7' Limestone (Brereton) - Medium gray, weathers brownish; fine-grained, thickly bedded, nodular.

2½' Shale (Anna) - Black, fissile, smooth, phosphatic.

Coal (not described).

Fault is vertical; slickensides horizontal, limestone is fractured intensively.

Phil DeMaris took several pictures.

(2) Offset of a small lens of Energy Shale shows 20 to 30 feet of left-lateral slip. The fault is an extensional zone to the west and pure strike-slip to the east.

Oil-stained fractures along strike-slip fault in east entry of the 8th Main South. Top of entry is base of Brereton Limestone; black blocky Anna Shale below, then the coal. White color is rock dust.

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MOORE'S MODERN METHODS
FORM 180 W

Slightly south of above location; oil seepage along fractures in the top coal has stained the rock dust.

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MOORE'S MODERN METHODS
FORM 180 W

Closer view of the same. The tilted pieces of Anna Shale are in their natural position, held in place by a claylike matrix.

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MOORE'S MODERN METHODS
FORM 180 W

Same fault on opposite side of the same pillar. Coal on right; Anna Shale on left dropped down into a narrow graben, and brecciated.

Fault on travelway of 8th Panel South. Coal is upthrown 2.7 feet on the southeast (left) side of the fault. Coal is folded and pulverized along the surface of movement.

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MOORE'S MODERN METHODS
FORM 180 W

View looking obliquely upward at the same fault, showing an open cavity or fissure in the roof along the fault. This extends upward several feet.

FREEMAN UNITED C.C. MACOUPIN COUNTY
CROWN II MINE 10/82

Notes by S.K. Danner. Nancy Netoff and I visited this mine at the request of Guy Gilbert, one of the resident engineers. The miners had encountered a large fracture in the roof of the 5th entry of the Main West, just west of the 12th Panel North. The location of this fracture is about 1375' south and 1375' east of the center of Section 21, T.12N., R.6W.

At the face of the 5th entry of the Main West we were able to get a good view of the large fracture that had the engineers concerned. It trends diagonally across the entry at a heading of about N55°E. The roof at this location consists of 0.6' to 1.0' of black Anna Shale, capped by an unknown thickness of Brereton Limestone. Near the coal face, the fracture is about 1.7' wide, with a 1.0' thick wedge of limestone running down the center. The limestone wedge may have dropped down from a higher position in the unit. The fracture is about 25' to 30' in length. It appears to have healed itself on its northeast terminus. It can barely be traced into the first cross-cut outby the face.

I can see a foot or two up into the void and no slickensides are visible. It seems to be purely a tensile (extensional) fracture. No vertical or strike-slip movement is evident. Part of the fracture is filled with a soft, gray clay and limestone chips. The floor is very wet and muddy from the water that has percolated down through the fracture.

The miners stopped the advance of this entry at the point where the fracture enters the south rib. For some strange reason they seemed to think that conditions would get worse if they went any farther. Apparently they thought that this fracture was part of the strike-slip fault they encountered

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on the north and east sides of the mine. If it was, they might have reason to worry. They have had some severe water problems as a result of that fault.

The miners have, however, continued to advance the faces of the other entries in the Main West. We visited the sites where the projected fracture should have intercepted the entries. All that I could find were some very fine, hairline fractures in the shale. These were small and discontinuous.

Apparently the horizontal stresses that generated the large fracture were relieved by that fracture. In other words, the fracture represents a localized occurrence, and is not part of a larger fault complex, as some of the men seemed to think.

SKD

Mine Notes - Freeman Crown II - Macoupin Co.

Trip: June 20-21, 1984 by Phil DeMaris and (20th) Steve Danner & Eugene Robertson (U.S.G.S.) and escorted by Dave Webb; (21st) escorted by Dave Hitchings.

