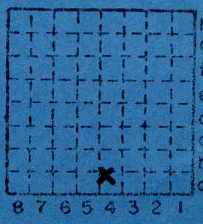
Amax Coal Co. Wabash Mine

AMAX COAL CO.
WABASH MINE

Mine Index No. 921
Coal Report No. S-1



Mine Index 921
WABASH COUNTY

MOORE'S MODERN METHODS

AMAX CC - WABASH

(Sheets) COAL PRODUCTION (Sheet)

Period Mo.	Day	Year	Mo.	Day	Year	Tons		
					1973		38	313
					1974		743	536
					1975	1	266	342
					1976	1	822	854
					1977	1	717	690
					1978	1	365	462
					1979	1	830	070
					1980	1	966	295
					1981	1	411	272
					1982	2	509	918
					1983	2	698	048
					1984	2	544	916
					1985	2	665	930
					1986	2	892	505
					1987	2	957	464
					1988	2	909	845
					1989	3	001	455
					1990	3	228	971
					1991	3	711	274
					1992	2	913	730
					1993	3	431	384

800' to coal at shaft.

(over)

SUMMARIES

No. to No.

Coal 7'8" thick.
Springfield coal.

Railroad, Wagon, Strip, Idle, Abandoned

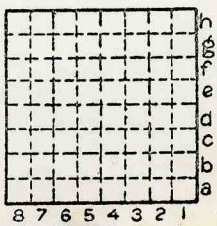
IDENTIFICATION

County No._____ Coal No. ☐ 5

Coal Report No. S-1

Quad.

County WABASH



Sec. 10

T. N. 2 S.

R. E. 13 W.

Index No.

COAL MINE—PRODUCTION

ILLINOIS GEOLOGICAL SURVEY, URBANA

(2732—2M—7-41)

Years	Tons
1994	3,993,838
1995	4,097,163
1996	3,239,695
1997	1,584,024
1998	1,389,309
1999	

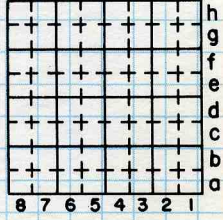
AMAX Coal Company, Wabash Mine

Face Channel Sample #1 (east side of air shaft), note: slope not completed.

Roof: Shale - Medium gray, well bedded and laminated, silty, firm, hard, one thin coal stringer about 1' above base.

Coal (Harrisburg No. 5) - Total thickness 7.8' detail description:

0'-0.45'	Coal - Normally bright banded, no obvious cleat fillings.
0.45'-0.46'	Pyrite band.
0.46'-0.85'	Coal - Normally bright banded, no obvious cleat fillings.
0.85'-0.86'	Pyrite band.
0.86'-1.04'	Coal - Normally bright banded.
1.04'-1.08'	Coal - Normally bright banded, prominent pyrite on cleats.
1.08'-1.37'	Coal - Normally bright banded, some pyrite on cleats.
1.37'-5.20'	Coal - Normally bright banded, minor kaolinite and very minor pyrite on cleats.
5.20'-5.50'	Coal - Hard, several thin dull bands.
5.50'-7.35'	Coal - Normally bright banded, minor calcite and kaolinite on cleats.
7.35'-7.37'	Shale - Gray, thins to 0.0' along face.
7.37'-7.80'	Coal - Normally bright banded, a minor



By MEH, GJA, RBN Date 4/11/72

Quadrangle Keensburg 7½'

County Wabash Sec. 15 T. 2S R. 13W

Assisted by O. E. Parks, J. E. Billman (AMAX), and Ken Villines (McGuire).

shale inclusion 0.3' from base.

Claystone (Seatrock) - Light to medium gray, hard, abundant rootlets, top 8" sampled.

Notes: Water present along interface of coal and roof shale; slight amount of oxidation (discoloration) observed along some fractures; some oil reported in water in the coal and the sump at base of shaft.

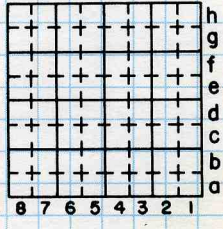
AMAX Coal Company, Wabash Mine

Face Channel Sample #2 (east side of air shaft, about 10'S. of Sample #1).

Roof and Floor same as Sample #1.

Coal (Harrisburg No. 5) - Total thickness 7.8' detail description:

0'-0.75'	Coal - Normally bright banded, no prominent cleat fillings noted.
0.75'-1.20'	Coal - Normally bright banded, pyrite abundant on cleats.
1.20'-2.90'	Coal - Normally bright banded, some kaolinite and pyrite on cleats.
2.90'-3.30'	Coal - Normally bright banded, prominent pyrite on cleats.
3.30'-7.80'	Coal - Normally bright banded, very minor kaolinite and calcite? on cleats.

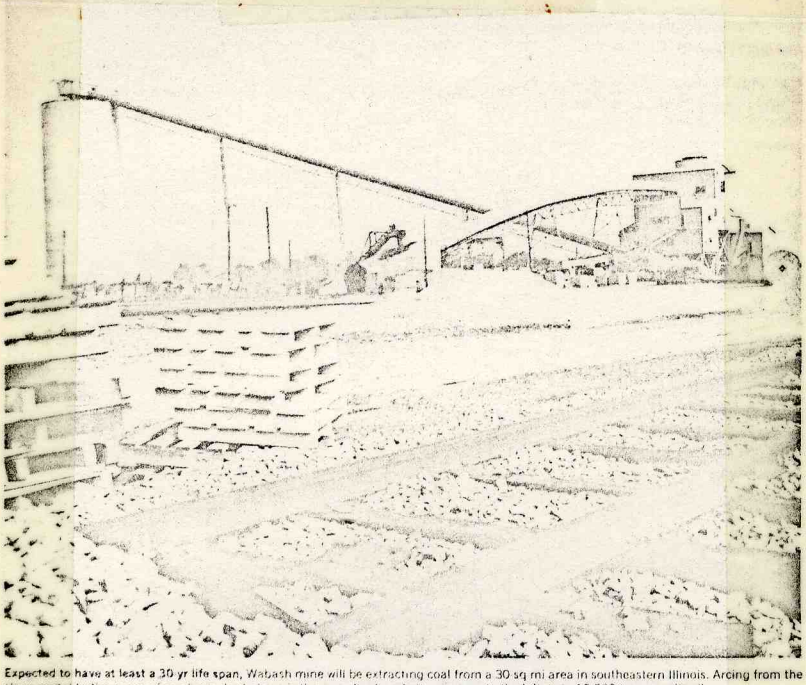


By MEH, GJA, RBN Date 4/11/72

Quadrangle Keensburg 7½'

County Wabash Sec. 15 T 2S R 13W

Wabash Mine
Coal Age September 1974



Expected to have at least a 30-yr life span, Wabash mine will be extracting coal from a 30-sq mi area in southeastern Illinois. Arcing from the slope portal to the raw coal crushing plant above is the main haulage belt conveyor; to the left, twin 12,500-ton capacity silos.

Third new mine in less than two years

Wabash mine begins contributing to the growth of Amax Coal

Destined to be a 3.6-million-tpy underground producer, Wabash joins Belle Ayr and Ayrshire as one of the company's newest mines. The sheer size and extent of this mine, moreover, has led to the development of an interesting concept in the overseeing of operations—"two-team" management.

Paul C. Merritt, managing editor, Coal Age

IT'S GOING TO BE A BEAUTY. It's also going to be a giant. That's the Wabash deep mine, one of Amax Coal's three sparkling new operations that have come on stream in the past 18 months alone.

Located in Keensburg, Ill., a bare five miles west of the river which gave the mine its name, Wabash is designed to be a 3.6-million-tpy producer at full capacity. This capacity figure puts the mine into the No. 2 slot among the 12 operating Amax mines (topped only by the mammoth Belle Ayr mine in Wyoming, where an almost-unimaginable 30 million tons will be mined yearly by the end of this decade), and among the top five underground coal mines on this continent.

Output going to Indiana utility

The only deep mine now operated by Amax Coal, Wabash began initial production on Oct. 17, 1973, when development work in the main entry commenced. This was just 22 months from the day of initial site construction at Keensburg, and 16 months after the closing of the Thunderbird mine, the only other deep mine worked by the company in recent years.

