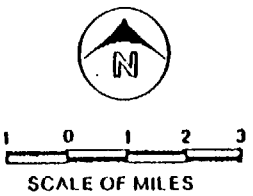
The purpose of this fact sheet is to explain the significant differences between the ROD and the remedy that will be implemented. This document provides a brief background on the site, describes the remedial action to be undertaken, explains the ways in which this cleanup plan differs from the remedy selected by EPA in 1988, and describes why changes were made.

This fact sheet presents only a synopsis of the information on the Yak Tunnel Operable Unit. Full information about the Yak Tunnel Operable Unit, including the administrative record, the 1988 ROD, the 1989 Record of Decision Modification, and the administrative order, is available for review at the Lake County Library in Leadville and at the EPA Region VIII library in Denver.

*Section 117(c) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986.







LOCATION MAP

PUBLIC PARTICIPATION

Announcement of the remedy modification and the reasons for the changes will be made in the Leadville newspaper. Copies of this fact sheet will also be sent to the California Gulch mailing list. EPA will be available to meet with interested people to discuss this Fact Sheet, answer questions, and listen to any concerns at a meeting to be held in Leadville. If there is sufficient interest, EPA may also schedule one or more additional meetings. Meetings will be announced in the Leadville newspaper.

SITE HISTORY AND BACKGROUND

The California Gulch site is located in Lake County, Colorado. The 11.5 square mile site study area includes the California Gulch watershed and the area drained by the Yak Tunnel. The site is within the historic Leadville Mining District where significant quantities of gold, silver, lead, zinc, manganese and copper have been mined since the 1860's. Hundreds of mines, many mills, more than 40 smelters and several placer operations have been active in the area. Numerous slag piles, tailings ponds and abandoned mine, mill and smelter sites are found along the length of California Gulch and in other areas of the site.

SUMMARY OF CONTAMINATION PROBLEMS

EPA studies indicate that the California Gulch site is contaminated with metals including cadmium, copper, lead and zinc coming from both active and abandoned mining and minerals processing facilities.

The Yak Tunnel is the major contributor to site contamination. The tunnel, which was designed to provide drainage to mines in the Leadville Mining District, extends underground approximately 3 1/2 to 4 miles. It collects ground water from the mines and then discharges flow into California Gulch. In an average year, the tunnel discharges a combined total of 210 tons of cadmium, copper, lead, zinc and other metals into California Gulch. California Gulch, in turn, flows into the Arkansas River. The tunnel contributes 75 to 80 percent of the metal contaminants released into the Arkansas River by California Gulch. Metals from the Yak Tunnel may move through surface water, ground water, and air at the site.

Cadmium, copper, lead and zinc are key metals of concern in the Yak Tunnel discharge. Aquatic organisms can absorb metals. Plants can take up metals from water and soils through their root systems. Domestic animals and wildlife can drink contaminated water or eat plants (or other animals) that have taken up metals. Humans can be exposed through inhalation or ingestion of contaminated water, sediments or food.

The metals of concern can be harmful to animals, aquatic life and humans. Chronic exposure to cadmium may result in hypertension and kidney and liver damage. Even in low concentrations, it is toxic to freshwater fish.

Copper is not acutely toxic to humans, but is one of the most harmful metals to fish and other aquatic life.

Long-term human exposures to lead can cause anemia, intestinal cramps, fatigue and neurological damage. Even at very low levels, lead exposure can cause harmful effects to the nervous systems of children. Lead also is toxic to aquatic life.

Zinc is rarely damaging to human health; however, when humans are exposed to zinc in combination with other metals, the results may be harmful. Some fish, such as rainbow and brook trout, are also adversely affected by exposure to zinc.

Studies of the Arkansas River below the confluence with California Gulch show that metals contamination has reduced the capacity of the river to support well balanced aquatic populations. Both the quantity and variety of fish are reduced in this portion of the river due to contamination from California Gulch.

