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Memorandum

TO: Mary Ann Wright, Associate Director of Mining

THRU: Daron Haddock, Permit Supervisor

FROM: David Darby, Senior Reclamation Specialist

DATE: March 5, 1998

RE: Technical Summary of Mr. Stamatakis' Concerns of Mining Related Impacts to Hydrologic Resources in Beaver and Gordon Creeks, Carbon County, Utah

Synopsis

Over the past four years, Steve and Pete Stamatakis have been in contact with the Division and have repeatedly expressed their concern that mining in the vicinity of Beaver Creek has had a negative impact on water resources; not only on Beaver Creek, but on the resources in adjacent areas as well. Messrs. Stamatakis have owned property in Beaver Creek for eight years and have managed cattle on the area for approximately forty years.

On October 3, 1997 Steve Stamatakis conducted a tour of sites which he suspected had been impacted by mining activities. Several people from the Division of Oil, Gas and Mining attended the meeting, including Mary Ann Wright, Associate Director of Mining; Jesse Kelley, Reclamation Specialist/Engineer; Sharon Falvey, Reclamation Specialist/Hydrologist; Luci Malin, Reclamation Specialist/AML; Bill Malencik, Reclamation Specialist/ Range Conservationist and David Darby, Reclamation Specialist/Hydrologist. Also participating in the tour was Dan Guy, Consulting Engineer represented Mountain Coal Company, Vicky Bailey, Environmental Consultant representing EarthFax Engineering and Horizon Mine and Pete Stamatakis, Landowner.

Near the Gordon Creek area, Steve Stamatakis pointed out two spring sites, one at the head of Jewkes Creek (for this report called Horseshoe Spring) and another at the mouth of Coal Canyon, both of which he asserts have increased in flow and caused slumping of slopes and soils adjacent to the springs.

The group then drove to Beaver Creek, where Mr. Stamatakis claims that flows have diminished over the years, and identified an area along the creek where sinking and slumping of the ground had occurred. The group also visited areas adjacent to Beaver Creek where Mr. Stamatakis claimed subsidence and slumping was caused by mining. The features were not distinct during this visit, however, some features were observed by division personnel on earlier visits.

Mr. Stamatakis pointed out a diversion on Beaver Creek that held a water right of two second-feet. He reasoned that the stream flow prior to mining had to have been greater than what was currently flowing in the creek in order to satisfy the water right as well as contribute to the flow downstream. He also pointed out springs near Beaver Creek, including Jewkes spring, that he contends had flowed more in the past.

Mr. Stamatakis was concerned that future mining would cause diminution of and devaluation to his property, since Horizon's long term mine plans will likely propose mines that will extend beneath Stamatakis property through the Hiawatha Coal Seam.

Several areas were examined to determine if mining had dewatered the stream. A major part of the examination focused on the possibility that mining activities conducted by Beaver Creek Coal Company and other mining companies had induced subsidence fractures that intercepted the stream and reduced flows in Beaver Creek.

Structure and stratigraphy were also evaluated to determine if subsidence had induced fracturing along the surface and transferred flows from Beaver Creek to sites described by Mr. Stamatakis as having increased in flow, i.e., Jewkes' Spring and Coal Canyon Spring. Other scenarios were also considered because of their obvious relationship to Mr. Stamatakis' claim.

Observation of the current stream morphology as well as testimony from persons who have visited the stream indicate that upper Beaver Creek has undergone extensive changes from 1980 to the present. The stream once supported a fishery, a thriving beaver colony and a willow-covered riparian area. The stream is now channelized with banks blanketed with silt.

The areas of concern were evaluated to determine if surface and water resources were affected as a result of mining activity regulated by Utah's Coal Regulatory Program. Mr. Stamatakis' concerns are identified and discussed below under three major headings, each of which is followed by an Analysis and Conclusion. At the end of the report is a Technical Opinion summarizing the probability of impacts on the Stamatakis property and rights.

I Dewatering of Beaver Creek

Several factors acting singly or in concert could account for the changes to the stream flow. A deficient water supply may be caused by interception by mining, drought, removal of beaver, overgrazing or logging. Each of these factors was evaluated and discussed below.