The Wabash coal is earmarked for the still-under-construction Gibson County generating station of Public Service Co. of Indiana, a 2.6-million-kilowatt facility situated on the picturesque eastern bank of the Wabash River. The mine will provide feedstock for the first two of four 650-Mw generating units, which are scheduled to go on stream in 1975, 1976, 1978 and 1979. In the meantime, the plant has been receiving and stockpiling Wabash coal since last May via a single unit train composed of 80, 100-ton-capacity hoppers. The train now makes the 10-mile round trip only two or three times a week, but this pace will quicken to an average of once a day, and then to twice a day as the generating units come on line.

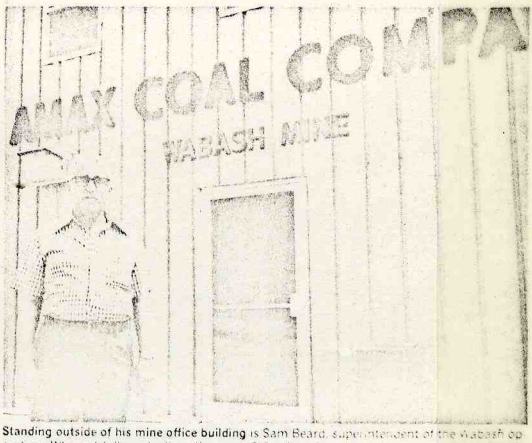
Brought into existence under the overall supervision of Ron Gaudiano, veteran Thunderbird mine superintendent and now Amax's general manager of deep mines, and Wabash Superintendent Sam Beard, a transplanted West Virginian who joined the company in 1971, this new mine has a projected 30-year life span as a producer, a life span that may be increased dramatically if overlying and underlying coal seams are ever mined.

Today's rate of production at Wabash is 4,100 tpd of marketable coal, about one-third of full production capacity. Employing continuous mining techniques and belt haulage from mine to plant, Amax removes contained rock in a McNally Pittsburg crushing and screening plant, then belts the coal to one of two twin silos for ultimate loading into the unit train. Driving of development headings in three working sections of the mine accounts for present production, but the first room-and-pillar panel is targeted to start this month. Eighteen such working sections will be set up over the life span of the operation, but only 13 to 14 will be worked at any one time.

Coal from the Illinois No. 5 seam

Amax's mineral leases at Wabash cover an area approaching 30 sq mi. The coal bed being tapped is the No. 5 Coal, lying about 800 ft below the surface. Average seam thickness at this site is 6½ ft, but locally the bed ranges up to a thickness of 8 ft. The mine roof is composed of 20-ft-thick gray shale; the floor, fireclay underlain by hardpan.

Varying from 100 ft to 200 ft above the No. 5 is the No. 6 seam, a 4½-ft-thick bed that could expand present Wabash reserves substantially when-and-if Amax makes a decision to mine it. In addition, about 300 ft below the present mine workings is the No. 3 seam, but its poorer composition and its 1,100-ft depth from the surface eliminates it from serious consideration as an economic source of coal anytime in the foreseeable future.

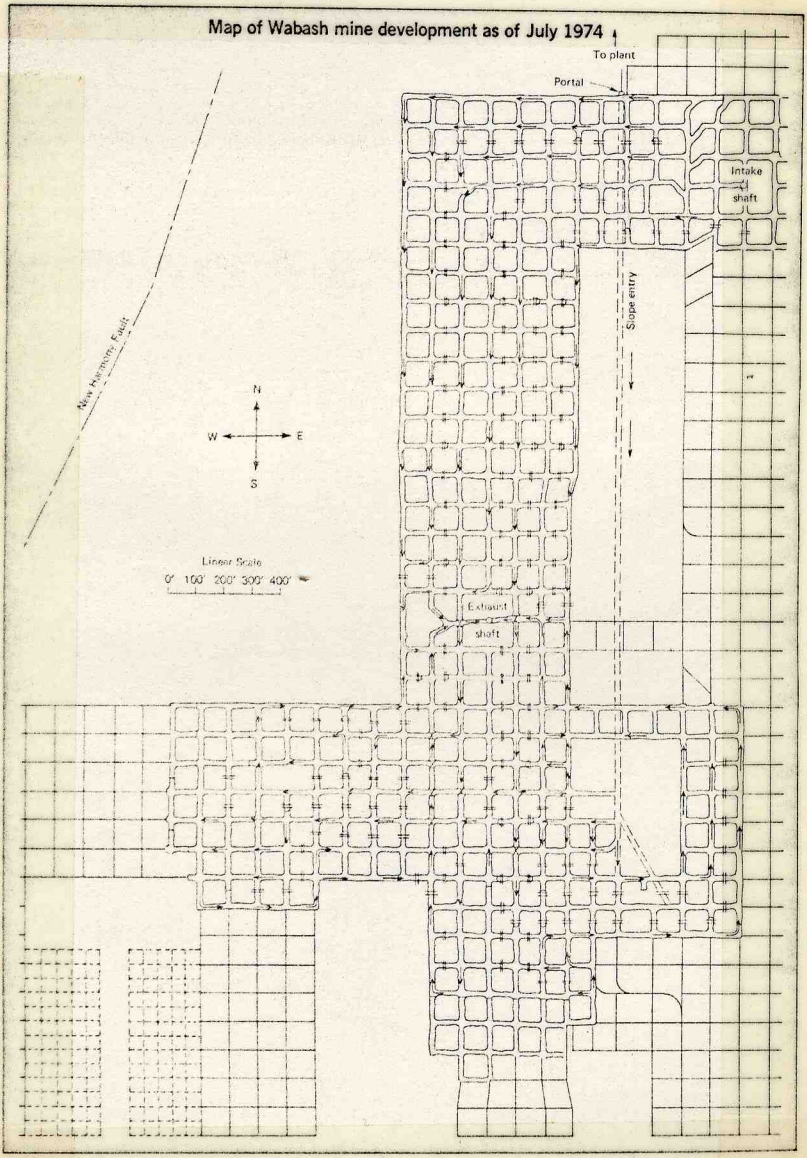


Standing outside of his mine office building is Sam Beard, superintendent of the Wabash operation. When at full production, this vast, 3.6-million-tpy mine will be run by two separate management teams, both responsible to the mine superintendent.

Amax engineers opted for continuous mining of Wabash coal. Present underground equipment includes Joy 12CM rotary drum units and a Marietta drum miner working with Joy 10SC22 shuttle cars and National Mine Service "Torkars." The cars, two in each of the three sections, feed to a Jeffrey-engineered conveyor haulage system equipped with 42-in. Goodyear and B.F. Goodrich belting on the gathering lines, and 48-in. belting on the main line.

Except for the miners themselves, everything enters and leaves the mine via a 17½-ft-dia slope entry that slants down to the seam at a

Map of Wabash mine development as of July 1974



17½° angle. Drilled by McGuire Shaft and Tunnel Corp. employing a Dresser-built tunnel borer, the 2,670-ft-long entry reached the seam in early 1973, and internal concreting and construction were completed several months later.

The slope is a "split-type" entry into the mine, allowing dual haulage methods. In the upper half, a concrete floor has been installed, on which the main coal haulage belt conveyor has been placed. Below the concrete floor, in the lower half of the slope, a 42-in.-gage track has been constructed to carry all equipment and supplies into the mine.

Miners' access to and from the mine is by way of the 796-ft-deep, 20-ft-dia intake air shaft. This structure, connected directly to the wash house, is equipped with a 150-hp hoist, from Connellsville Corp., that operates a 60-man-capacity, single-stage elevator. Between the base of the shaft and the working areas of the mine, the men will be trammed by rail.

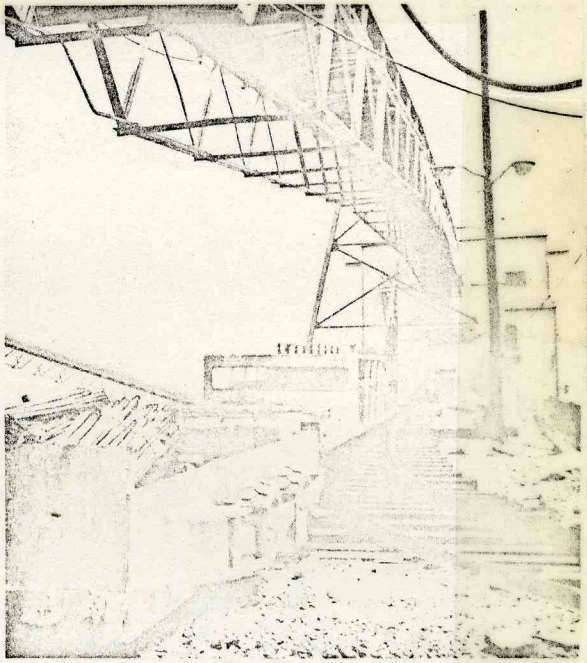
The mine entry (termed "South Main" at Wabash) is composed of six intake and seven return entries (see accompanying mine map). Submains have seven headings (three intakes, four returns), and all panel entries will have five headings. Breakthroughs are presently made on 100-ft centers.

