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From: "Karla Knoop" <kknoop@jbrenv.com>
To: "'Steve Fluke'" <stevefluke@utah.gov>
Date: 1/16/2007 2:41:14 PM
Subject: West Ridge -- Bear Canyon visit in November

Steve,

Dave Shaver at West Ridge asked me to email you the attached report. It presents observations that I made during the trip to Bear Canyon right after the longwall passed under the canyon bottom, in late November 2006. Currently the report is in draft form, as indicated by the watermark that appears on each page. JBR can prepared final printed copies at any time, but Dave thought that you might want to take a look at it first.

Let me or Dave know if you have any questions about this.

Regards,
Karla

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Report on Field Conditions in Bear Canyon After First Longwall Pass At the West Ridge Mine

DRAFT

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Report on Field Conditions in Bear Canyon After First Longwall Pass At the West Ridge Mine

1.0 Introduction

WEST RIDGE Resources, Inc., a subsidiary of UtahAmerican Energy, Inc., operates an underground coal mine in the Book Cliffs Coal Field east of Price, Utah under Utah Division of Oil, Gas and Mining Permit No. C/007/0041. Longwall operations have recently expanded northward to an area overlain by Bear Canyon. In the vicinity of the topographic low associated with the Bear Canyon stream channel, cover above the Lower Sunnyside coal seam is reduced to about 350 feet. Full extraction mining at such depths has the potential to induce surface subsidence. Therefore, as a permit condition of undermining the Bear Canyon channel (which does not flow perennially), WEST RIDGE committed to documenting subsidence effects in the vicinity of the channel.

The longwall first passed underneath the Bear Canyon stream channel on or about November 15, 2006. On November 24, 2006, Karla Knoop, a JBR Environmental Consultants, Inc. hydrologist, visited Bear Canyon on behalf of WEST RIDGE to observe immediate subsidence effects. This report presents those observations.