SUMMARY OF THE 1988 RECORD OF DECISION

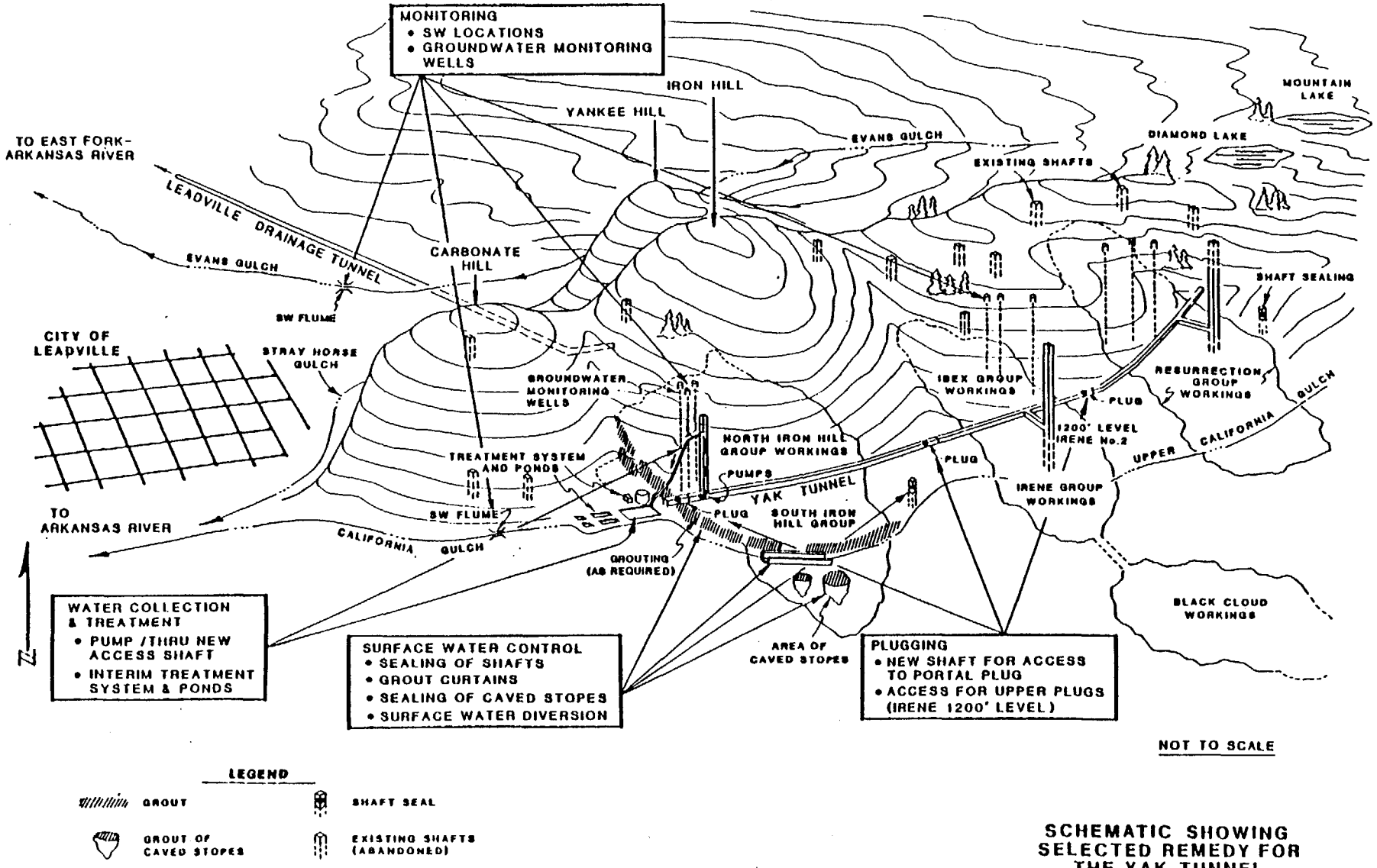
In March of 1988, EPA signed a Record of Decision (ROD) outlining a cleanup plan for the Yak Tunnel portion of the California Gulch site. The remedy, designed to minimize the flow of water out of the Yak Tunnel and to prevent the uncontrolled release of tunnel drainage to the environment, consisted of several elements:

- Construction of surge ponds to capture drainage from the tunnel and to minimize the impact of surges from the tunnel on California Gulch and the Arkansas River.