Undecided at this moment are the final dimensions of the working panels. The first panel entries, however, will be driven 18 ft wide on 100-ft centers.

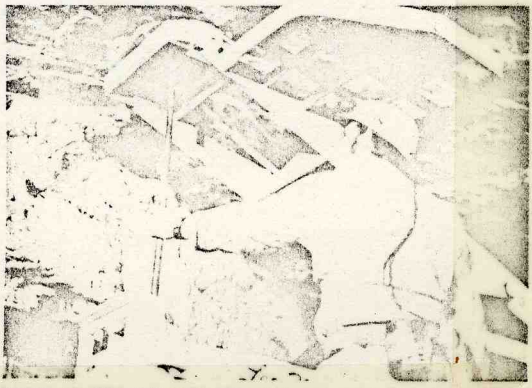
When operating at full capacity, the Wabash mine will have 41 machine shifts daily—14, 14 and 13. "Cycle" mining, whereby the machine operator always remains under the roof-bolted area, will be employed. Amax presently limits the number of places to be driven at any one time by any one machine, to two.

All coal will be taken from roof to floor of the seam in each heading. On the other hand, to avoid caving the upper No. 6 seam—which may be mined at some later date—and to avoid surface subsidence of valuable farm land, pillar recovery will not be practiced. As a result, total coal mined at Wabash probably will not exceed 50% of that in place.

Conventional roof bolting is used at this mine, the average today



All equipment and supplies will enter the mine by rail along the slope portal. Within the slope and above the 42-in. gage track is the 48-in. belt which feeds to the crushing plant.

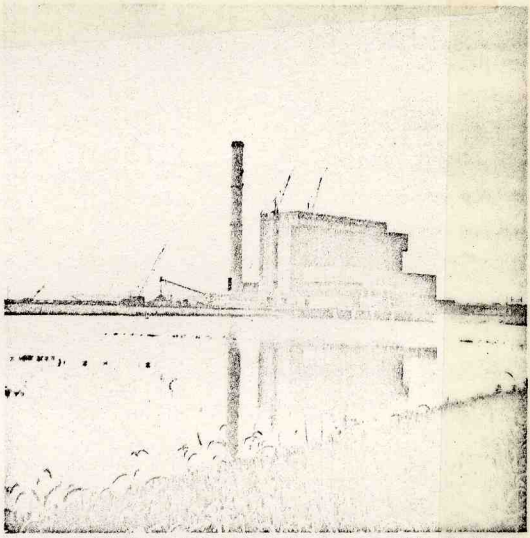


Presently, each shift in each working section installs approximately 145 roof bolts daily into the 20-ft thick gray shale roof. Each section employs two rotary drilling units.

being about one bolt per linear foot of development. Each shift in each working section installs approximately 145 bolts daily, using two Lee-Norse "Top Dog I" or two single-boom Galis 320 self-propelled rotary drilling machines.

Spent air is exhausted from the mine by two 96-in. Jeffrey Aerodyne fans. In the mine, each working section has a double split, with 40,000-48,000 cfm delivered to each split. Design considerations have been taken to insure that when full production is achieved, a minimum of 25,000 cfm will be supplied to every split, or 50,000 cfm per section.

The mine receives its electrical power from a public utility in the nearby town of Mt. Carmel. That generating plant transmits 69 kv to the permanent substation at Wabash, where it is stepped down to 12,470 v before subsequent distribution on-site. Within the mine itself, wheel-mounted transformers (one in each working section) step the voltage down to 550 v AC for powering the continuous miners and 250 v DC for shuttle cars.



The consumer of the Wabash mine coal will be the 2.6 million kilowatt Gibson County generating station of Public Service of Indiana. An Amax-owned unit train services the plant.

Crushing/screening plant removes rock only

A raw-coal crushing plant, designed and constructed by McNally Pittsburg, is located approximately 500 ft north of the mine portal. Coal is to be delivered from the mine by the 48-in. belt at a rate of 1,500 tph, and passed over a 10-ft-wide McNally single-deck shaking screen equipped with 1½-in. round hole perforations.

Undersize from the screen goes to a 48-in. gathering belt, while oversize is delivered to two McNally 10 x 24-ft rotary breakers for further reduction to 1½ x 0. Oversize (rock) is rejected, and undersize is combined with the undersize from the shaking screen and conveyed through an automatic sampler station to Wabash's two 12,500-ton-capacity silos.

These twin structures, each 190 ft tall and 70 ft in diameter, were designed and built by First Colony Corp. Flood gates installed in the silos permit a continuous loading capability of up to 5,000 tph for the unit train, permitting it to fill all its 80 cars in about 95 min.

Credit goes to good miners

Over the life span of the mine, coal content is expected to be as follows:

Moisture	14.50%
Ash (as received)	10.40%
Volatile matter	30.16%
Fixed carbon	44.94%
Sulfur	1.48%

(Pyritic–0.81%, Organic–0.63%, Sulfate–0.04%)

The heat content of the coal now being mined is slightly in excess of 11,000 Btu per lb.

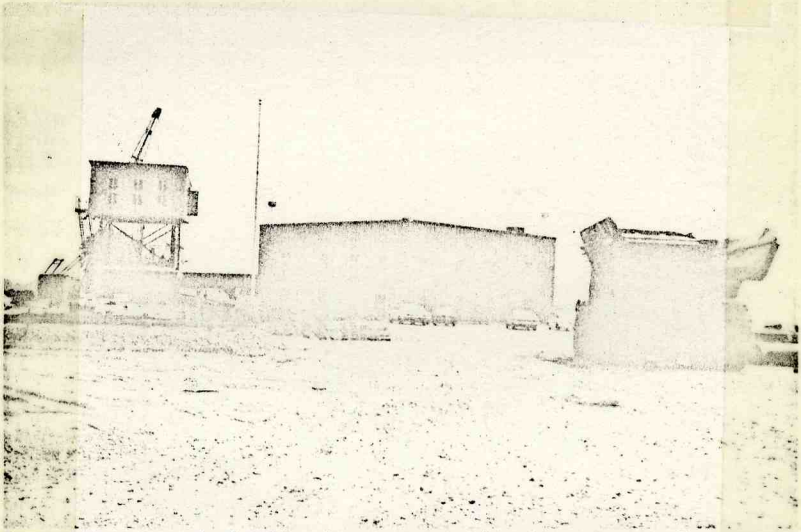
Additional portals to be constructed

How does Amax Coal plan to operate an 18-section, 3.6-million-tpy mine, surely a formidable task at best? "We're going to run it essentially as two independent mining operations, each using different portals but sharing common track and belt haulage systems," reports R.E. Samples, senior vice president of operations for the company.

Basically, this approach calls for dividing the mine into two "management units," each unit composed of a general mine manager, six assistant mine managers, and section foremen. The two general mine managers, in turn, will report to the top man on-site at Wabash, the mine superintendent.

Each of the two management teams will be assigned to operate a large working area within the mine, areas best designated by portal locations. Today, a new shaft drilling operation is underway 10,000 ft south of the slope entry. When completed in 1976, this site will have a set of two new shafts (one intake, one exhaust), each 20 ft in dia and approximately 800 ft deep.

As at the present site, the new portals will "service" another group of nine working sections and be managed by one of the two management teams. (The other team, of course, will be operating the original nine working sections in the area of the slope entry.) Access to the new workings will be via the new intake



Shown to the left of the Wabash mine office building and above the mine intake shaft is the hoist room from which a 60 man capacity man cage is controlled. Connected directly to the wash house, the nearly 800 ft shaft will serve as the mine portal for all personnel.

shaft, but all coal haulage from the working sections will go by belt along the South Main to the slope entry and thence to the crusher plant.