Analysis

Stream Flow Diversion on Beaver Creek

Mr. Stamatakis claimed that the flow in Beaver Creek should be higher, not only to accommodate the diversion of two second-feet, but to maintain flows downstream for his priority stock water rights. In a telephone conversation with this reviewer, Mark Page of the Utah Division of Water Rights stated that it is common practice to issue water rights on a stream which exceed the normal flows of that stream. Mr. Stamatakis' stock water rights have the highest priority on the stream and the Division of Wildlife Resources (DWR) has second priority. Essentially, DWR can only divert flows in excess of the stock water rights.

Stream Flow Interception by Subsidence Along Beaver Creek

A potential exists that stream flow can be intercepted when subsidence opens fractures and allows flow to migrate out of the stream to other areas. Faults that exist in an area can intercept and transmit water if movement caused by subsidence opens interstices along the shear zone. This scenario is hard to recognize and apply unless the activity is highly visible or background data exists that reveal a change in flows.

Mining has taken place beneath Beaver Creek before and after SMCRA. The Blue Blaze #3 Mine and the Gordon Creek #2 Mine mined areas under Beaver Creek in the Castlegate A Seam.

Beaver Creek Coal Company mined under the upper part of Beaver Creek between 1978 and 1981. Messrs. Stamatakis later purchased the property where some of the mining had taken place. Steve Stamatakis suggested that mining of the Gordon Creek #2 Mine had caused depletion of flows in Beaver Creek and caused an increased flow to Horseshoe Spring.

Subsidence data collected by Mountain Coal Company (Beaver Creek Coal Company, Annual Report 1997) indicate that no subsidence has occurred adjacent to their monitoring sites. Most of the areas were mined prior to the passage of SMCRA, August 1977, whereas other areas in the graben were mined while interim rules were being established and no subsidence monitoring stations were required.

The Gordon Creek/Beaver Creek area is highly faulted. The faulting dictated the way mines were developed. In some instances faulting prohibited mining. Several of these faults cross Beaver Creek, and two of them form the edge of a horst which runs northeast through the Stamatakis property. The relationship between groundwater movement and the faults is not well known. According to Dan Guy, no major flows were contacted in the Gordon Creek #2 Mine.

The area around Horseshoe Spring is highly faulted. Although the fault systems of the horst which crosses Beaver Creek align with Horseshoe spring, a conclusive correlation cannot be established. The historic flows of Horseshoe spring are not well known. An old water collection system was used for culinary water at some of the older mine sites and towns in the area, which shows that the spring existed prior to mining of Gordon Creek #2 Mine.

Drought in the Vicinity of Beaver Creek

South central Utah and the adjacent mountain areas experienced continuous drought conditions a total of 6 years from the end of 1986 to the beginning of 1993 (Palmer Hydrological Drought Index). This was about the time when Mr. Stamatakis and many other water users expressed concerns about water loss. Dry conditions were again experienced in 1994 and 1996 and this added to the questionable levels of stream flows. Drought conditions would unquestionably yield lower stream and spring flows and lower the water tables adjacent to the stream.

Riparian Management Along Beaver Creek

The riparian corridor along the Beaver Creek was once covered with willows and beaver ponds. Most of the beaver are gone. Only one large beaver pond is active on the upper reaches of Beaver Creek.

Grazing Along Beaver Creek

Both sheep and cattle graze the areas adjacent to Beaver Creek. Overgrazing can damage the riparian zone and decrease its ability to store water. Overgrazing can also damage the banks of the stream and thus increase sediment loading in the stream. Overgrazing in combination with removal of beaver ponds would cause the stream to channelize and reduce the bank storage which supplies water to the stream as stream flows diminish.

Logging Near Beaver Creek

Logging is currently conducted on private lands adjacent to Beaver Creek. It was

observed that no riparian management practices are implemented which would protect Beaver Creek. Improper logging practices can increase overland flow, decrease infiltration, erode soils, contribute excessive sediment to streams, destroy and displace biota (macro invertebrates and fisheries) in the streams. All of the following appear to be occurring on Beaver Creek.

1-Extensive logging activities on slopes, leaving barren areas and exposed soils that are easily washed down into the creek.
2-Logging adjacent to Beaver Creek with no buffer zones to inhibit impacts.
3-Road development along Beaver Creek with no runoff controls.
4-Extensive erosion of the channel in Beaver Creek.
5-Thick deposits of silt in Beaver Creek.