- Installation of an interim water treatment system to treat water from the Yak Tunnel before discharge into California Gulch.

- Construction of plugs at three locations within the tunnel to stop uncontrolled discharge of tunnel drainage into California Gulch and to prevent surges.

- Sealing of shafts, drill holes and fractured rock and diversion of surface water from tunnel recharge areas to reduce the amount of water entering the Yak Tunnel system.



NOT TO SCALE

SCHEMATIC SHOWING SELECTED REMEDY FOR THE YAK TUNNEL

CALIFORNIA GULCH
LEADVILLE, COLORADO

- Grouting of fractured rock, caved-in areas, and drill holes to prevent seepage of contaminated water to the land surface.

- Establishment of a surface and ground-water monitoring system to detect any leakage, seeps or migration of contaminated ground water which may result from installation of the tunnel plugs.

- Installation of a pumping system to control water levels behind the portal plug, if necessary, to prevent uncontrolled seepage. The pumped water would be routed to the interim treatment system to remove contaminants before discharge into California Gulch.

- Development and implementation as necessary of a contingency plan to address any adverse effects on surface and ground water resulting from tunnel plugging.

- Operation and maintenance of the remedy.

SUMMARY OF RECORD OF DECISION MODIFICATION

The elements of the modified remedy are listed below. With the exception of two changes discussed in the Explanation of Significant Differences section of this fact sheet, the remedy remains fundamentally the same.

- Construction of a surge pond to capture drainage from the Yak Tunnel and to minimize the impact of surges from the tunnel on California Gulch and the Arkansas River.

- Installation of a permanent water treatment system to treat water from the Yak Tunnel before discharge into California Gulch.

- Construction of plugs at three locations within the tunnel to to stop the uncontrolled discharge of mine drainage into California Gulch and to prevent surges.

- Sealing of shafts, drill holes and fractured rock and diversion of surface water from tunnel recharge areas to reduce the amount of water entering the Yak Tunnel system, as necessary, for proper performance of the remedy.

- Establishment of a surface and ground-water monitoring system to detect any leakage, seeps or migration of contaminated ground water which may result from the installation of the tunnel plugs.

- Installation of a pumping or drainage system to control water levels behind the portal plug. The pumped or drained water would be routed to the treatment system to remove contaminants before discharge into California Gulch.

- Development and implementation, as necessary of a contingency plan to address any adverse effects on surface and ground water resulting from tunnel plugging.

- Operation and maintenance of the remedy.

EXPLANATION OF SIGNIFICANT DIFFERENCES

EPA has reevaluated the remedy outlined in the ROD and has modified the ROD to include two significant changes that strengthen the remedy:

MODIFIED PORTAL PLUG

The ROD proposed three solid plugs in the tunnel. In the modified remedy, the lowermost plug in the Yak Tunnel will be designed to allow water to be drained through or pumped from behind the plug. That is, all water flowing in the lower portion of the Yak Tunnel (between the middle plug and the portal plug) will drain out or be pumped from behind the plug and will be piped to the water treatment plant. The lowermost plug will also provide surge protection for California Gulch and the Arkansas River, but will be designed to avoid backup and flooding of this portion of the tunnel.

The design of the plug outlet pipe or collection system will be completed during remedial design activities. It is critical to design a structure that will minimize blockages and allow safe maintenance.

As discussed in the ROD, the rock in the area of the portal plug is extensively fractured and faulted, and near-surface mine workings are present. The potential for uncontrolled seepage, subsidence, and other problems from flooding associated with the portal plug is much greater than that associated with the other two plugs. For this reason, EPA proposed in the 1988 ROD that extensive sealing of potential seepage points be undertaken. EPA also proposed that, if necessary, water levels behind the portal plug be lowered by pumping to a point at which seepage would not occur. Water would then be piped to the interim treatment facility for treatment prior to release.

