CHAPTER VI

Geology

PART 6.2 Methdology

Field reconnassance and previous documentation.

PART 6.3 Regional Geologic Framework

The drainage basin of Crandall Canyon, covering approximately 5.7 square miles exposes six different geologic types, primarily cretaceous in age: The North Horn Formation (a fluvial sandstone and mudstone), the Price River Formation (fluvial and marine sandstone and mudstone), the Castlegate Sandstone (deltaic in origin), the Blackhawk Formation (sandstone, mudstone, shale, and coal), the Star Point Sandstone (deltaic and beach deposits), and the Masuk Shale member of the Mancos Shale (marine in origin). The Hiawatha and Blind Canyon Coal Seams, which will be the seams to be mined in the permit area appear at the bottom of the Blackhawk Formation which is of late cretaceous age. Several other thin, lenticular coal seams occur throughout the property, but none of them are of significant thickness or probable lateral extent to be of any economic interest.

PART 6.4 Geology of Project Vicinity

The geology of the surface lands within the proposed mine plan area consists entirely of exposure of the Blackhawk Formation which consists of sandstone, mudstone, shale and coal. The Hiawatha coal seam has been mined and is exposed at an approximate elevation of 7,900 feet. Overburden for mining this seam in the permit area would consist entirely of the Blackhawk Formation rising from the portals to approximately 8,800 feet in the northwest corner of the permit area. This would give a maximum overburden of approximately 1,000 feet with an average overburden of approximately 400 to 500 feet. The entire permit area is underlain by the Star Point Sandstone. During our geologic inspection of the property, all indications were that prior mining in the Hiawatha seam did not encounter any subsurface water. Coal analysis of samples taken from the Hiawatha Seam indicate that it is a high volatile bituminous coal with a BTU content of anywhere from 12,500 to 13,000 BTU's, ash content of 6% to 8%, moisture of 3% to 5%, volatile matter from 40% to 44%, fixed carbon from 43% to 45%, and sulfur from 0.3% to 0.8%. Sulfur forms averaged .20% pyritic sulfur, 0.09% sulfate sulfur, and .50% organic sulfur.

6.4.1 Stratigraphy

The Blackwhawk Formation is comprised of approximately 1000 feet of grey, carbonaceous shales, siltstones, coals and thin interbedded sandstones. The coal beds to be mined, near the bottom of this formation, are anywhere from six to 14 feet in height and are generally classified a high volatile bituminous coal with a sulfur content anywhere from 0.30 percent to 1.0 percent. The Blackhawk Formation is underlain by the massive, cliff-forming Star Point Sandstone which is 700 to 900 feet thick.

6.4.2 Structure

These formations in the Wasatch Plateau area, gently dip one to three degrees westward off the west flank of the San Rafael Swell. The regional structure altitude is broken by several north-south trending, high angle normal faults which offset the rocks from less then ten to approximately 250 feet or more. The major faults as mapped indicate that there are no major faults occuring in the permit area we propose to mine in Crandall Canyon. Springs surface in the upper reaches of the canyon near the Castlegate Sandstone-Blackhawk Formation boundry while several seeps of water have been noted in the Crandall Canyon area issuing from the Starpoint Sandstone.

PART 6.5 Geology of Coal Bed and Adjacent Units

6.5.1 Exploration and Drilling

Applicant's permit area being only 80 acres lends itself quite will to field reconnaissance exploration. With no structural disturbances and information from previous mining, we feel we can qualify the reserves on the 80 acres. Economics eliminates drilling of such a small parcel for exploratory reasons. See Map included as Item Number One with this Chapter for outcrop information.

6.5.2 Stratigraphy

See 6.4.1 above.

6.5.3 Structure

See 6.4.2 above.

6.5.4 Detailed Columns of Interest and Cross-Sections

See Item Number Two included with this Chapter.

6.5.5 Coal Reserves

Based on U.S.G.S. data indicates 840,000 ton in place, 420,000 tons recoverable.

6.5.5.1 Reserve Calculations

From U.S.G.S. figures.

6.5.5.2 Coal Quality and Characteristics, Sulfur Forms, Clay and Alkalinity

See 6.4 above.

Part 6.5 Continued-

6.5.6 Adjacent Units (Overburden)

See 6.4 above.

6.5.6.1 Rock Characteristics, Acid-toxic, Pyrite, Clay and Alkalinity

See 6.3, 6.4, 6.4.1, and 6.4.2 above.