Coverage:
Introduction
Fault check on 4th N.W.
Examination of fault zone on E. Mains junct. with 2nd S.
Samples & desc. in South Mains
Seam Desc. from W. Mains (day 2)
Samples (set "P", complete)

Introduction

This trip was arranged to show Gene Robertson some tectonic faults for his gouge-zone/throw ratio research. Other purpose was to get pyrite/marcasite samples esp. from partings from described sites. Dave Webb, recently married, is now construction manager. E. Fletcher expressed interest in having a summary map of the strike-slip fault zone as mapped; nothing specific was provided to Freeman. The W. Mains were stopped due to poor conditions (see prev. notes) and will be jogged about ½ mile south - called "10th S.W.". Dave says Ernie Fletcher may become Superintendant of Crown III when it reopens early in 1985 (depends on market) -- Webb might move to Supt. job at Crown II.

Fault check on 4th N. off West

This is a 6 entry submain being driven north. It's purpose is to divert ventilation around the S. Mains(not in good shape) when connected. The strike-slip fault on the S. may be encountered here, perhaps 1000'-1500' N.

We paused on the travelway one c/c into 4th N.W. to look at roof fall; either a boss - effected area or low, rolling limestone occurs over 3 crosscut area (top of coal depressed).

A. (area near face) On third N. entry at 1320' roof fall shows Brereton Ls. directly over Energy shale; in next c/c N. base of Brer. is 'rolly' over thin Energy. On 2nd N. vic. 1380'(just to E.) made desc. of fall:

	2.'+ lt. gray, micaceous siltst. ∫? (sheet facies A.r.Ss)
0.9'	Brer. Ls., discontinuous, 0-1½' thick w. thick 'clod'.
3.3'	Energy Sh.
7.2'	Herrin; thin & pyritic blue band .06' tk. 2.1' above floor.

At 1st N. , same plus, there is Anna roof with Anna concretions. Very wet. 6' point-anchor bolts being used. Some fracturing at 55° noted but not excessive.

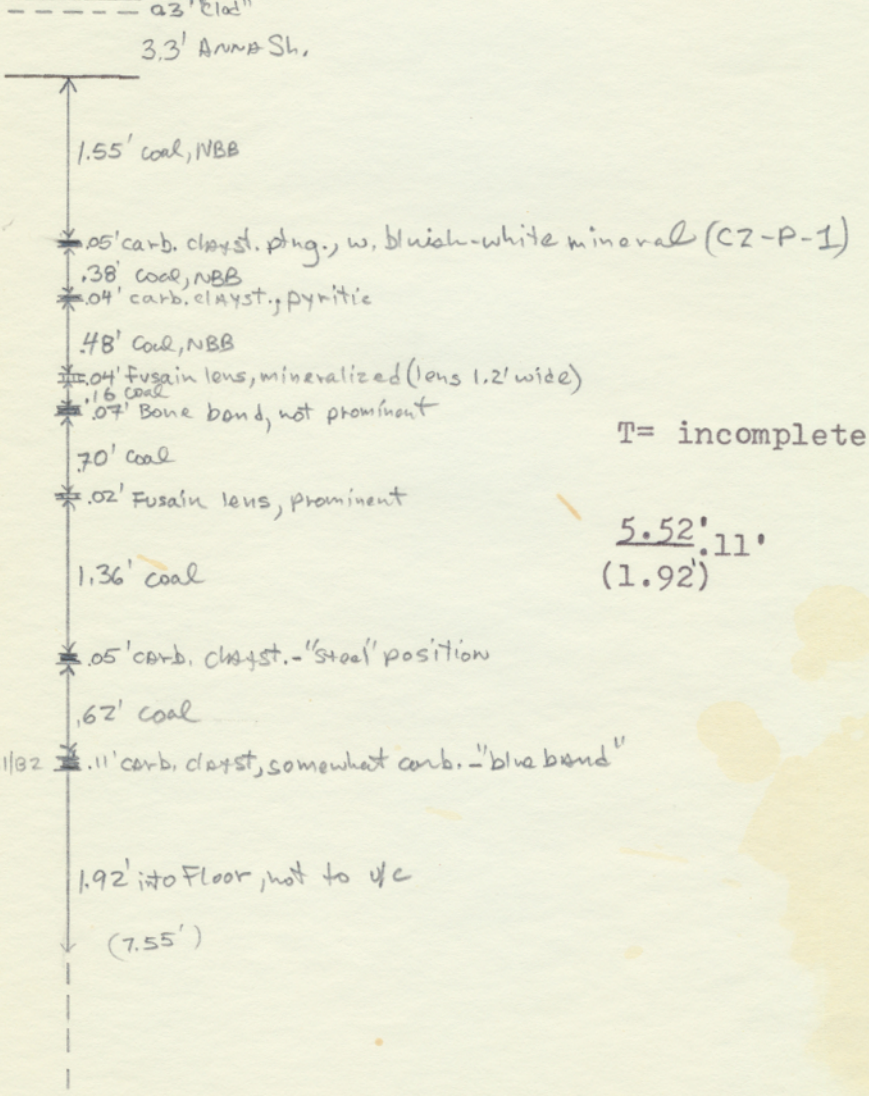
We checked from 1300' back to 800' N. for signs of strike-slip fault and found no fault proper & no strong evidence of excessive fracturing. Area should be rechecked on next trip.