The ROD modification will minimize the potential for uncontrolled seepage at the outset. By pumping or draining water from behind the portal plug, flooding in the highly fractured and faulted area will be minimized. The "contingency" of the original remedy

proposed in the ROD would be implemented up front to avoid the need to maintain safe water levels. Water then will be transported to the treatment plant described below. Sealing and grouting of any seepage points will be undertaken, as necessary, as part of the contingency plan. Less sealing will be needed than contemplated by the 1988 ROD.

This modification in the ROD results in a remedy similar to that evaluated as Alternative 7 in the Yak Tunnel Operable Unit Feasibility Study dated June, 1987. Alternative 7 provided for construction of two plugs, rehabilitation of the tunnel below the second plug, and construction of a treatment facility. The modified remedy is a variation on Alternative 7 in that the portal plug would be constructed primarily for surge control. In addition, as stated in the ROD, the decision on pumping versus rehabilitating the first 1500 feet of the tunnel will be made during the remedial design phase of the project. Technical feasibility, cost, safety, and maintenance requirements will be evaluated in making this decision.

The timing of remedy implementation and the cleanup standards for the Yak Tunnel will not be affected by the installation of this type of plug. Construction and maintenance of this plug does not fundamentally alter the cost of the remedy.

PERMANENT TREATMENT

The remedy has been modified to provide for construction of a permanent treatment facility rather than the interim treatment plant described in the 1988 ROD. A lime precipitation plant incorporating a High Density Sludge (HDS) component will be installed.

The plant will be constructed to treat the entire Yak Tunnel discharge during design and construction of the three plugs. After plug construction, the plant will treat all water draining through or pumped from behind the portal plug. Since the quantity and quality of this discharge will change after the two uppermost plugs are installed, the HDS plant may require modification.

As described in the Yak Tunnel Operable Unit Feasibility Study, the HDS process offers several potential benefits over the interim treatment system detailed in the ROD. The treatment facility will remove metals more effectively, so the quality of water discharged from the plant into California Gulch will be better than that which could have been achieved by the interim treatment facility. In addition, the HDS process greatly reduces the volume of sludge produced by the facility and may create a less toxic sludge, which would increase the disposal options and decrease disposal costs. Another potential benefit is resource

recovery. Zinc, and possibly other metals, can be recovered from the sludge and may be sold, given favorable economic conditions.

The environmental benefits of this modification outweigh the disadvantages of the remedy. The modified remedy requires ongoing treatment and sludge disposal, but this was also the case with the 1988 ROD. Given the geology of the area affected by the portal plug, it is likely that continued operation of the interim treatment facility would have been required to prevent seepage. The modified remedy addresses the seepage problem up front. Moreover, as discussed above, the modified remedy minimizes the generation of sludge and disposal problems.

The 1988 ROD indicated that a permanent treatment facility would be built at a later date during cleanup activities in connection with a later operable unit. With the ROD modification, a permanent treatment facility will be built earlier as part of the Yak Tunnel remedy. An additional treatment facility or facilities, or modification of the Yak Tunnel treatment facility, may be required at a later date to treat water associated with other parts of the site. The permanent facility will be sized, designed, and located to permit integration, to the greatest extent practicable, with cleanup plans developed as part of subsequent operable units.

The cost, timing and cleanup standards contained in the 1988 ROD are changed by this remedy modification. While the cost of the HDS treatment plant will be about $3 million higher than the treatment plant proposed in the 1988 ROD, these increased costs may be offset by the resource recovery potential. Initial data indicate that the sale of the sludge from the treatment plant will help to offset operating costs.

Design and construction of the HDS plant may take up to a year longer than the interim treatment plant described in the 1988 ROD. An adequate design period and pilot testing are needed to assure that the treatment plant will achieve the required cleanup standards.

The HDS treatment plant is expected to meet all regulatory requirements specified in the ROD. Because the HDS treatment plant is permanent, it will have to meet all regulatory requirements for surface water discharges. Consequently, EPA reviewed and modified Appendix C, "Evaluation of Applicable or Relevant and Appropriate Requirements," of the 1988 ROD to reflect construction of a permanent rather than an interim treatment facility. The primary modification is that the treatment plant will have to meet water quality-based, in addition to technology-based, effluent standards. The discharge will have to meet the State of Colorado's standard prohibiting discharges "in amounts, concentrations, or combinations which are

harmful to the beneficial uses (of the stream) or are toxic to humans, animals, plants or aquatic life."