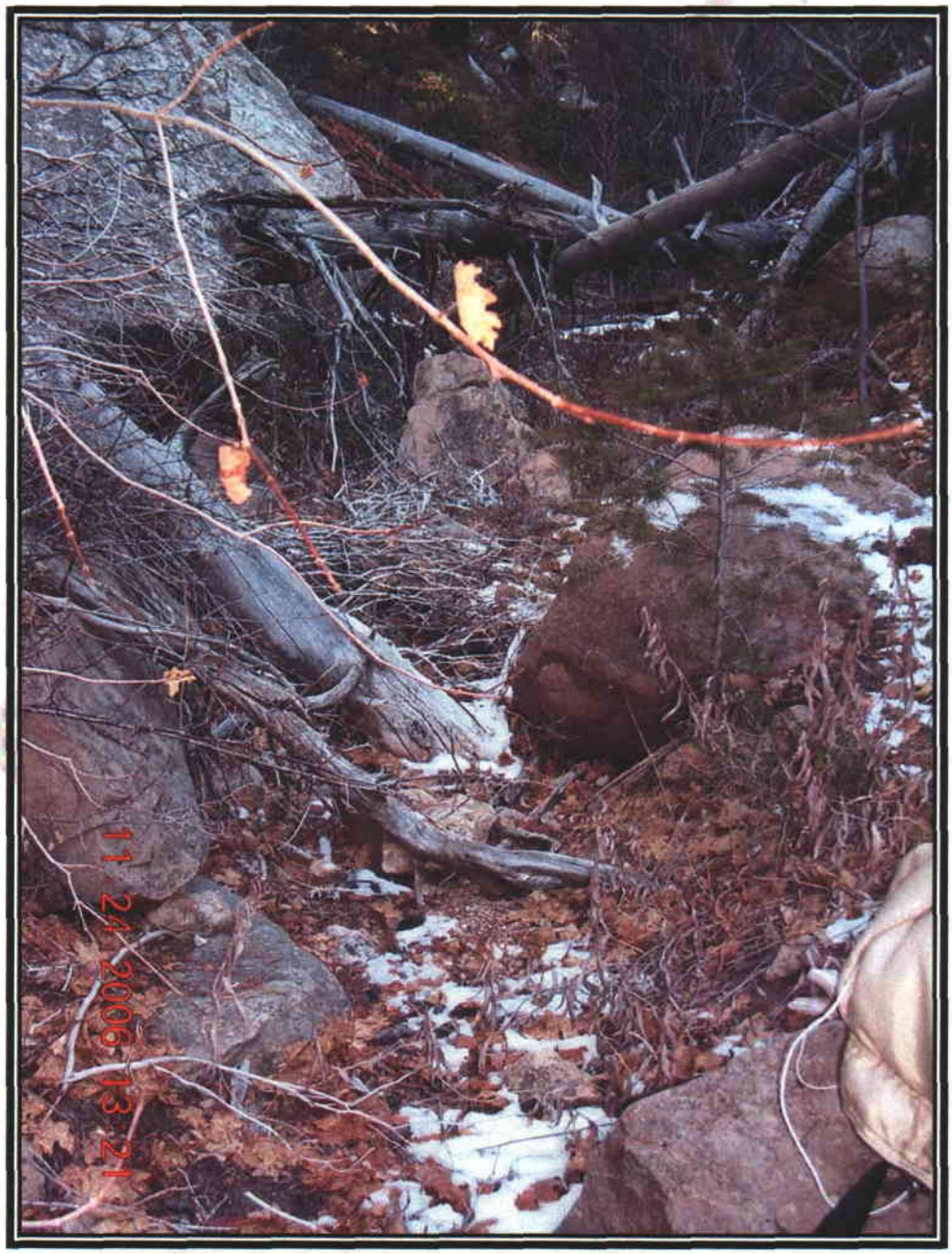
2.0 Background

JBR began visiting Bear Canyon in early July 2005 to document stream flow conditions prior to the planned longwall mining. Field observations by WEST RIDGE and Division of Oil, Gas and Mining personnel in June 2005 documented high spring runoff flows throughout the entire canyon. These continued through early July as documented by JBR. (Many other streams in the Book Cliffs also had higher and longer-sustained spring runoff flows than normal at that time, due to above normal winter snowfall.) However, during a July 27, 2005 visit, flows were negligible throughout most of the canyon and nonexistent in the vicinity of the proposed first longwall pass.

Monthly visits continued from late July through October, 2005 and April through October, 2006. These visits all documented no flow conditions, indicating the ephemeral nature of flows in the canyon. Based upon these repeated visits, the Bear Canyon channel can generally be described as having fairly frequent storm-related flows that are sufficient to support a limited riparian community where substrate allows, but not sufficient to support wetland vegetation. These storm flows also appear to convey a significant sediment load. In-channel sources are evident from bank sloughing, exposed root masses, and areas of channel incision. Along with these erosion-prone areas, sediment deposition and bedload rearrangement are evident throughout the channel. Further, the narrow canyon with steeply sloping walls and exposed bedrock produces frequent rock fall in and near the channel.