Examination of fault zone on E. Mains

B. Gene took photos of fault exposures at intersection of 1st E. and 7th S. Mains. We walked east to "arch" on 12th S., and onway took (Gene took) photos with scale of gouge zone on 9th S. int; best view in coal was 10th S. & 1st Main E., which he sketched. Gene took his last photos on the 11th; we last visited the "pool" on the 12th S. by the arch.

C. I paused to do a seam desc. at intersection of the 10th S. and 2nd Main E.,

on the SW corner. Well-weathered exposure of the top 4/5th of the seam. Should revisit and dig to underclay. Desc.:

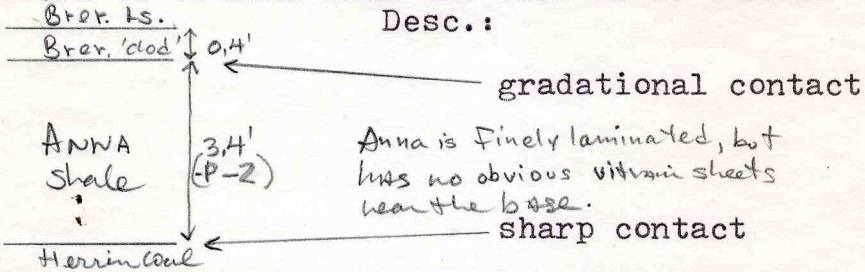


T= incomplete

5.52'
.11'
(1.92')

D. 3rd E. at 6th S. Danner takes large Anna sh. sample for Mike Stevenson. I take representative sample of full thickness. Anna is very finely laminated, with no obvious slivers of vitrain near the base as is common.

Desc.:

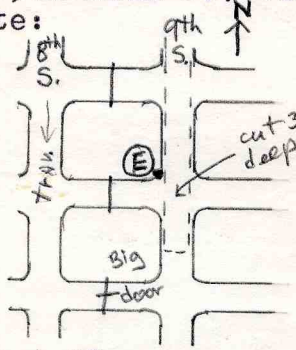


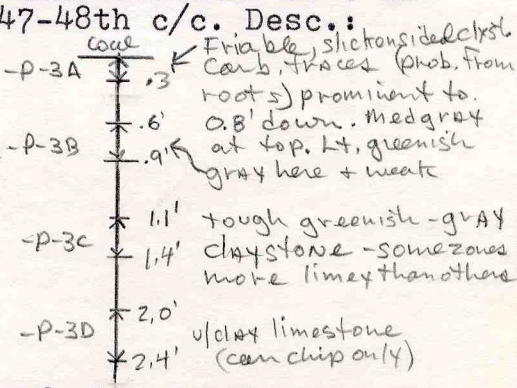
Exposures were not the greatest for Robertson, and with promise of better things he and Steve left before noon.