STATUTORY FINDINGS

EPA has determined that the remedy, as modified, remains protective of human health and the environment and is cost-effective. In addition, the modified remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable.

The remedy will attain all applicable or relevant and appropriate Federal and State requirements, except for requirements pertaining to instream water quality. EPA waived the attainment of cleanup requirements for instream water quality as the Yak Tunnel is only one of many sources of contamination of California Gulch and the Arkansas River. The Yak Tunnel cleanup is the first step in a total remedial action for the California Gulch site that will attain cleanup requirements when completed.

QUESTIONS AND ANSWERS

What will happen to water in the tunnel behind the two uppermost plugs?

Water levels behind the two uppermost plugs will behave in the same manner as described in the 1988 ROD. Plugging will cause ground-water levels to rise behind the two uppermost plugs. The amount of increase in water levels depends on other mining operations in the area. If the Black Cloud Mine is operating and pumping water, the pumping at that mine will lower the water table thus causing much of the ground water to flow in the direction of the Black Cloud.

When the Black Cloud ceases pumping, water levels in the area of the Resurrection and Irene mine groups will rise. No increased surface seepage to California Gulch is anticipated. An additional flow of about 15 gallons per minute from the Resurrection Group toward the Evans Gulch area could occur. However, due to its small quantity this seepage is not expected to cause any deterioration in ground-water quality in the Evans Gulch area. The monitoring network will track any changes in ground-water quality and levels. Should monitoring indicate a worsening of ground-water quality, the water control measures described in the contingency plan will be implemented as needed to protect human health and the environment.

Have EPA and the Bureau of Reclamation considered employing a single water treatment plant to treat drainage from the Yak and Leadville Drainage Tunnels?