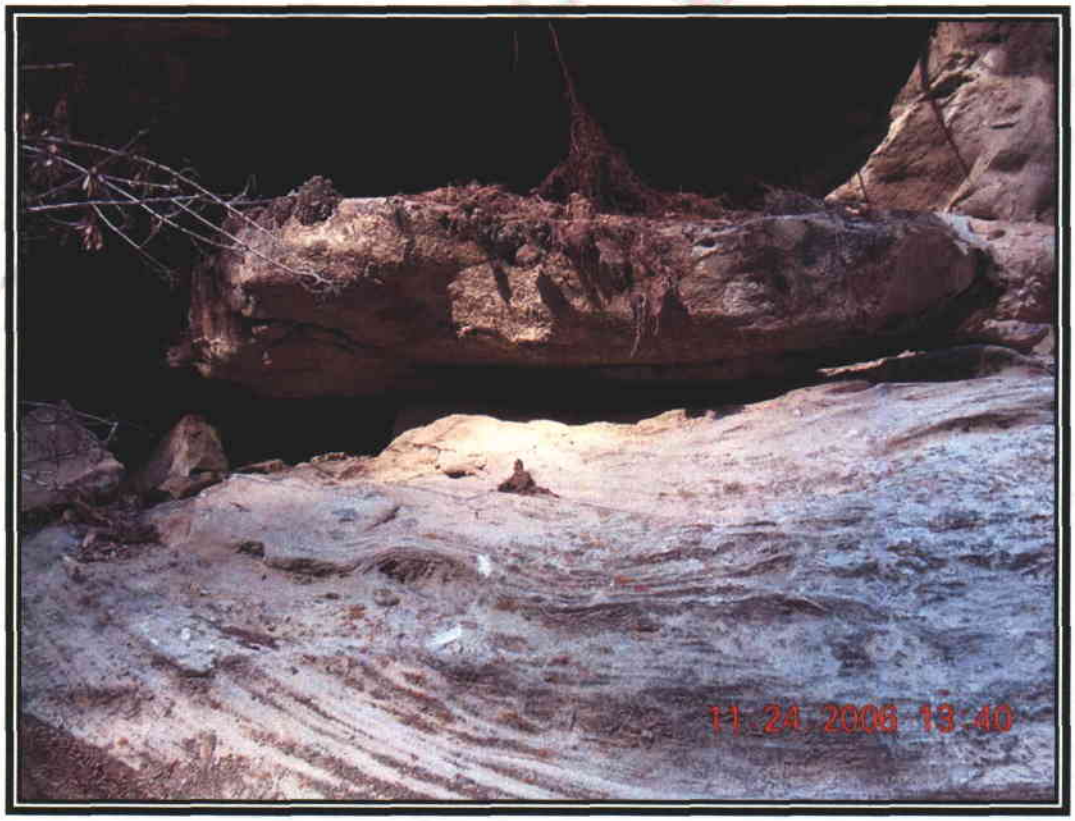
3.0 Observations Made During November 24th Site Visit

During the November 24, 2006 visit to document initial subsidence effects resulting from the first longwall pass, there was no stream flow in the canyon. The ground was generally free of snow. However, there were some areas where snow cover was spotty, or up to approximately one inch deep in protected areas, particularly in the upstream channel reaches. This amount of snow did not significantly impact the ability to observe channel conditions at any of the observed reaches. The photo provided below shows typical channel condition in the primary area of concern.