Two other sets of similar shafts are also in Amax's plans for the Wabash mine. The first of these will be located another 10,000 ft south of the new shafts now being drilled, and these should be finished in 1977. In 1978 the final set of twin circular shafts will also have been drilled and completed. This set will be located about 10,000 ft east of the portals now being drilled, placing it geographically in Indiana. It will be joined to the South Main haulage system by the so-called "East Main" to be driven under the Wabash River. By the time this eastern portion of the mine achieves full production in its nine working sections, the original workings now being mined in the area of the slope entry will have been exhausted, and all equipment now in use there will have been shifted to this new area of the mine. And, of course, the management team responsible for the slope entry of the mine will have shifted to the eastern mine area.

Once this final stage has been accomplished, the present site, depicted in the photographs accompanying this story, will only be used for the coal crushing/screening plant and unit train loadout.

Production rate averaging

17.4 tons per manshift

At the present time, Wabash is being worked three shifts a day, five days a week, by a 185-man force, most of them with prior underground experience. It is expected that the total work force will approach 800 (670 of them miners) as the mine itself approaches designed capacity.

Since the first of this year, Wabash output has been about 17.4 tons per manshift. When queried by COAL AGE about this above-average figure, Beard pointed out, "It's a safe mine, so we've had no walkouts to speak of, and absenteeism is very low. Most importantly, we've got good miners—aggressive miners. That's why we've done so well."

For that matter, the entire company has done well. In the five years that have passed since Amax became a major factor on the American coal scene by acquiring Ayrshire Collieries, the firm has—or is—adding 15.5 million tpy to its coal-producing capacity. During the same period, output has jumped from 11.2 million tons to a COAL AGE estimate of 22 million tons this year.

With further expansion now scheduled in the western coal fields, and new mines such as Wabash coming on line in the Midwest, it is obvious that this growth will continue. Just where Amax Coal will ultimately rank among this nation's coal producers 10 or 15 years from now can't be predicted with any accuracy at this time, but it is quite apparent to industry observers that the drive and determination of Amax Coal's management—factors which propelled the firm from 11th place among all North American producers in 1969 to the No. 5 spot last year—are themselves growing. ■

AMAX COAL COMPANY WABASH MINE-WABASH COUNTY, ILLINOIS.
January 18, 1979
Notes by John Nelson on visit with John Popp, accompanied by two engineers from Amax; Dana Meier and Steve Dickson.

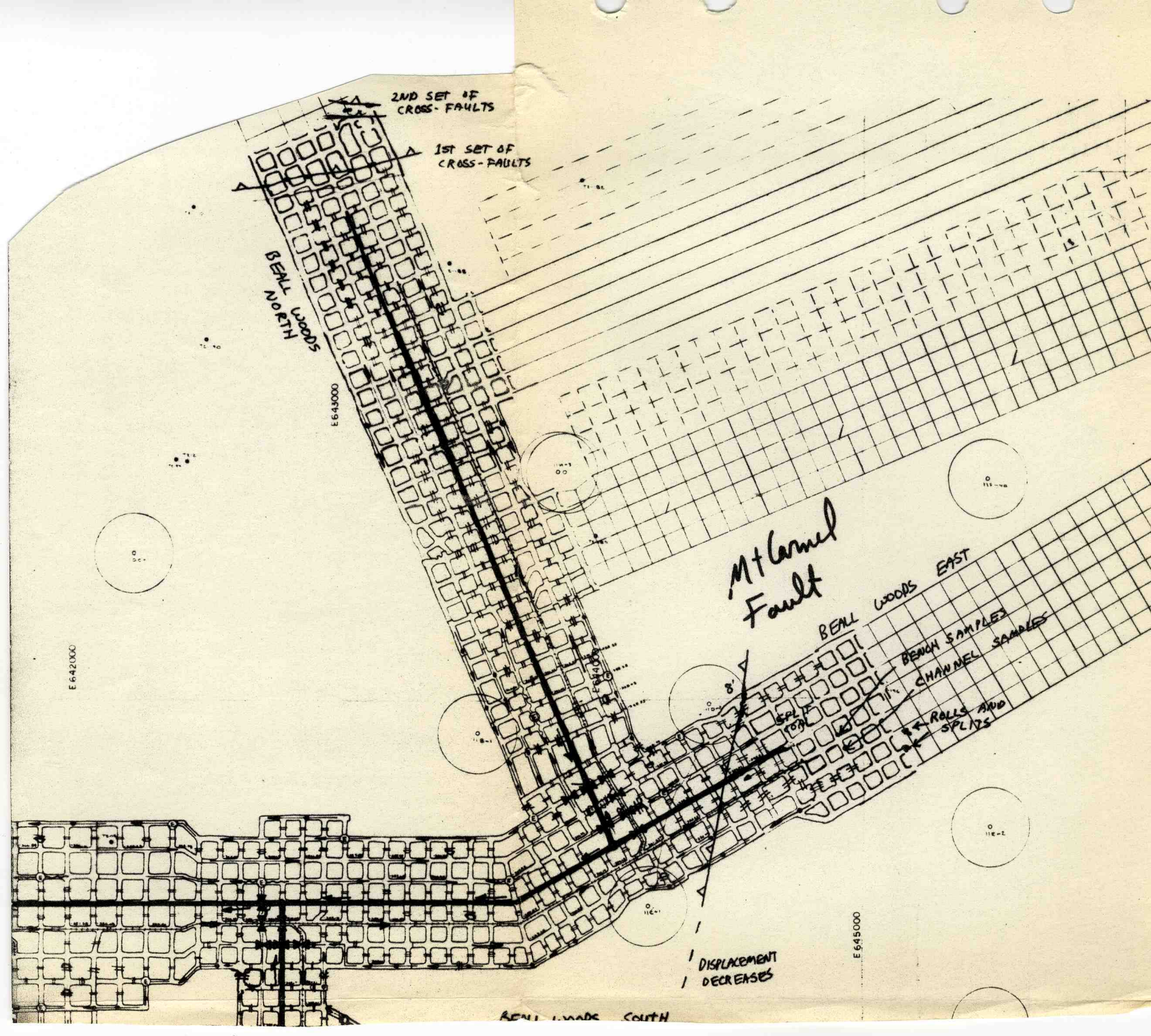
Purpose of visit is to examine faults and other geologic features of interest, and also to take coal samples.

The mine lies within the Wabash Valley Fault System of which the main faults trend NNE. The mine is bordered on the west by the New Harmony Fault, which has 60 feet or more of displacement. Amax does not intend to mine across this fault. To the northeast of the present workings another major fault, the Mt. Carmel Fault, has been located by drilling. A fault believed to be the southern tip of the Mt. Carmel Fault has been crossed by a set of entries, and this we examine. We also study some east-west trending cross-faults which have recently been exposed in the northernmost end of the mine.

We also see several examples of splits in the coal, and related features. The north end of the mine is less than a mile from a major channel that was contemporaneous with the coal (the Galatia channel).

The mine, in the Harrisburg (No. 5) Coal, is more than 800 feet deep at the shaft. There are 10 working units in the mine, all with continuous miners. Coal moves by belt, men and materials by rail. The workings are all room-and-pillar, in panels. Several methods of robbing the pillars have been attempted. In some early panels they tried making two cross-wise cuts completely through each pillar. This led to a squeeze. More recently they have tried taking one cut off the side of each pillar, and have experimented with making smaller pillars (70-foot centers) on first mining. Both methods have been more successful, but only about 50% recovery is being achieved.

The roof is gray shale or siltstone (Dykersburg). It is known to thicken northward toward the channel, with a corresponding decrease in sulfur content of the


2ND SET OF CROSS-FAULTS
1ST SET OF CROSS-FAULTS
BELL WOODS NORTH
E643000
E642000
E644000
Mt Carmel Fault
BELL WOODS EAST
BENCH SAMPLES
CHANNEL SAMPLES
ROLLS AND SPLITS
SPL TOP
8'
DISPLACEMENT DECREASES
E645000
BELL WOODS SOUTH

coal. In the southernmost end of the mine, 3-4 miles from the shaft, Amax anticipates high-sulfur coal and black shale-limestone roof. In the present workings, roof conditions are said to be quite good except where faults or splits of coal in the roof are present.