PART 6.6 Geologic Effects of Mining

6.6.1 Mining Hazards

Applicant determines there will be no mining hazards other than would be normally encountered. Will be mining with M.S.H.A. approved roof and rib control plan which will detail procedure in normal and adverse geologic conditions, (see map included with this Chapter as Item Number 3 for extent of underground working). which is?

6.6.2 Surface Hazards

Applicant determines there will be no surface hazards other than would normally be encountered (negligable with underground operation).

6.6.3 Impacts of Mining

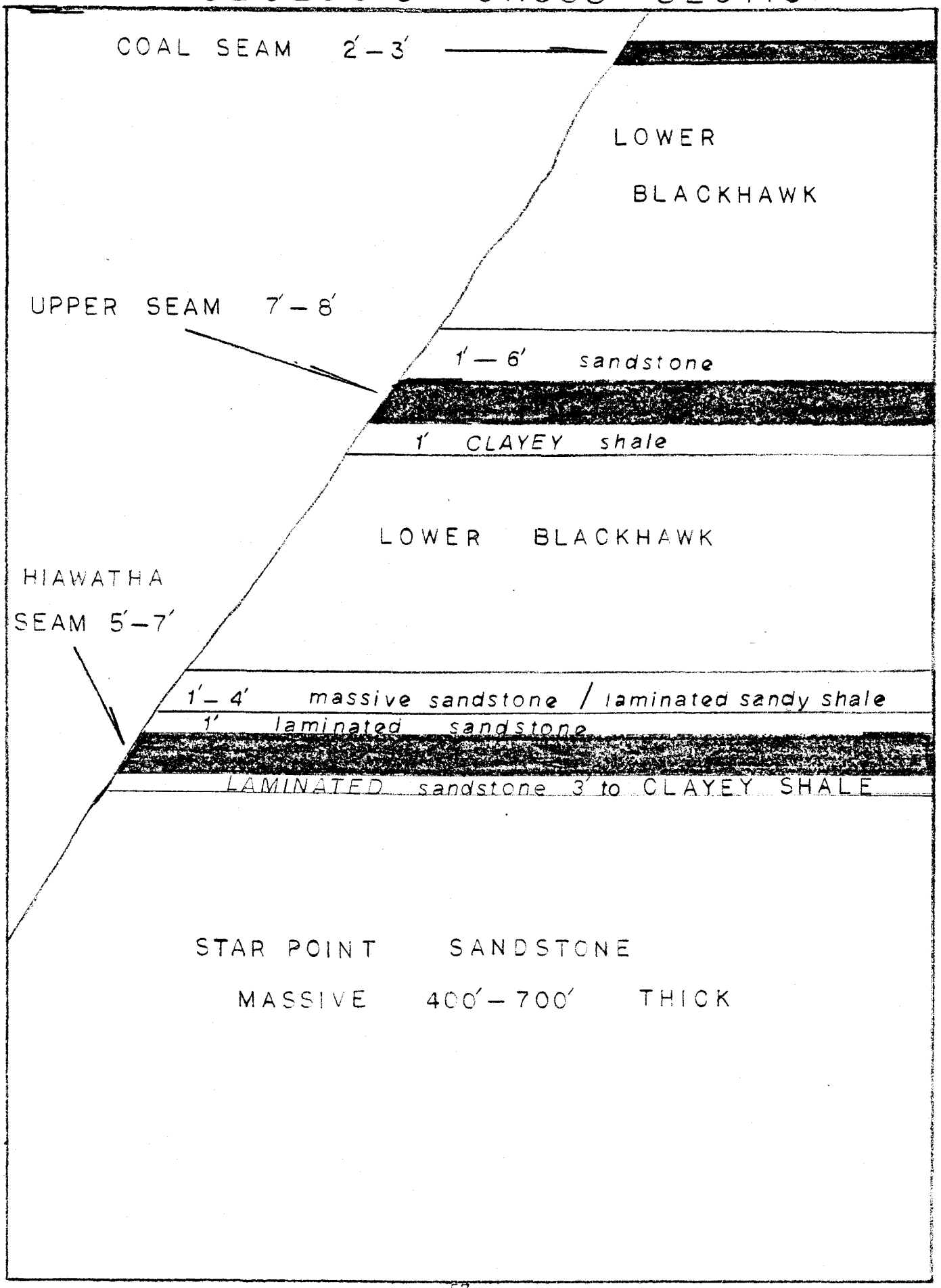
Applicant determines there will be no geologic impacts as a result of proposed mining operation. why?

PART 6.7 Bibliography

None included.

ITEM VII

GEOLOGIC CROSS SECTION



TYPICAL