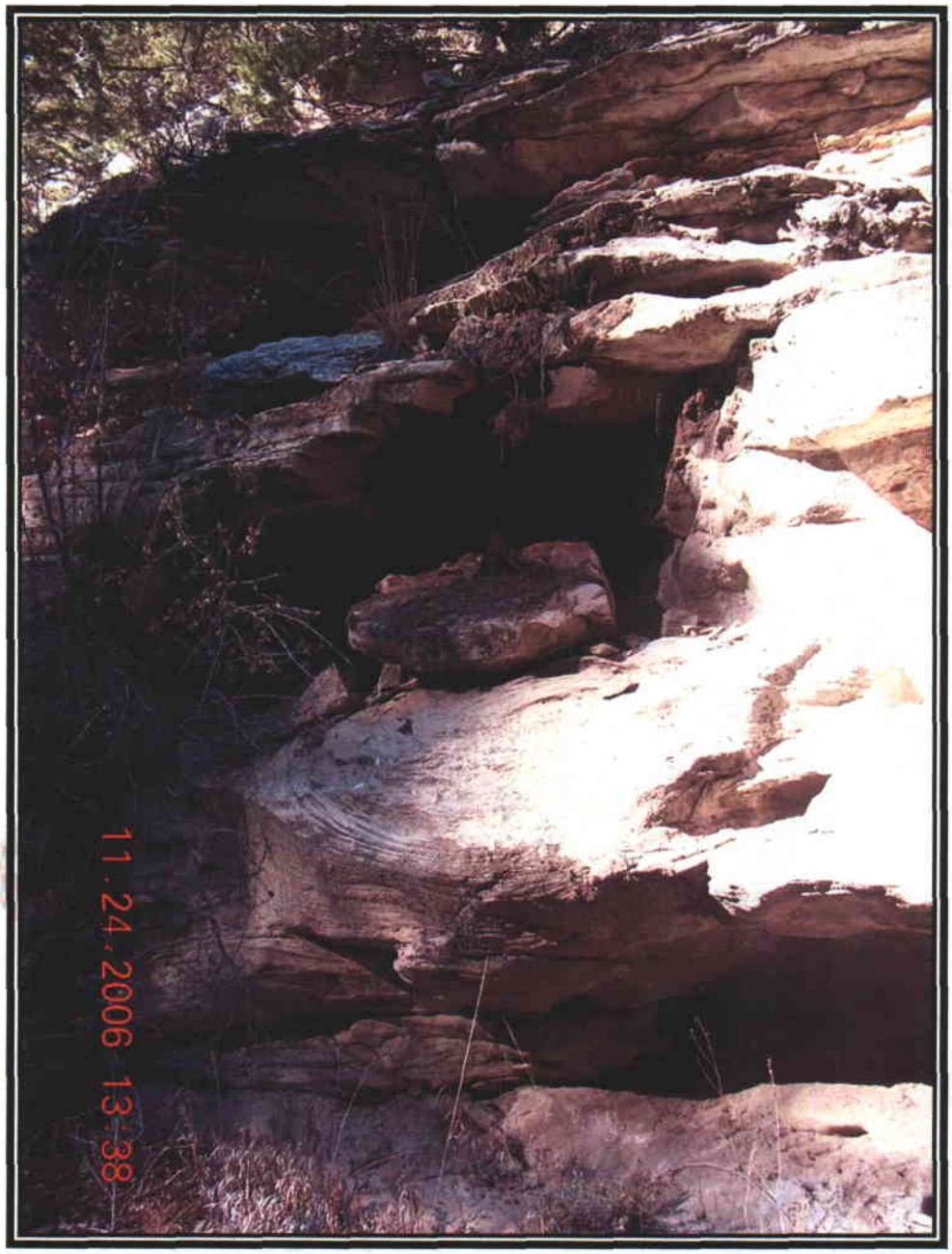


There were no visible indications that the longwall pass had resulted in noticeable ground lowering or had caused subsidence cracks to propagate to the ground surface. Survey pins installed in 2005 in the vicinity where the longwall panel intersects the Bear Canyon channel were all visible, and the surrounding ground was undisturbed to the eye. A re-survey of this area in the spring of 2007 will document any actual elevation changes that could not be visually observed (or that have not yet occurred). No tension cracks in the ground surface, either in the channel bottom, channel side slopes, or surrounding ground, were found. This includes the shallowest area where survey pins were installed, as well as areas upstream past the old drill hole location, and downstream past the potential area of influence. As mentioned above, snow cover did not hinder observations. However the presence of a relatively thick leaf litter cover in some channel bottom areas possibly could have obscured very narrow or small cracks.