Another problem at this mine regards oil wells. One area could not be mined due to the large number of wells. In other places main entries have been diverted to avoid wells. Amax can mine within 50 feet of a plugged well or 100 feet of an active well, with the permission of the owner. If they do not obtain permission they must stay at least 150 feet away from the well.

Mt. Carmel Fault

We examine the Mt. Carmel Fault and associated fractures in the "Beall Woods East" heading. The fault dies out to the south, and in the "Beall Woods South" heading is said to be present only as a "roll" (see map).

In the track entry the fault trends 062/82°W and the northwest block is downthrown 6.0 feet, making it a normal fault. There is almost no drag, and only a thin zone of gouge.

Two sets of slickensides are visible on the fault along the north rib of the entry. A coarse set of striations trends in dip direction and a fine set runs nearly horizontal, plunging 10-12 degrees to the south. The latter set apparently is younger as it is better defined. If the west block moved downward during horizontal slippage, the movement was left-lateral.

To my knowledge no indications of strike-slip or oblique movements have been found previously on the Wabash Valley Fault System.

West of the main fault are many parallel high-angle fractures with no visible displacement. These have slickensides in dip direction. Most dip eastward and many are relatively shallow in dip at the roof line

East of the main fault two sets of fractures can be seen in the roof, one set parallel, the other roughly perpendicular with the fault. About 100 feet east of the fault is a small normal fault parallel with the large fault and downthrown a few inches to the east. Slickensides trend in dip direction only.

In the northernmost entry the large fault trends 020/79° W and has about 8 feet of displacement. Again it shows two sets of slickensides, one nearly horizontal and the other vertical. Here the vertical striae are finer and appear to be younger than the horizontal ones. The fault plane is sharp and straight, with no drag and a variable thickness of gouge.

In the crosscut between this entry and the next entry south (1 and 2) no consistent direction of striation is seen on the fault. The gouge zone is wider than at the other places we have seen the fault, and parallel with the main break are many small faults and fractures. The overall displacement is about 8 feet. Some blocks or slivers appear to have rotated during movement.

Split Coal

A major split in the coal begins about 100 feet east of the Mt. Carmel Fault along the track entry of Beall Woods East. The split begins 4.5 feet below the top of the coal and thickens from a feather edge to several feet within a short distance. The miner has followed the upper bench of coal, which varies from 4.5 to 6.0' thick and turns uphill above the split. The split consists of siltstone or fine-grained sandstone, medium gray-brown, hard, massive, micaceous, with abundant carbonaceous debris, plant fragments, amd stringers of coal. The split ends quite abruptly; the coal is benched for a sort distance beyond the edge of the visible split. The maxiumum observed thickness of the split is 4-5 feet.

The split material is quite similar lithologically to the roof material. The roof contains rather more shale than the splits, and has numerous large plant fossils including large stems, logs, and sections of bark.

Locally in the roof fine layers of light gray sandstone are interbedded with the darker siltstone.

Toward the east the split may end, but this is not certian. Possibly the split still exists, and only an upper bench of coal is being mined.

Bench Samples

A set of eight equal bench samples was taken from the coal at the location marked on the map. Each sample includes about 8 inches of coal (total thickness of seam 6.2').

Roof

0.20' Siltstone, medium gray, hard, micaceous, finely laminated, sideritic, minor plant debris.

0.20' Shale, very dark gray, hard, brittle, thinly laminated, coaly, with many thin vitrain streaks abundant plant debris.

0.29' Coal, N.B.B., blocky, highly fractured, contains traces of white to brownish calcite.

0.05' Pyrite, fine grained, thinly laminated, with partings of coal and shale. A lenticular band. Excluded from sample, bagged separately.

5.86' Coal, N.B.B., blocky, highly fractured. Cleats trend 035° and 090°; also fractures trend about 065°. Considerable white to light brown calcite and a little crystalline pyrite on cleats, especially in the upper part of the seam (benches 2 and 3). Several fusain lenses just above middle of seam, in Bench 4. Coal is under pressure- bursts out as we take the sample.

Floor- Sandstone, medium gray, very fine-grained, thinly laminated, shaly, micaceous, carbonaceous, with abundant plant debris. Possibly a split, with more coal beneath.

Channel Sample

Taken in crosscut 50-60 feet south of bench samples (see map). No exclusions.

Roof- Siltstone, medium to dark gray, thinly and irregularly laminated, argillaceous, micaceous, very carbonaceous, with many thin coal stringers and abundant plant debris.

0.5' Shale, very dark gray, hard, brittle, coaly, almost a bone coal, contains abundant laminae of vitrain. Irregular contact:

5.55' Coal (Harrisburg No. 5), N.B.B., fractured, white calcite and a little multi-colored crystalline pyrite on cleats. Discontinuous fusain bands near middle of seam. 0.01' dark gray shale about 0.20' above the base. Cleats trend mainly 075-090°.

Floor, as at bench sample; or possibly the top of a split.

Splits and Rolls at Face

On the right-hand (south) entries of Beall Woods East the miner is encountering more split coal, along with rolls and coal "riders" in the roof making difficult mining conditions.

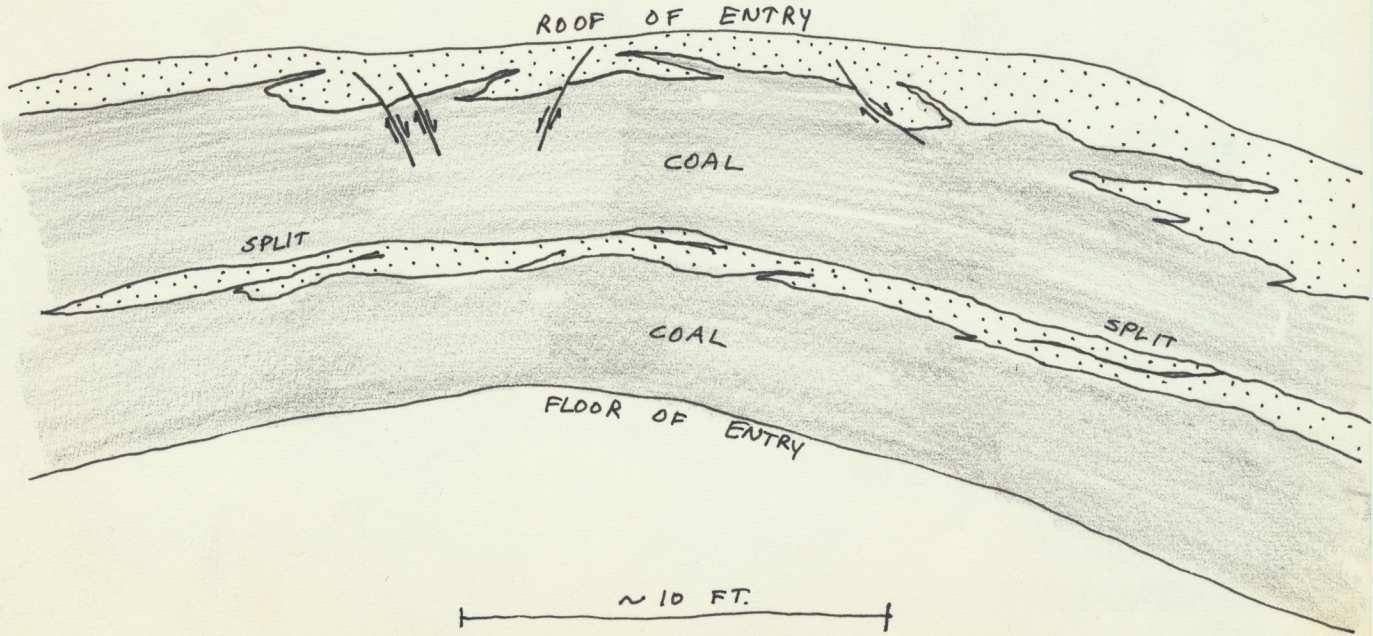
Near the face of the 7th Entry (2nd from south) an irregular layer of hard gray siltstone appears near the middle of the coal and averages about one foot thick; locally more. The top of the seam also is split, splaying into the roof. Many slips and small rolls are present, mostly trending N-S to NNE. The upper layers of coal appear to be pinching out toward the face as the splits widen. The rolls and slips weaken the roof. In the top coal many extension fractures filled with calcite (?) strike at right angles to the slips and rolls. The coal seam pitches downward at the face.