Conclusion and Recommendation

Mr. Stamatakis' claim that flows in Beaver Creek were higher to accommodate the upstream diversion (DWR's water rights) flows plus the flows for his cattle watering rights is flawed and does not reflect past streamflow characteristics or lesser flows.

There is no evidence of subsidence or dewatering of Beaver Creek in the area where Mountain Coal Company (Beaver Creek Coal Company) undermined the stream. Subsidence data from the area adjacent to Beaver Creek indicate that no subsidence has taken place. A seepage study conducted by EarthFax Engineering indicates that flows generally increase in the creek over mined areas and decrease outside of the mined areas, indicating no significant interception of streamflow by mining.

The relationship of Horseshoe Spring and Beaver Creek was examined. It is highly likely that the spring is recharged from the fault system that forms the horst which extends west through Beaver Creek. The association between Horseshoe Spring and the fault zone is highly probable. However, there are no definite indications that there is an association between Beaver Creek and the fault system. Extensive tests would have to be conducted to establish a relationship between the spring and the creek.

The combined effects of poor riparian management are evident. These practices coupled with a drought have had devastating impacts on the stream. Reduced flows can be attributed to these practices.

It is recommended that subsidence surveys and surface water monitoring programs be intensified during potential subsidence periods. Horizon Coal Company has currently been collecting some information in the area in accordance with their permit requirements.

II Slumps and Slides

Mr. Stamatakis pointed out sites on Beaver Creek where he suspected that subsidence features exist. He also identified sites in adjacent areas that had subsided and others sites that he thought were related to subsidence.

Analysis

Beaver Creek

The Blue Blaze #3 Mine mined the Castlegate A Seam under Beaver Creek. Mr. Stamatakis pointed out small escarpments and sink holes along the south side of the stream. The sinks/escarpments were not apparent to several people on the October 3 trip, but were more obvious on earlier tours.

The sink/escarpment location on Beaver Creek was measured by vehicle mileage and GPS readings. Both readings marked the location over the old Blue Blaze #3 Mine. There is in this area 700 to 800 feet of overburden above the old workings. When previously observed the features resembled fractures with a pattern more representative of tension cracks. There was no definitive findings that this area was disturbed by mine subsidence.

North Fork of Gordon Creek-Bryner Canyon

During the site visit, Steve Stamatakis pointed out areas where sink holes and slumps occurred that he thought were related to mining. His point in doing so was to show that subsidence had happened in the past and could be associated with future impacts and stream loss.

We hiked down a slope from the county road to the Gordon Creek #2 Mine pad. We found a fracture approximately 60 feet long that had opened about 2 feet wide. The fracture had filled in substantially with some of the surrounding earth. Some animals had burrowed into the fill material of the fracture. The fracture overlies some entries that don't appear to be second mined, according to Plate 3-3 of the Gordon Creek #2 Mine Map. There is less than 200 feet of overburden.

As we walked down to the Right Fork of Bryner Canyon, Steve pointed out another area that had subsided. Dan Guy described the situation. Back in 1979 the channel had sunk into the mine entries. The cover was less than 50 feet. The subsidence hole was backfilled and a culvert was placed in the channel to span the subsided area.

Conclusion and Recommendation

Mr. Stamatakis pointed out sluff areas on adjacent hillsides and settling of a pond near the Gordon Creek #8 mine and discussed areas over the Gordon Creek #8 Mine portals that had subsided. None of these areas was on Stamatakis property. Mountain Coal Company had already documented the subsidence areas over the portal areas of the mine.

Desicccation of the soils brought about by drought and poor riparian management would cause settling of embankments and fracturing along slopes, and is a likely cause of the sink hole/escarpment phenomena. No definitive findings could be made that this area was related to subsidence from mining.

The subsidence sites near the Gordon Creek #2 Mine pointed out by Mr. Stamatakis were definitely mining related. The subsidence sites were not known to exist at the time Mr. Stamatakis pointed them out, but are associated with the #2 Mine entryways with overburden less than 80 feet. The areas noted over the #8 Mine were recorded in the Gordon Creek #8 Mine Annual Report.