Samples and desc. from S. Mains

E. R. Hughes expressed interest in having a vertical series of underclay samples, and Dave Webb said he had a good site where undercasts were under construction. Site is on 9th Main S., vic. 47-48th c/c. Desc.:

Site:

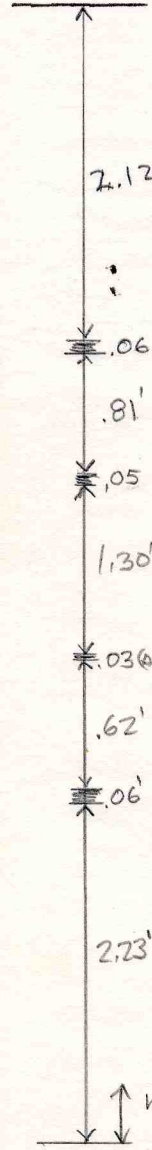




About 3' max was exposed, but tough nodular underclay began about 1' down. Dave says this and other sites have to be dynamited. The "bottom" area didn't have "high" ls. as this area, and much of the mine has.

Coal desc. at same site: (rough stratig. only)

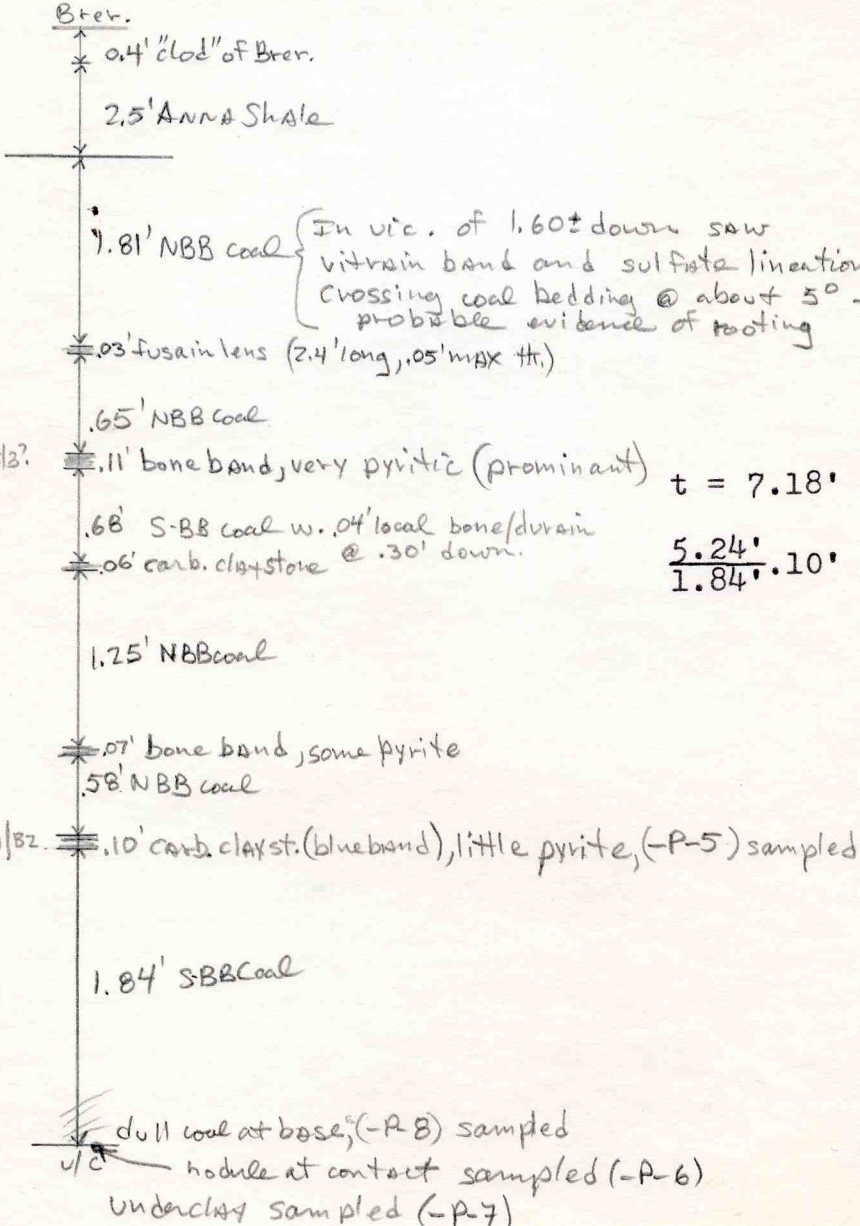
very thin, bioturbated Anna, or 'clod' of Brer.; Brer. Ls. above