In the crosscut turning south off the 6th entry toward the 7th entry, the coal seam pitches upward and thickens to as much as 9 feet, but the top is split

WSW

SPLITS AND ROLLS
NEAR FACE OF 7TH ENTRY
OF BEALL WOODS EAST.

ENE



and very rolly. At the face the coal levels out but the splits increase in thickness so only about 4 feet of coal is exposed at the southeast corner. The roof is gray shale or siltstone with thin laminae of light gray sandstone, and many large fragments of fossil logs etc. Many slips trend north-south here. The lower part of the coal is not split, as in the 7th entry.

At the face of the 1st entry there are multiple splits which in places are more than 2 feet thick. The splits are in the lower half of the coal. The entire exposed seam, including splits, is at least 9 feet thick. More probably has been left in the floor.

Cross-Faults in Beall Woods North

Two sets of cross-faults are present. One set, to the south, already has been mined through. Another set is now being encountered at the face of the two eastern most entries.

On the track entry the southern set consists of two large faults trending 085/70° N, with 3 feet and 5 feet of throw. Both are normal faults with no drag, thin gouge, and many closely-spaced parallel fractures. No definite slickensides can be seen.

The entry is graded into the floor exposing a lower bench of coal 0.7-0.8 feet thick below a 4-foot layer of hard, massive gray siltstone. Below the lower bench of coal is more siltstone. Other minor partings and beds of siltstone occur near the base of the main seam.

Along with the faults are many closely-spaced fractures trending 075-083° in both coal and rock. Also an occasional 025° set of fractures-this direction is parallel with the main faults of the Wabash Valley Fault System.

In the entry east of the track there is one large fault with about 8 feet of throw. Its trend is 079/58° N and there are many parallel fractures or faults with little or no displacement. The gouge zone is up to

two feet wide; no definite slickensides are seen.

Two entries west of the track the main fault is 7-8 feet down to the north and there is a second fault with about a foot of throw down to the south, making a graben. Both faults have well-developed slickensides in dip direction. In a few places other directions of slickensides are seen, but they are minor. Many smaller faults and fractures run parallel with the large ones.

In the westernmost entry again the main fault has about 7 feet throw down to the north, and smaller faults lie north of the main fault. One of these has about a foot of throw to the north, another has a foot of throw to the south. All faults have vertical slickensides.

The roof is well-exposed near the faults and is seen to consist of siltstone, medium gray, with very fine and faint perfectly parallel and even laminations. Some bands are darker due to finely divided plant material. The laminae almost look like glacial varves.

In the two easternmost entries (the 7th and 8th entries) the second, northern set of cross-faults is being exposed by mining.

In the 8th entry one small fault has already been mined-through. It trends 095/53° N and has about a foot of throw down to the north. A second fault, also down to the north by at least the thickness of the coal seam (6-7 feet) is partially excavated at the face. The roof bolter presently is pinning the top at the face.

In the 7th entry the continuous miner is working but we can see that one large fault has already been crossed. It trends about 084/31° N and has 7 feet of throw, down to the north. This fault has an unusally low angle of dip. It is probably the same fault at the face of the 8th entry.

The miner is digging into the hanging wall of another fault with similar strike and dip. No coal is visible at the face. Probably the seam lies below

the miner, if it is a normal fault like all the others.

We can also see that a 1-foot bench of coal lies about 6 feet above the main bench in the roof. Several thin layers of siltstone occur in the lowermost part of the main bench.

The rock layers in the fault zone dip gently southward, opposite the direction of throw on the faults. See sketch in John Popp's notes.

Location of Bench and Channel Samples

Approx. 614,800' N, 644,900' E in Ill. State Plane Coordinates, or 100' north, 200' west of the center of Section 11, T.2S-R.13W, Wabash County.

Theories on Faulting

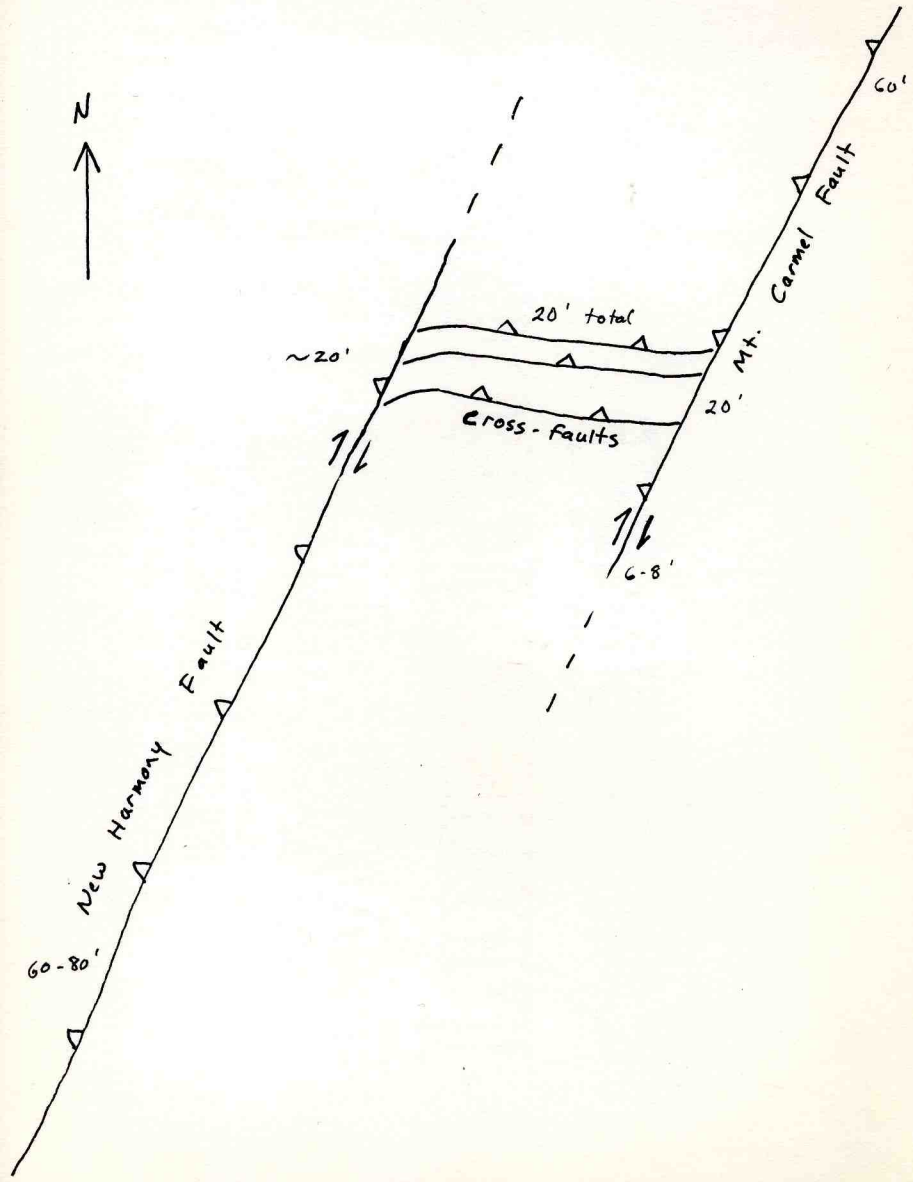
The diagram (over), showing the generalized pattern of faulting in the northern part of the Wabash Mine, suggests an explanation for the structures.

The Mt. Carmel Fault, trending east of north, is downthrown to the northwest and is known to increase in displacement toward the northeast. The New Harmony Fault strikes parallel with the Mt. Carmel Fault and is downthrown in the same direction. The New Harmony Fault, as mapped from subsurface data, is known to increase in throw to the southwest and die out to the northeast, as indicated in the diagram.

The cross-faults are downthrown to the north and apparently connect the Mt. Carmel and New Harmony Faults, as shown. With the two large faults they show a consistent direction of displacement (downthrown in the northwest quadrant). The overall displacement of all three sets of faults appears to be roughly the same, about 20 feet, at the point where they connect.

This suggests that the Mt. Carmel Fault, the cross-faults, and the New Harmony Fault are all in effect one continuous fault, forced for some reason to divert from a straight line. Along the cross-faults the direction of maximum extension shifts from

Inferred pattern of faulting in Wabash Mine. See text for explanation.