As we hiked down the slopes of a hillside Mr. Stamatakis pointed out what he thought were slumps on adjacent hillsides. They were too far away to determine if they were slumps. Jesse Kelley, Ron Singh, Vicky Bailey, Steve Faulk, Max Nielsen, Stan Perkes and Jim Kohler toured the sites around the #8 Mine on October 16, 1998. Jesse Kelley stated that he could identify subsidence cracks over the #8 Mine, but could not locate the stock pond that Mr. Stamatakis said had dried up due to subsidence. Jesse also stated that the slump areas that Mr. Stamatakis pointed out on the ridges might in fact be bare areas or rock outcrops.

Subsidence has occurred in locations over the #2 mine and #8 mine where overburden was not sufficient to support the cover.

The location of the sink/escarpment features overlies the Blue Blaze #3 Mine. Considering that overburden depth ranges from 750 feet to 850 feet and the height of mining is approximately 8 feet, it is unlikely that subsidence occurred on the surface at such a late date. No definite link could be concluded between the features and mining. The features could be caused by droughts and poor land management practices.

III Increased Flows to Gordon Creek

Analysis

Mr. Stamatakis pointed to Horseshoe Spring and Coal Canyon Spring to illustrate that

flows were being transmitted from Beaver Creek and increasing the flows in Gordon Creek.

Horseshoe Spring

Steve Stamatakis pointed out an area along the county road in the NE 1/4 NE1/4 Section 18 which he claims had slumped over the last few years The slump area lies between the Gordon Creek #2 Mine and the Blue Blaze #3 Mine. Spring sources have been noted on the U.S.G.S. quadrangle, dated 1979. A spring box just below the bend in the road was built to supply some of the early mines and towns. The elevation of the slump area ranges from 7920 feet to 8240 feet. Several faults appear to intersect at the spring site coming from the horst that transects the area.

Coal Canyon Spring

Mr. Stamatakis expressed concerns that a spring area at the mouth of Coal Canyon was discharging larger flows, which drowned a group of trees and caused sloughing of the river embankment along Gordon Creek.

During the site visit on October 3, 1997, Mr. Stamatakis pointed out a stand of aspen trees at the mouth of Coal Canyon, the same canyon in which the Gordon Creek #3 and #6 mine portals are located. A stand of aspen, all similar in age and occupying the valley floor, apparently died abruptly. Mr. Stamatakis claims that the ground surrounding the trees became saturated with groundwater produced as a result of mining, killing the trees. He proposed that the water issuing from the seeps came from Beaver Creek, reducing the flows in Beaver Creek and increasing the flow of Gordon Creek.

Dan Guy discussed mining activities in the Gordon Creek #3 & #6 mining operations. The mine workings are located in the eastern end of a major fault block (graben) which trends WNW-ESE. The fault block is part of the down thrown block of the Fish Creek graben (Figures 6-1 and 6-2, Horizon MRP). A 40 foot fault cuts NW-SE through the graben which created a barrier for the southern limit of mining for the #3 Mine. The National Mine workings were developed on both sides of the fault and lie mainly to the west of the #3 Mine. Dan mentioned that during the development, Gordon Creek #3 Mine operations broke into the National Mine workings a couple times, but were sealed off. The #3 Mine was considered dry until the company mined through a 14-foot fault (graben) which lies in the mined block. Then the mine had to pump water from the mine daily, while mining in the graben. Dan estimated that the mine was pumping about 400,000 gallons per day.

The 40 foot fault intersects the creek in Coal Canyon at about the 7410 ft elevation. The highest level that water begins flowing in the channel at the mouth of Coal Canyon, considered

related to the spring, is at the 7360 ft elevation, about 1,000 feet below the fault. Several faults are deliniated on Horizon's Geologic Map, Plate 6-1.

During the tour a few people hiked up the west side of the canyon mouth to observe the stand of dead trees and to determine where the water was emanating. An evaluation of the geologic features (on site and in the office) reveals a possible connection for transmitting ground water from the National/Gordon Creek #6 Mines and the spring area.

