

Summitville Mine

Narrator: Like a storm drain cut deep into the mountain water runs through this abandoned mine shaft as it has for years. And although the water is highly contaminated, the investigation underway is not focused on the contaminant specifically, but rather on the presence and nature of any fractures in the adjacent rock where the water could migrate.

The problem is that the oxygen-rich environment in the shaft enables the water moving through it to readily leach metals such as copper and zinc from ore veins in the surrounding walls. If allowed to leave the mountain untreated, the water would be toxic to life downstream. By plugging the shaft, engineers believe they can limit the flow of contamination exiting the mine and at the same time diminish the process that causes it.

Greg Powell, Environmental Scientist / ERT: Where the water that's moving through the old tunnels that's being re-charged from melt, snow melt on the mountain and also from precipitation events, it moves through these old mine tunnels. And this water's oxygen-rich and the chemical reaction with the sulfide bearing minerals in those old tunnels, it picks up metals and discharges out of the mine shaft. By plugging the adit. It'll basically back up water behind the plug, which you won't have that oxygen-rich water in contact with the sulfide-rich veins. There will still be some metals picked up in that water and still be some movement of the contaminated water through the fractures, however the loading will be significantly reduced.

Narrator: With the adit plugged pressure will force the water to follow a different course through the rock. Mapping the fractures or cracks across the subsurface of the mountain prior to closing off the shaft, will help to predict where, and at what volume the water may reappear. But the site encompasses over 500 acres and with a mining history that has shaped and reshaped the mountain, mapping will be difficult.

Hays Griswald, On-Scene Coordinator, US EPA: This area, this mineral district was originally discovered in the 1870s, early 1870s. And originally they discovered gold in the creeks and it was placer mined. Then they discovered these lead ore bodies up here, the veins, that they mined first by a small, shallow open pit or glory hole as they call them. Then they went underground in tunnels or drift mining and followed the veins. That occurred off and on through the early 1900s all the way up to the 1940s, a little bit in the 1960s, and then there was quite a bit of exploration in the 1970s up here. And that last part of the exploration was looking for a low grade gold deposit and heap leach operation.

Narrator: The Summitville Mine remained active until October of 1991. At that time EPA Region VIII stepped in to maintain the wastewater treatment plant and to begin the long process of restoring the site. Mapping the subsurface fractures and consequently plugging the [Reynolds adit] are just part of that overall effort.

To locate and verify the fractures, 2 different technologies were used. SP or self potential which took readings from within the mine shaft and VLF, which required a number of traverses to be walked across the expanse of the hillside.

Steward Sandberg, Geophysicist: Okay, we're running VLF, it stands for very low frequency. It's an electromagnetic method. We're detecting radio waves that have transmitted from military sites, submarine communication sites across the different points. We're using a Seattle station but we're basically using that as an electromagnetic signal and we're mapping the scattering of that field due to stuff under the ground. A fracture is sort of a general term for a geologic condition where the rocks open up and water can move through that uh opening. Basically if we have a fault or fracture zone it's going to conduct electricity a lot more than the rock to the side of it so that we'll concentrate the magnetic field in that conductor, in the fracture zone. And if we map that radio field, the VLF signal over this site, the transmitter's so far away that it should be uniform so deviations from that uniformity will, will indicate fracture zones are possible.

Narrator: The leaching of metals is a direct consequence of the presence of oxygen coming in contact with the water. Fractures which are found to be water filled are less likely to trigger this decay.

Rich Henry, Ecotoxicologist: Should that groundwater back up into an area that doesn't allow it to come in contact with oxygen, then those chemical reactions would not occur and the groundwater may be discharged in a natural way, very similar to the way it was discharged prior to the mine being dug in the ground in the first place. If the groundwater backs up into areas that contain oxygen, that will trigger those chemical reactions that create the acidic solution that leaches the metals from the rock and if that solution is then discharged to the stream, we're back in the same position we were prior to plugging the tunnels.

Narrator: Water continues to pass through the mine as a result of rain and snow melt from higher elevations. At present the EPA has a wastewater treatment plant in place to treat the water coming out of Reynolds adit.

Hays Griswald, On-Scene Coordinator, US EPA: Right at this particular time the adit is flowing at 300 gallons a minute so we are treating all the flow from the adit. During the spring the adit flow goes up to as much as this spring, 1,000 gallons a minute. So we obviously didn't catch all of that and that's part of the idea of plugging the adit to even if we don't get the attenuation in the rock, if that's not possible, we at least have the plugs in the adit for surge control and be able to at least back up and store all of that flow in the mountain and treat it at the rate we are able to.

Narrator: When the water leaving the adit exceeds the capacity of the treatment facility, its channeled directly into the same stream as the treated water. Once there, the contaminants are free to move downstream where they pose a significant risk.

Rich Henry, Ecotoxicologist: There are a multitude of contaminants in this water including metals and cyanide. In addition the water is probably at a low pH, somewhere around 2 to 3, and that has a number in negative consequences. Primarily its toxic. Its toxic to most forms of aquatic life including the macro invertebrates that inhabit the stream bottom, any fish that may inhabit the water or any organisms that might use this stream as a water source. There's other effects as well. When this contaminated water is put onto crops and crop land it

has a tendency to accumulate in the soil and then potentially it'll accumulate into crops and that can have negative effects on the people that are consuming the crops as well as any livestock that might uh graze in those areas.

Narrator: When this phase of the operation is completed and the results forwarded to the Regional EPA, engineers should have a clear idea of whether or not plugging the adit will minimize the amounts of contaminants flowing downstream.

Within the first day of mapping 3 significant fractures were located, one as deep as 300 feet. This almost instant access to details of subsurface creatures allows the team to focus their efforts so that their findings will not only indicate whether plugging the adit will work, but where a plug will have the greatest positive impact on the environment.