WNW-ESE to N-S. The extensional movements account for the horizontal slickensides observed on the Mt. Carmel Fault in Beall Woods East. The horizontal movements are thus secondary to the vertical displacements. No large-scale strike-slip movements are indicated or required by the evidence.

Janis Treworgy, who with Hubert Bristol has made a major study of the Wabash Valley Fault System, says ours is the first positive evidence for the existence of cross-faults in the system. Also she says we are the first to find any indications for horizontal movements.

AMAX COAL COMPANY-WABASH MINE, WABASH COUNTY
January 18, 1979

Notes by Popp on a visit with C. J. Nelson and Dana Meier, engineer, and Steve Dixon, surveyor, both with AMAX.

The Wabash Mine is about 5 years old and is working in the Harrisburg (No. 5) Coal at a depth of about 800 feet. The mine has ten continuous miner sections, and two entrance portals which are referred to as Wabash 1 and Wabash 2.

The purpose of this visit is to look at the faults of the Wabash Valley Fault System, to look at general mining conditions, and to collect bench and channel samples. Typically gray shale (Dykersburg shale) covers the entire mine property. The No. 5 Coal can be split, and usually the lower split is thin and in the floor. The splits are the result of the presence of a channel to the north that was active during deposition of the Harrisburg Coal. Don Eggert of the Indiana Geological Survey has also visited this mine to look at the split coal and the character of the roof rock. The "channel" more or less forms the north boundary of the mine property.

Coal recovery is limited to 50%. The company had achieved this by driving entries on 80' centers and then slabbing the pillars during retreat. Due to floor squeezing, the company now obtains 50% recovery by mining on 70' centers without any secondary recovery.

All ribs are pinned with 3' header boards. This rib control is required by law for the coal height and because of the shattered nature of the coal. The pins don't seem to do much good; the lower split falls out regardless of the pins.

The Wabash Fault System cuts through the mine property from northeast to southwest. The fault system consists of two faults here: the New Harmony and Mt. Carmel faults. The faults are down to the northwest and are normal faults.

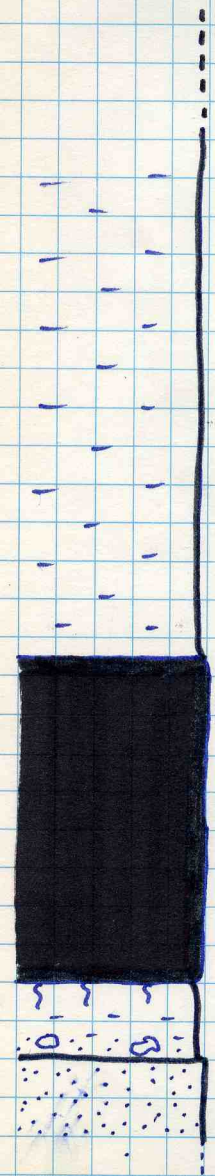
We first went to the mains of Beall Woods East where the New Harmony Fault crosses the mines. The fault is oriented at 033°/82NW, and displacement is 6.0 feet. Nelson reports two sets of slickensides, one vertical and the other is almost vertical. Coal thickness at this location is 8.5 feet. A shaley siltstone parting appears in the coal about 4.5' from the top of the seam, and is thickening to the northeast. Farther in by the entry has been graded, and where the parting is thick only the upper split has been mined. Although the thickness is variable the upper bench is about 5.3-5.4 thick.

The rock partings consist of gray siltstone which is hard and carbonaccous with plant debris. The partin is split itself by a 0.5' coal split. See ne next page for an idealized sketch of what may be happening. Drill holes nearby confirm this type of split coal, thick upper bench and thin lower bench. I believe this parting is similar to the split I've seen at Burning Star No. 5 mine (Jackson County) in the Herrin (No. 6) coal. The thick coal is benched and seems to belie the upcoming rock split. The split rock represents infilling of sediment along the bedding plane separating the upper and lower benches. The fact that there are two rock splits indicates repeated influx of sediment.

The shale above the coal is silty and highly carbonaccous with bark impressions at the roof contact.

Another split coal area was encountered in the 6th and 7th Entries of BWE. The coal elevation rises several feet, and a gray, silty, micaceous shale parting splits the coal about halfway up the

AMAX COAL COMPANY - WABASH MINE
BEALL WOODS EAST MAINS
JANUARY 18, 1979



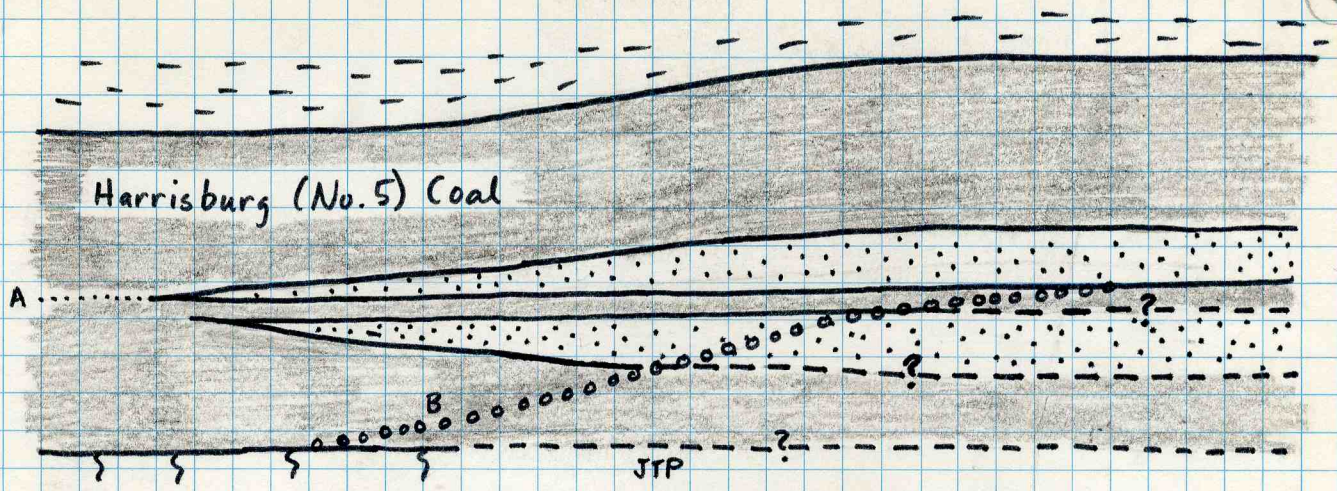
Shale, (not well exposed), carbonaceous, silty

Coal, Harrisburg (No.5), 8.5', n.b.b., highly fractured and ribs are pinned. Coal appears to have a benched appearance; upper bench is about 3', and lower bench is softer than upper. May have a parting.

Underclay, ~2', greenish-gray to gray, slickensides, carb. w/plant frag. and some coal stks; contains nodules at base and grades into:

Underclay siltstone, 2.2'+, light gray, hard, micaceous

AMAX COAL COMPANY - WABASH MINE
BEALL WOODS EAST



This is a sketch of split coal along the track entry in Beall Woods East. I have compacted the view so that the lateral changes appear to occur more rapidly than is the case. I have dashed those portions of the sketch where there was no exposure, and the sketch is postulated. The dotted line (A) represents the bedding plane parting separating the upper and lower benches. The line of circles (B) represents the approximate entry grade.

seam. The upper bench appears to thin. A test hole nearby (200') shows just the opposite geology- a thick upper bench and thin lower bench. The roof rock has gone to the dogs where the upper bench is in the roof. The roof shale and coal is differentially compacted and as a result the roof rock is falling out. Although the roof is standing immediately after mining, it won't remain in place long.

Ribs in this area are in pretty rough shape also. Immediately after mining the ribs begin to rash even with pinning. Where we took our coal samples the coal was snapping. I imagine the condition of the ribs may be the result of the faulting, depth and differential compaction due to splitting. The coal is much more highly fractured than at Sahara No. 20 and Eagle No. 2 Mines; as a result it was much easier to take samples.

Farther to the northwest in these BWE Mains is additional split coal. Where the splits thin out the coal is as much as 9-10' thick.

In the No. 1 Entry of BWE we measured displacement along the fault to be 7.8' and as orientation of 020°/75W. Fault shows mostly vertical slickensides with some horizontal slickensides.

Beall Woods North (BWN)

We walked into BWN and encountered another rock split. The rock split is in the lower portion of the seam rather than the upper or middle portion of the seam as in BWE. Two partings are present, and they consist of gray, micacious, hard, shaly siltstone.