It is difficult to establish a connection from Beaver Creek to the National/Gordon Creek #3 and #6 Mines. The National Mine had mined in the graben block west of the Gordon Creek Mines (in the Hiawatha seam, Plate 1-3, Gordon Creek #3 and #6 Mines MRP). A connection between the mines and the spring might be established if water intercepted at the faults which border on the graben were transmitted via the mines through a fault or the Star Point aquifer to the spring. This scenario lacks the data to show that the faults and mines are connected in some way to the spring.

The spring area appears to be located at the interface between the Star Point Sandstone and the Mancos Shale. Similar springs exist in the Wasatch Plateau in relationship to the Star Point Sandstone. Water emanates from both sides of the creek and in the bottom of Coal Canyon, even though the creek cuts through the eastern side of the canyon. This suggests that water is moving horizontally along the contact and not from a particular fault. The sandstone units of the Star Point Sandstone display higher porosities which hold and transmit groundwater more readily than the fine grains of the Mancos Shale.

When groundwater contacts the Mancos Shale it tends to move laterally, sometimes reaching surface as a spring. The spring at the mouth of Coal Canyon appears to follow the parabolic shape of the canyon mouth where the Star Point sandstone intersects Coal Canyon. More water flows from the north and west side of the canyon than from the east side. However, seepage was noticed on the east side of the creek and road, indicating that the flow might come from a deeper source such as a formation supplied from the fault or overlying strata.

A conduit or system that links groundwater movement between either the National Mine or the Gordon Creek #3 and #6 Mines to the spring has not been demonstrated to exist.

The spring existed prior to development of the #3 and #6 mines. This is known because the miners noticed the meadow area and trees. Some have reported that the trees were killed when beaver built a large dam across the marshy meadow. This theory for the dead trees has been expressed by several people who have worked in the area, including Mel Coonrod and Pat Axelson. They indicate that the dead aspen are the result of large beaver ponds built by a pair of beaver. Young trees are once again growing in the marshy meadow above the dead trees. Beaver

are no longer at the site.

Conclusion and Recommendations

The Coal Canyon Spring appears to flow from the Star Point Sandstone/aquifer. A definite link has not been established between water produced in the Gordon Creek #3 and #6 Mines, or the National Mine, and the Coal Canyon spring. There is not sufficient evidence to establish a connection between the mining operations in Coal Canyon and Beaver Creek.

Mr. Stamatakis' concerns regarding potential impacts from future mining are currently being addressed by the Division under the Utah Coal Regulatory Program. Horizon has already submitted an application with the U. S Bureau of Land Management to acquire some federal coal leases adjacent to Beaver Creek. The Division of Oil, Gas and Mining will require any applicant to analyze and characterize the surface and groundwater regimes in the area surrounding Beaver Creek prior to mining. Already, Horizon has located and monitored several streams, springs and some well sites to help establish the state of existing conditions. More groundwater analysis and and subsidence surveys will be required of Horizon prior to mine development beyond the current permit area.

New methods of reporting and managing hydrologic data have been implemented by the Division which will help in the collection of quality data. A newly implemented water quality data base will provide the means to analyse monitored data and help identify impacts to the water resource. Subsidence monitoring stations will be required to detect land and surface movement. Any impacts will be easier to identify as information is gathered and compared to baseline characterization.

It is recommended that before future mining activities are conducted in the vicinity of Beaver Creek that the mining applicant identify the surface and groundwater regimes, evaluate and model the relationship between fault systems and groundwater movement.

The applicant should develop wells to access all major aquifers above and below the mined seam and conduct separate monitoring activities to reflect the flow (or pressure) and quality of water in the aquifer.

At least three monitoring wells should be located along the northeastern side of the Fish Creek Graben Zone northwest of Beaver Creek (Figure 6-3. Regional Structure Contour Map, Horizon Mining and Reclamation Plan), one of which should be located northwest of Jump Creek. Another three monitoring wells should be located in the Jump Creek Graben (or fault block) northwest of Beaver Creek, of those one well should be located northwest of Jump Creek.

Technical Opinion

The existing data and information does not indicate that mining has impacted or caused diminution of the Stamatakis' property or water rights.

Evaluations conducted by the Division staff identify varied scenarios for each concern, but available information does not support Mr. Stamatakis' claim. There is no conclusive evidence or data to show that water is being intercepted from Beaver Creek and conveyed to Horseshoe Spring or Coal Canyon Spring. The claims that subsidence has occurred beneath or adjacent to Beaver Creek can not be substantiated.