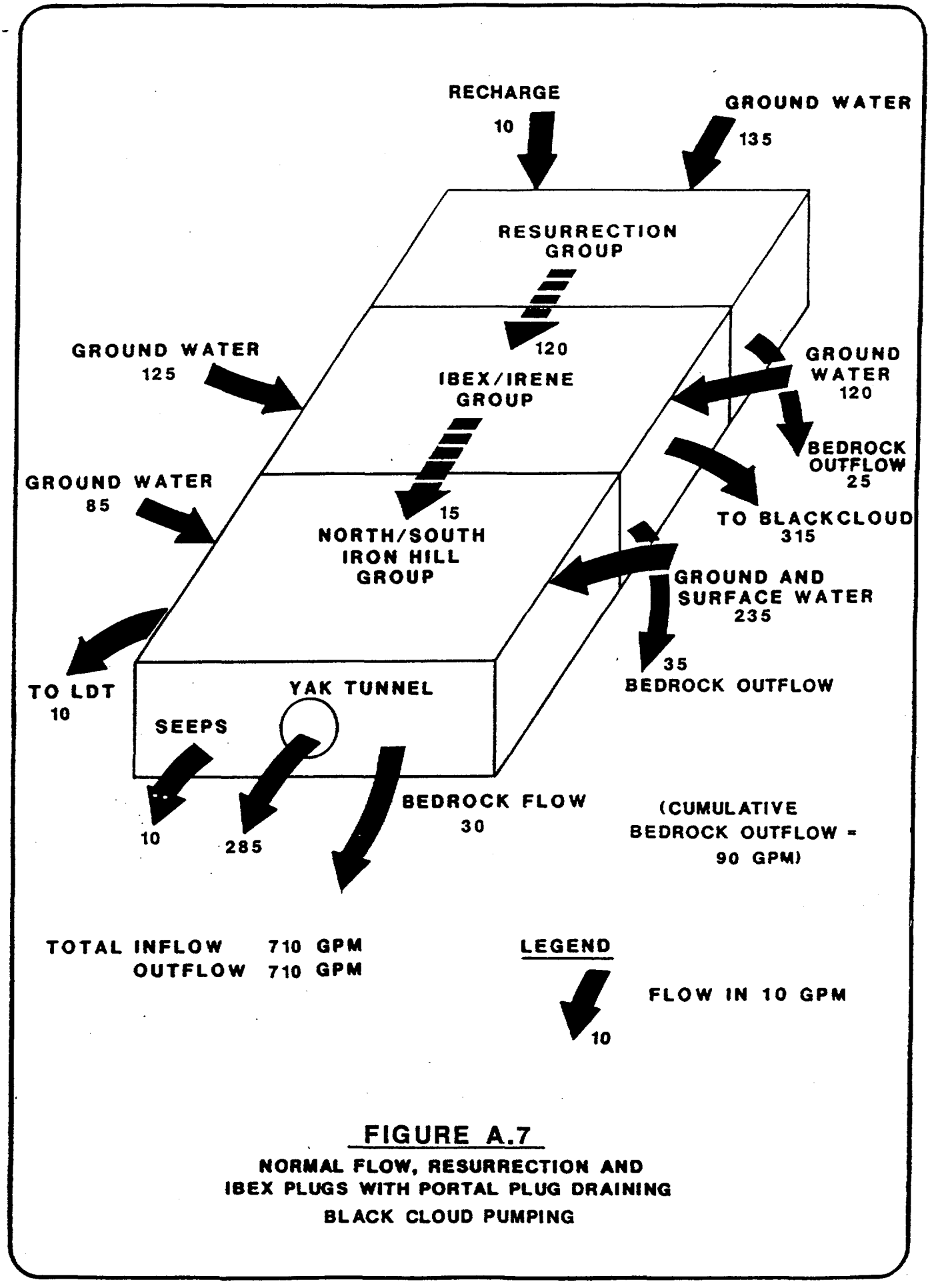


FIGURE A.7

NORMAL FLOW, RESURRECTION AND IBEX PLUGS WITH PORTAL PLUG DRAINING BLACK CLOUD PUMPING

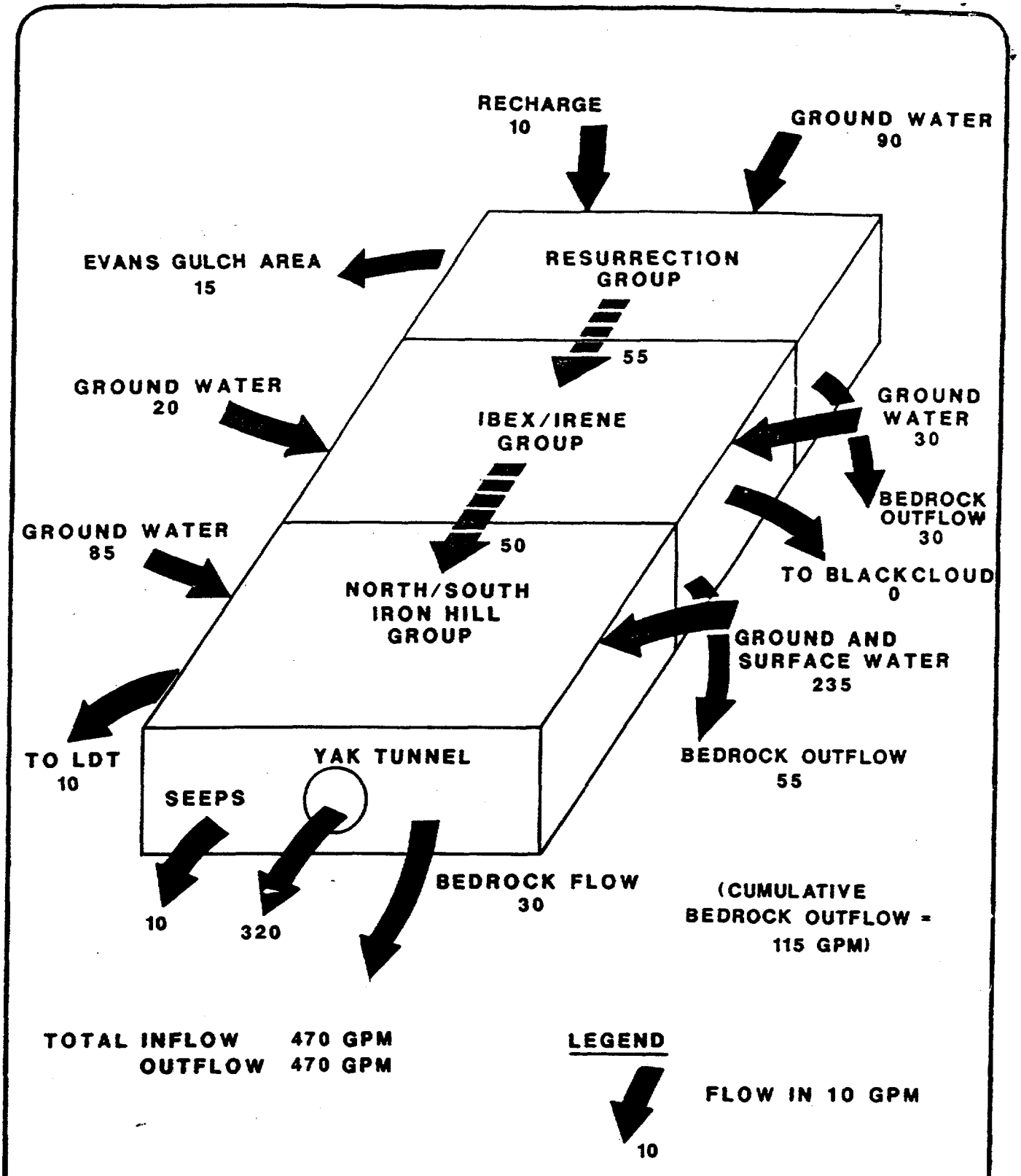


FIGURE A.8

NORMAL FLOW, RESURRECTION AND
IBEX PLUGS WITH PORTAL PLUG DRAINING
BLACK CLOUD NOT PUMPING

EPA, ASARCO, and the Bureau of Reclamation have discussed the possibility of constructing a joint water treatment plant to treat the drainage from both the Yak and Leadville Drainage Tunnels. It is technically possible to design and build a water treatment facility that will successfully treat the wastes from both tunnels. However, preliminary studies show that the additional costs resulting from constructing the miles of pipeline necessary to bring these two waste streams together at a central treatment point will be high. These added costs are far greater than any savings that might be realized by replacing the currently planned two treatment plants with a single larger plant.

What effect does the modified remedy have on current and future mining in the California Gulch area?

The modifications to the ROD do not have additional impacts on future mining activities. Plugging of the Yak Tunnel need not halt recovery of mineral resources. Present and future mining companies must operate in compliance with modern health, safety and environmental laws and regulations. Operators currently are responsible for the quality of their industrial or mine waste discharges into the environment. They also are responsible for safe working conditions at their facilities. Operators may find it necessary to dewater certain mine workings and treat the drainage before releasing it. Proper ventilation will need to be provided to mine workings.

Who will be responsible for long-term operation and maintenance of the remedy?

Under the Administrative Order, ASARCO Incorporated, Newmont Mining Corporation, Resurrection Mining Company, and the Res-ASARCO Joint Venture are responsible for long-term operation and maintenance of all aspects of the remedy.

When will work begin on the remedy?

The surge pond was constructed in the fall of 1988. Under the present schedule, installation of the surface and ground-water monitoring network is planned to begin in 1989. The construction of the treatment plant is planned for the 1990 construction season. Design and construction of the plugs will follow construction and operation of the treatment plant. No construction will take place until EPA has reviewed and approved all required plans and designs.

AVAILABILITY OF INFORMATION

A copy of the administrative record will be available at the following locations:

Lake County Library
1115 Harrison Avenue
Leadville, CO 80461
Phone: (719) 486-0569

EPA Library
One Denver Place, Suite 215
999 18th Street
Denver, CO 80202-2405
Phone: (303) 293-1444

Questions regarding this Explanation of Significant Differences should be directed to:

Elisabeth Evans
EPA Remedial Project Manager
Phone: (303) 293-1649

Sonya Pennock
Community Involvement Coordinator
Phone: (303) 294-7505

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