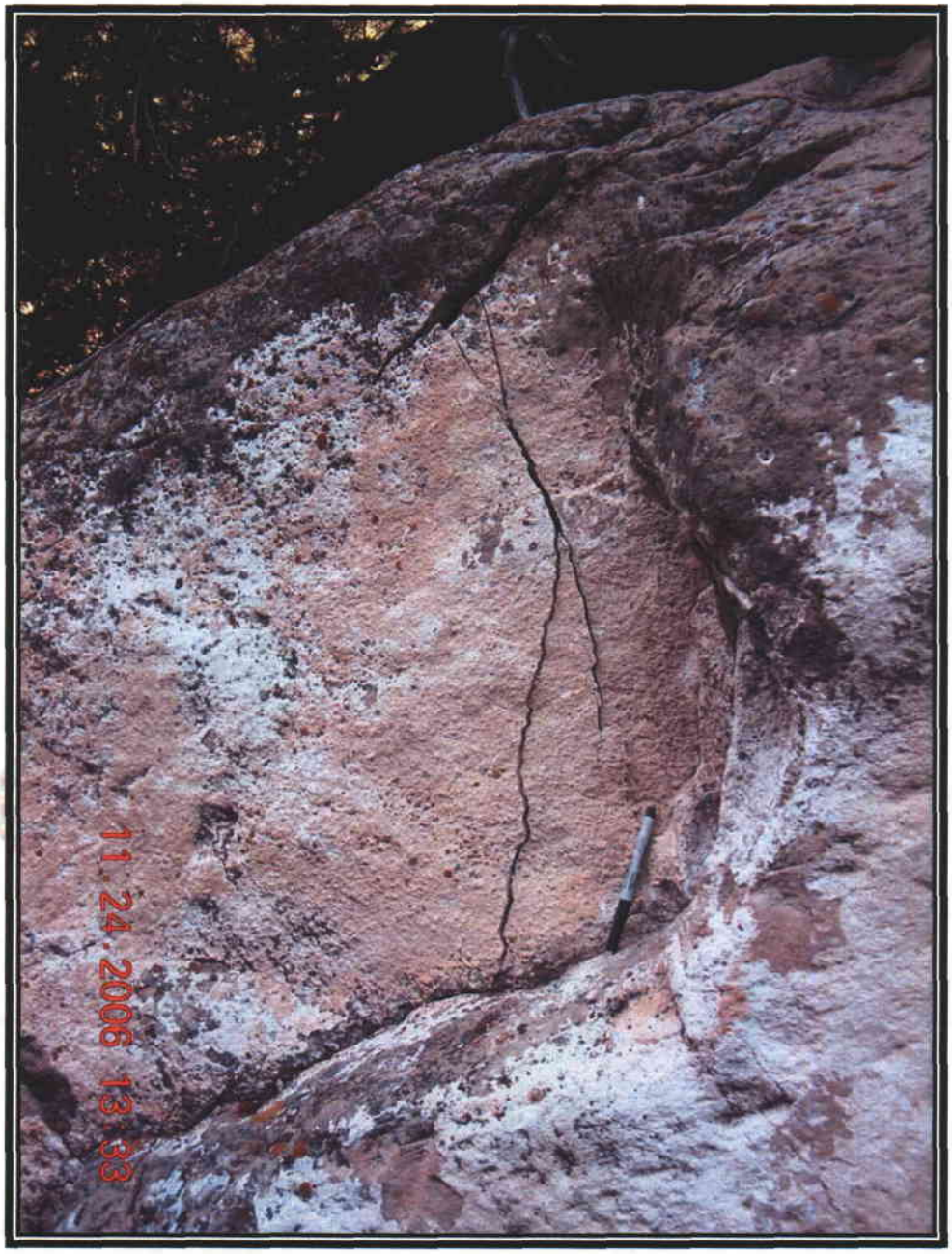
There were some indications of the effects of ground shaking due to subsidence, though of a scale and extent that would not necessarily be noticeable or attributable to recent mining if it had not been known that that possibility existed. Generally, these indications were visually similar to what occurs regularly due to freeze-thaw and similar processes; their freshness was the primary reason they were attributed to the longwall passage. The following two photographs provide one example of this type of observation. They show exposed bedrock on the north canyon slope approximately 15 feet above the channel. The first photograph shows a close-up view of rock that had separated and dropped vertically a couple of feet, landing on a ledge below. Note the fresh white scars on the rock face below the ledge, which indicate other rock that had tumbled to the ground surface (observed but not depicted in the photograph). Also note the still-attached organic matter on top of the displaced rock.