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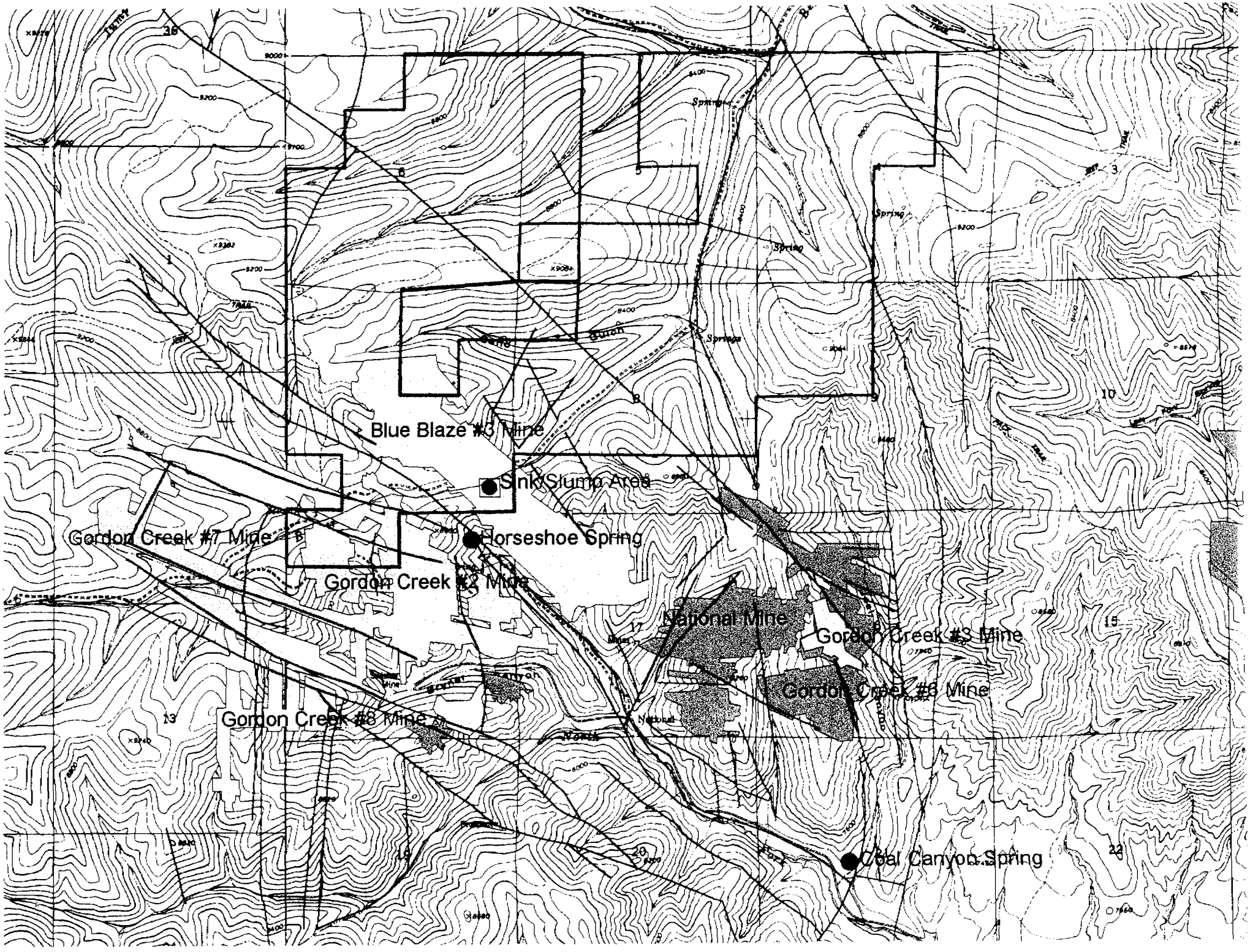
Blue Blaze #3 Mine
Sink/Slump Area
Horseshoe Spring
Gordon Creek #7 Mine
Gordon Creek #2 Mine
National Mine
Gordon Creek #3 Mine
Gordon Creek #6 Mine
Gordon Creek #8 Mine
Coal Canyon Spring