A set of faults cut across the mains, and the faults trend nearby east-west which is nearly at a

right angle to the Mt. Carmel and New Harmony faults. In the track entry the main fault had an orientation of 085°/70°N. Total displacement is about 8.1 ft. A well-developed set of slickensides is dipping to the east.

I didn't see any mineralization along the fault plane; rather there is a clay-shale/coal gouge. The roof remains very stable. The roof rock is shale, with 0.35 ft. of dark gray shale and coal laminations at the coal contact, and 4.7+ laminated gray shale above.

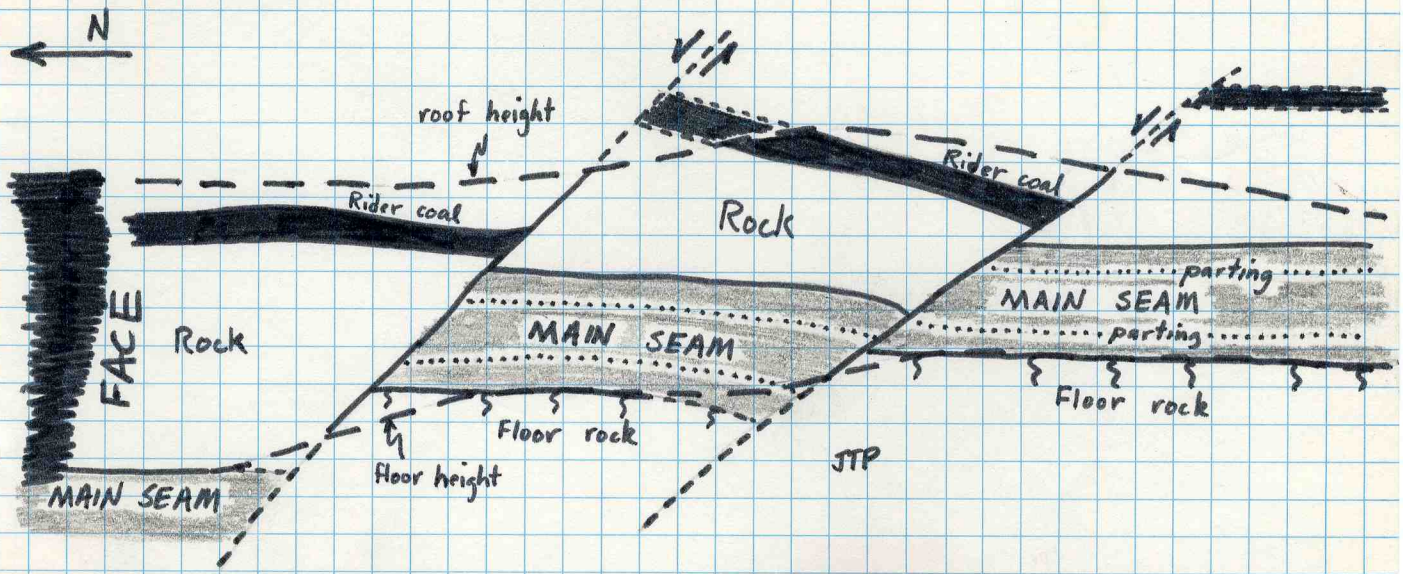
The area is dripping water, but is not really wet.

We looked at the fault exposures in the entries to the west. A second fault is present, and it differs from the other cross-fault because displacement is down to the south. The displacement is about 1'+ and orientation is 095°/59°S. Slickensiding is mostly in the dip direction, but there is faint horizontal slickensiding. Although there is no drag there is some antithetic fracturing.

In the outside (virgin)entry there is gas hissing both from the floor and from the outside rib. I doubt that the gas is associated with faulting, but rather with virgin coal.

We briefly examined two more crossfaults in the eastern most entries. The exposures were limited by the mining and roof-bolting activities. I made a sketch on the next page of what the faults looked like.

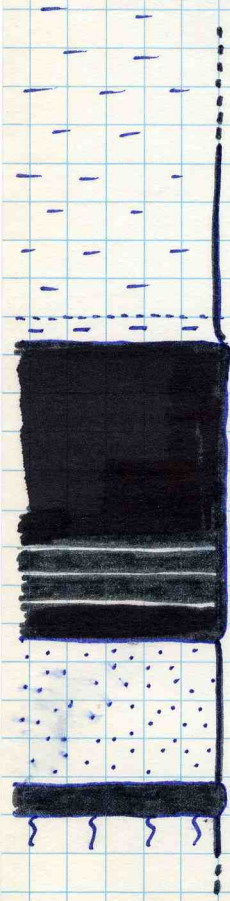
AMAX COAL COMPANY - WABASH MINE
BEALL WOODS NORTH
No. 6 ENTRY



Rough sketch, not to scale, of cross-faults in No. 6 Entry. Contacts are dashed where not known.

AMAX COAL COMPANY - WABASH MINE
BEALL WOODS NORTH
JANUARY 18, 1979

Section described at a fault exposure, No. 4 Entry.



Shale, Dykersburg, 5.1'+, gray with a lower 0.4-0.5' dark gray shale unit, very well bedded and firm in places whereas other places it is weak due to plant debris on bedding planes

Coal, Harrisburg (No. 5), 7.6', n.b.b. with partings in basal few feet

- 0.05'
- 0.01'
- 0.05'

partings consist of gray siltstone to silty shale.

Siltstone, 3.6',

Coal, 0.7',

Underclay, 1.0'+

Amax-Wabash Mine
Description of bench samples taken in the mine by J. Nelson

Bench 1
CP2097
C20508

(Top of No. 5 seam)
Clarain, bright, clean coal, no fusain observed. Vitrain, 2 or more prominent layers, 3 to 5 mm thick, with cleat bearing kaolinite (non CO_3). Shale, black with dull coal 7 mm. Other shale partings occur. Pyrite in this bench was all concentrated in a single lense and was sampled separately in the field. This lense was in two parts:

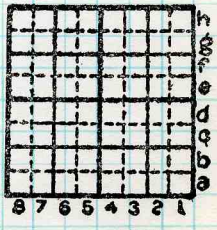
#L1950

Specimen taken, typical of the clarain with vitrain and some concentrations of vitrain.

CP2097*

B2
CP2098
C20509

Clarain, bright, with vitrain layers commonly 1-2 mm. Clean coal, fusain observed on one shale parting. Carbonaceous shale, 4-5 mm thick. Pyrite, brassy, on some cleat and also associated with kaolinite as rosettes. Pyrite is a minor component.



By F. Fiene and R. Harvey Date 2/9/79

Quadrangle

County Wabash Sec. 10 T 2S R 13W

B3 Clarain, with numerous vitrain layers 1-3 mm,
CP2099 few dull coal, 2-3 mm, fusain partings. Pyrite,
C20510 brassy, on cleat associated with kaolinite on cleat. Pyrite, finely laminated with coal stringers as lense parallel to bedding up to 1 cm thick. Specimen removed (CP2099*).
Noted a distinctly arcing cleat with pyrite which extended about 1-2 cm verticle dir.

B4 Clarain, with numerous vitrain layers $\leq$ 3 mm.
CP2100 Vitrain, at least 3 prominent layers 5-8 mm.
C20511 Fusain, irregular lenses, 7 to 10 mm bounded on one side by 2 mm layer of vitrain, other by clarain. Sampled separately CP2100*.
Kaolinite (light cream, non CO_3) on cleat as minor constituent.

B5 Clarain with few vitrain layers 1-2 mm thick.
CP2101 Fusain on occasional partings. Kaolinite, minor
C20512 constituent on cleat.

B6 Clarain with few 1-2 mm vitrain layers. Fusain
CP2102 on occasional parting. Kaolinite minor
C20513 constituent on some cleat surfaces.

B7 Clarain, dull, few 1-2 mm vitrain layers. Fusain
CP2103 in occasional parting. Kaolinite on two sets of
C20514 cleat, minor amounts (specimen CP2103*).

B8 Clarain, with vitrain layers 3 mm vitrain (1
CP2104 layer observed). 1 cm th* bounded by clarain.
C20515 Specimen CP2104*. Fusain on occasional parting $\leq$1 mm. Kaolinite on cleat, especially with vitrain. Calcite trace amount on 1 piece (fine granular type).