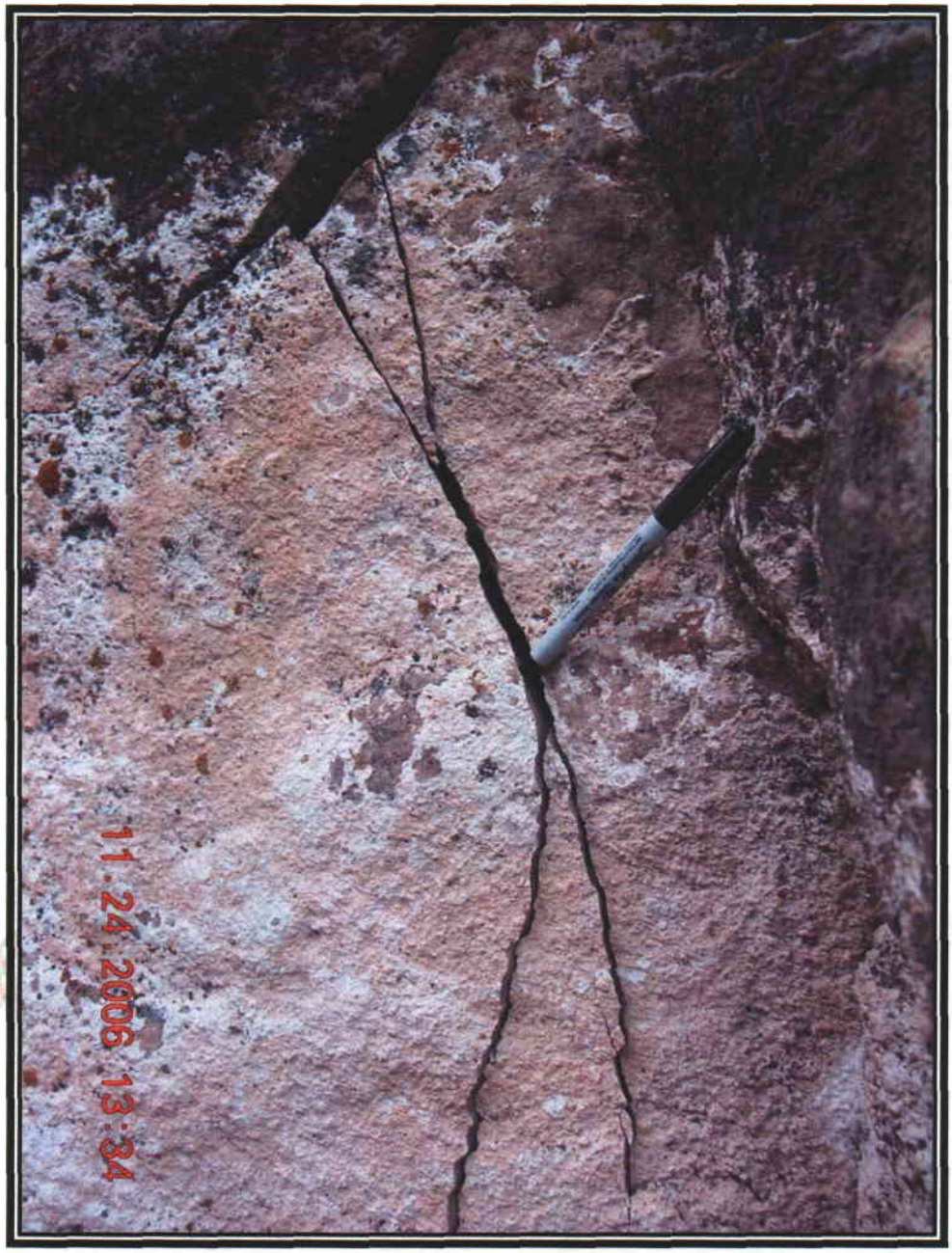


The next photograph shows a longer view of the same location. The noted movement, while something that commonly takes place in this environment, is, because of its apparent occurrence coincident with the longwall pass, likely related to vibration associated with subsidence following the longwall pass.