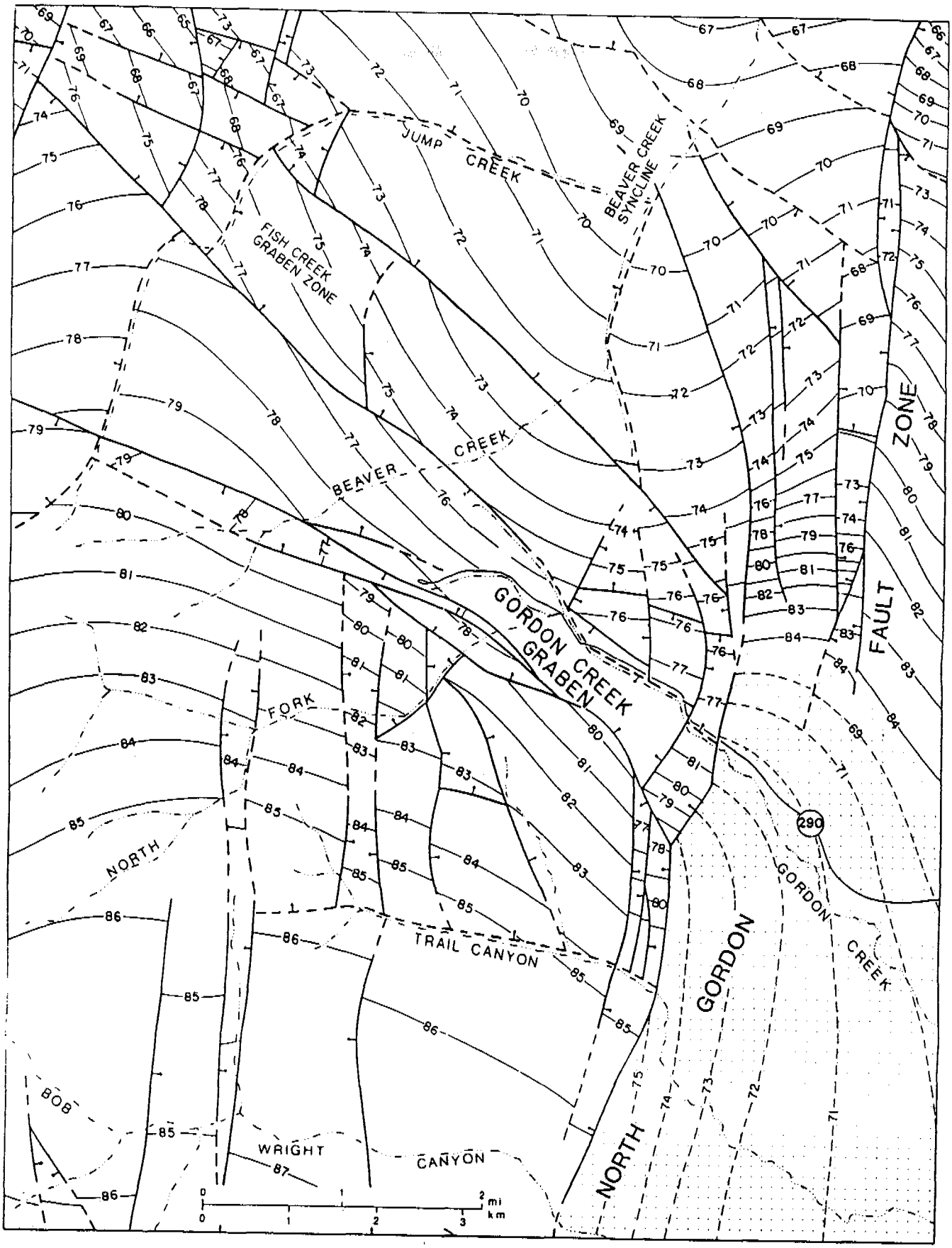

FIGURE 6-3. REGIONAL STRUCTURAL CONTOUR MAP.

DATUM IS TOP OF SPRING CANYON MEMBER OF STARPOINT FORMATION EXCEPT IN SHADED AREAS. IN SHADED AREAS, DATUM IS TOP OF EMERY SANDSTONE MEMBER OF MANCOS SHALE. (HANSEN, 1988).