Knight Hawk Coal - Royal Falcon Mine - Jackson County

Notes by John Nelson on visit with Scott Elrick and Chris Korose of ISGS, and Tom Hasenstab from Knight Hawk, July 21, 2008.

This is a new (opened December 2007) highwall-drift mine in the Herrin Coal. The portals are in a purpose-made box cut, with the initial set of entries running west. Approximate portal location: near west edge of SW SW SW, Sec. 25, T 7S, R 1W, on Elkville 7.5' quadrangle. The coal is about 170 feet deep at the portal.

Royal Falcon is attacking a patch of coal left behind by previous operators. Their reserves are bounded on the east by the long-abandoned Western Coal & Mining Co. Bush No. 2 and the Franklin County Coal Company's No 7 Mine. On the west lies split coal and the Walshville channel. Bisecting the reserve block, north of the Royal Falcon portal, is the Cottage Grove master fault, which trends west-northwest. Knight Hawk proposes to mine across the fault.

The presently mined area is about 400 X 600 feet. Rubber boots were issued, as the workings are extremely muddy.

Coal. The coal seam is approximately 8 feet thick, but in most places top coal is left in place. The following section was measured at the intersection of Entry 8 and Crosscut 3, under a roof fall where coal, roof, and floor are well exposed.

Roof - Energy Shale. Contact sharp to ragged, with coal stringers entering shale.
4.0' Coal, bright banded, cleat moderately developed, several discontinuous layers of fusain, pyrite, and dull coal less than 0.05' thick.
0.01-0.03' Claystone, brownish gray, soft, widely traceable.
0.40-0.65' Coal, dull, very soft, banding disturbed or deformed; large lenses of grayish-black clay occur within, pyrite stringers near top. Portions are slickensided. This proves to be a horizontal (bedding-plane) fault zone.
1.2-1.4' Coal, bright banded, more thinly laminated than upper and lower parts of seam, contains a couple of discontinuous clay laminae.
0.2-0.5' Claystone ("blue band"), olive gray, soft, many thin coal laminae throughout.
2.1' Coal, bright banded, cleat well developed and more widely spaced than in rest of seam. No clastic partings, pyrite common as cleat facings. Base sharp.
Floor - Claystone.
Total seam thickness approx. 8.1 feet.

The "blue band" is continuous throughout the mine, and maintains its position about 2 feet above the base of the coal. It averages about 0.4 ft thick but pinches and swells abruptly, locally reaching 0.8 ft. Evidence of shearing or horizontal movement along the "blue band" is widespread. On Entry 6 at 660 feet inby the portal, a small high-angle fault that displaces the "blue band" has been offset 1.5 ft (apparent offset) along a horizontal fault that follows the base of the "blue band" on one side of the high-angle fault, and the top of the "blue band" on the other. See sketch.

The zone of soft, dull coal at 4.0 to 4.5 feet from the top of the seam has been crushed by horizontal movement and mixed with claystone that originally formed splits or partings. The crushed zone is evident throughout the mine, and in places includes

the entire interval from the "blue band" through the upper claystone parting noted in the measured section. Banding in this zone is inclined and contorted, truncated against bedding planes above and below. Slickensides are present, although we neglected to measure their orientation. The crushed coal is so soft it could be dug with a spoon.

Similar bedding-plane faults were previously recorded in the Herrin Coal close to the Cottage Grove master fault. See, for example, p. 47-49 in ISGS Circular 522.

Floor. Below the coal is massive to blocky claystone that is greenish to olive gray, thoroughly slickensided, and rooted. A maximum thickness of 1.5 feet was observed at the same place where the coal was measured. The claystone turns to gumbo when wet, which is the case almost everywhere. During our visit, production came to a halt because the continuous miner was mired. Wheeled transport moved with great difficulty; progress on foot was difficult in some areas.