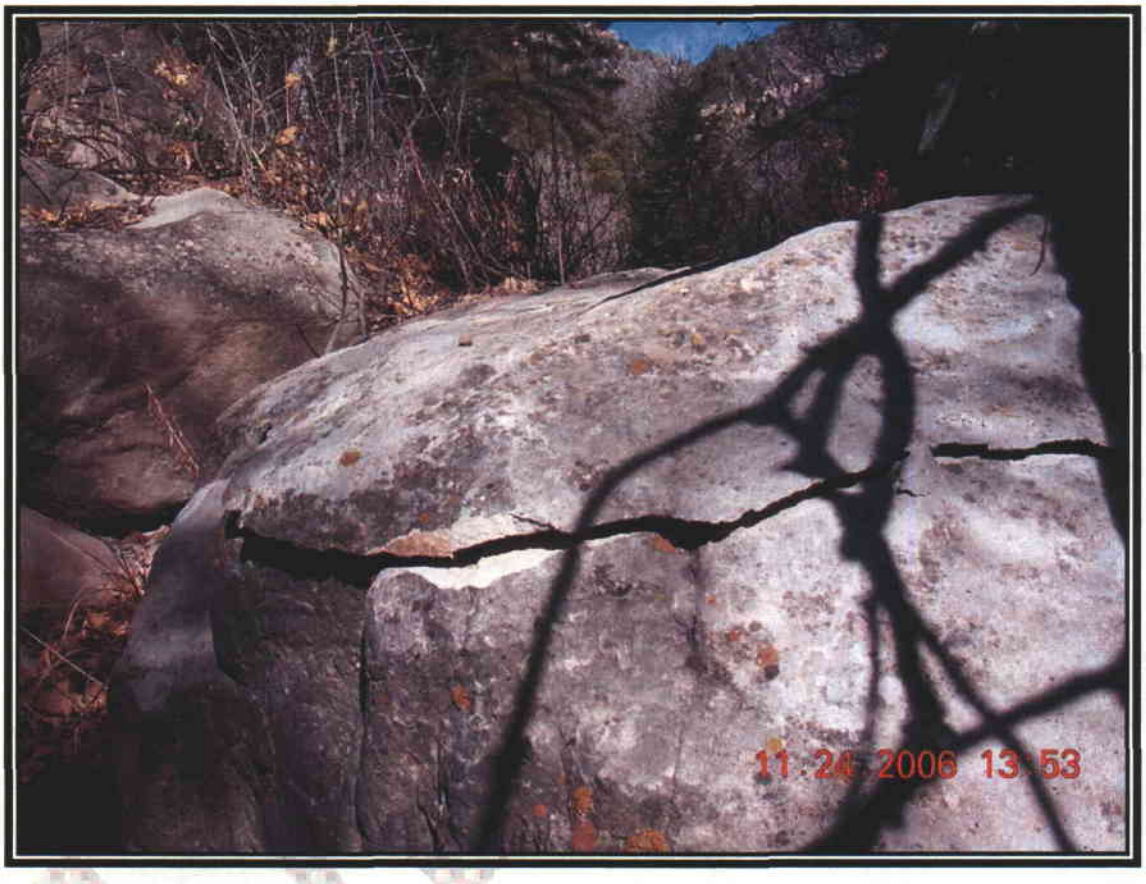
Very fresh rock cracking, a similar distance above the stream channel as the previous photograph and also on the north side of the canyon, is evident in the following two photographs. The first shows a longer view; the second a close-up. Note the older cracking at the top and bottom of the first photo, with the very new cracking in between. The close-up shows flaking along the bottom right crack. These flakes have a very tenuous hold, another indication of the very recent nature of the cracking.





As with the previously described rock fall, this cracking is primarily attributed to subsidence-generated vibrations because of its timing. While freeze-thaw activity frequently causes similar cracking in joints or weak spots in these sandstones, it would be more likely to occur in the early spring after there has been a more substantial precipitation base. For that reason, subsidence-induced vibration is considered the likely mechanism in this instance.

One last example of the type of rock cracking that was observed during the November 24th visit to Bear Canyon is shown below. This boulder is located in the channel itself, and appears more likely to have cracked due to shaking rather than to settling. Older, vertical cracking is evident at the bottom of the photograph, contrasting with the very recent horizontal, larger crack.



All of the above-shown sites were located with a GPS unit for future reference, and were found within a several hundred foot reach at the approximate location of the longwall pass. They represent the most obvious features observed that could indicate the level and type of subsidence effects immediately after the longwall pass. In addition, there were many areas where relatively recent channel bank sloughing had occurred (as shown in the following photograph). However, this type and extent of ongoing erosion has been noted during previous visits to Bear Canyon, and was also noted downstream of potential subsidence effects on the November 24th visit, so it is less likely to be related to the longwall pass. It may, in fact, document a relative lack of immediate subsidence effects because these areas are ones that would be prone to accelerated activity if ground-shaking effects had been severe.

While it is possible that ground settling could continue to occur over the next several months, and more indications of subsidence could manifest, these initial observations indicated only minor potential evidence of ground shaking and no evidence of subsidence. None of these observed consequences would have the potential to affect the hydrologic regime of the Bear Canyon channel.

4.0 Summary

As requested by WEST RIDGE Resources, Inc., JBR Environmental Consultants, Inc. visited Bear Canyon on November 24, 2006 to investigate field conditions shortly after the first planned longwall pass under the shallow cover associated with the topographic low of the canyon's stream channel. The intent of the investigation was to observe the initial effects of subsidence related to this mining activity. No major indications of subsidence effects were noted. Minor, limited examples of cracking likely related to subsidence-generated vibrations were noted and photographed; these were of a type and extent that commonly occur in the area from other natural processes, and were primarily notable for their freshness. Thus far, no effects to the hydrologic regime of Bear Canyon have been noted as a result of the longwall pass.