Roof. Top coal is left intact in most places to reduce roof falls and water influx. At the spot where the coal was measured, a roof fall exposes about 6 feet of Energy Shale. The Energy Shale also can be seen in the box cut at the portals. The shale is medium gray, slightly silty, and weakly fissile. Faint planar, rhythmic laminae are accentuated by siderite. In places the lamination is inclined to the top of the coal (lateral accretion). Plant debris is common, an upright stump was observed. Stringers of coal commonly splay off the top of the Herrin into the shale.

On the north side of the portal, Anna Shale about 2 feet thick overlies the Energy Shale with a sharp contact. Thickness of Energy Shale below the Anna varies from nearly zero to about 8 feet.

Sandstone overlies the Energy and Anna Shales with an erosional contact, and cuts down to the top of the Herrin Coal on the south side of the box cut. This sandstone is water bearing and at the present, is the greatest source of difficulty in mining. A further description of strata in the box cut will follow.

Structure. The coal is horizontal to gently rolling in the small area that has been mined. Small, high-angle faults and fracture zones were observed in the box cut; one small fault was seen underground. The fault underground strikes N 50° E and dips vertically, marked by pulverized coal and passing into a strongly developed set of orthogonal fractures N 40° W and N 50° E. This fault does not penetrate the lower part of the coal, but we later realized that its downward continuation might be offset by faults parallel to the bedding. In the box cut, a set of large fractures crosses the pit on a heading N 45 to 60° E, and dipping 70 to 80° SW. These fractures bear vertical striations. Additional faults or intense fracture zones were visible, but not safely accessible.

The box cut. In the box cut about 20 feet of Quaternary sediments (not examined) overlie about 150 feet of bedrock, which is almost entirely sandstone. As noted above, the sandstone rests with erosional contact on Anna Shale, Energy Shale, and Herrin Coal. This sandstone appears to represent a single depositional sequence filling a major channel or incised valley. Most likely, this is the Gimlet Sandstone.

Lithology: light to medium gray, weathering yellowish brown; fine grained

litharenite, abundant mica and clay matrix, porous and friable. Bedding is thick to massive, with large-scale planar crossbedding evident in the upper part and north-dipping lateral accretion surfaces at the base (and elsewhere).

Near the southeast corner of the pit and about midway between the bedrock surface and the top of the coal, is a block of fine-grained laminated or bedded rocks tilted at 30 to 40° and truncated by overlying sandstone. The rocks include shale, siltstone, thin-bedded sandstone, and limestone. The limestone is yellowish brown, sublithographic, and dolomitic. I believe it to be the Bankston Fork Limestone, and this is a slump block from the walls of the paleochannel.

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Notes by John Nelson on visit with Scott Elrick of ISGS, Howard Falcon-Lang of Royal Holloway University in London, England; Chris Fielding from the University of Nebraska, and Barry Sargent from Knight Hawk. September 15, 2009

We did not go underground, but confined our attention to the box cut. We were eager to get Chris Fielding's input as a sedimentologist on the channel features.

Barry told us that Knight Hawk has deferred the decision on where to cross the fault underground. In the meantime they will mine westward, dealing with split coal.

There wasn't much new for me to do except draw a sketch of the paleoslump near the southeastern corner of the box cut. Letters refer to sketch.

A - Anna Shale (black, hard, thinly fissile) and Lawson Shale (gray, siderite nodules common), more or less horizontal and believed to be in place below the channel and slump.

B - Interbedded shale, siltstone, very fine sandstone, and dolomitic limestone believed to be Bankston Fork. Strata are tilted and moderately deformed within slump blocks. These rocks are in fault contact with "A".

C - Shaly sandstone containing abundant ragged stringers of coal, in erosional contact with "A" and "B".

D - Massive sandstone (with a few shaly partings and coal stringers) overlying and truncating "B" and "C".

Slumping did not take place ina single event but at least two episodes. After slumping, eroded slump blocks were covered with coaly sand "C" before further movement took place, again truncated and covered by clean sandstone "D".

Bankston Fork is stretched and deformed into a series of irregular lenses. It was not fully lithified when the slumping occurred.