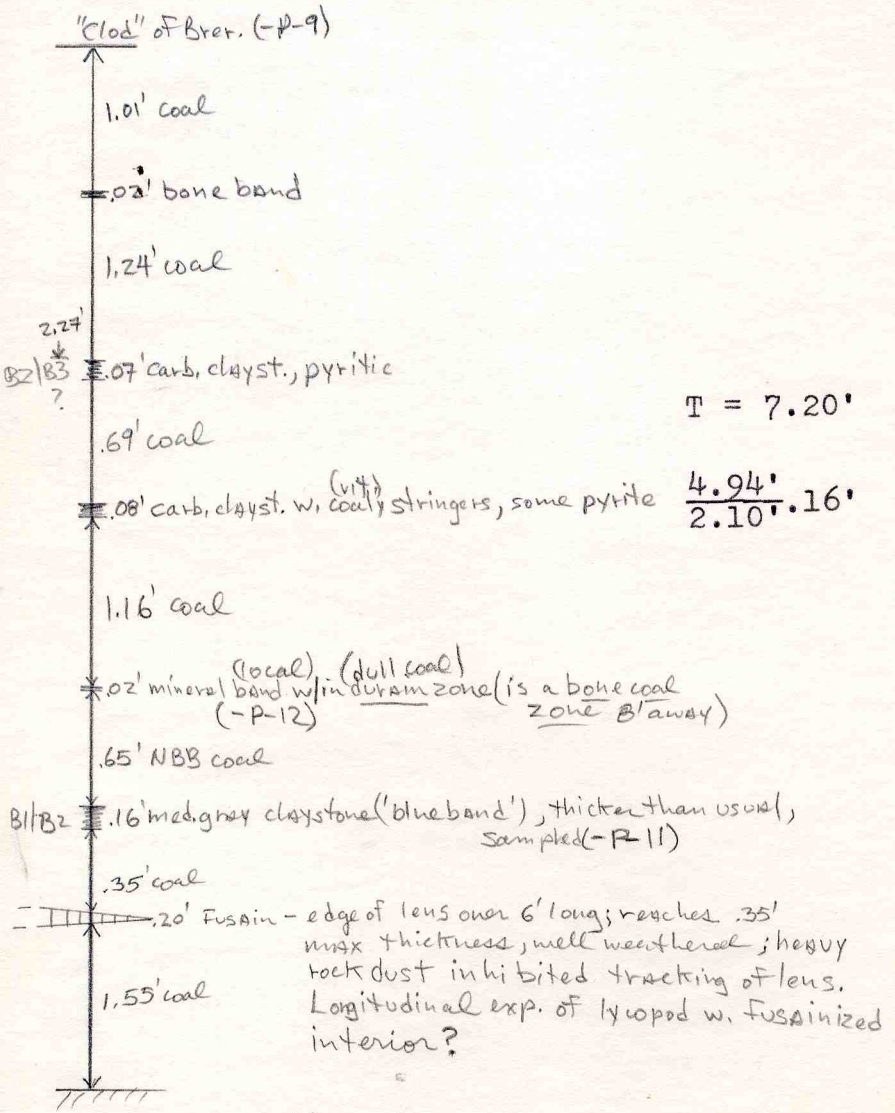
T= 7.28'

$\frac{4.99'}{2.23'}$ .06'

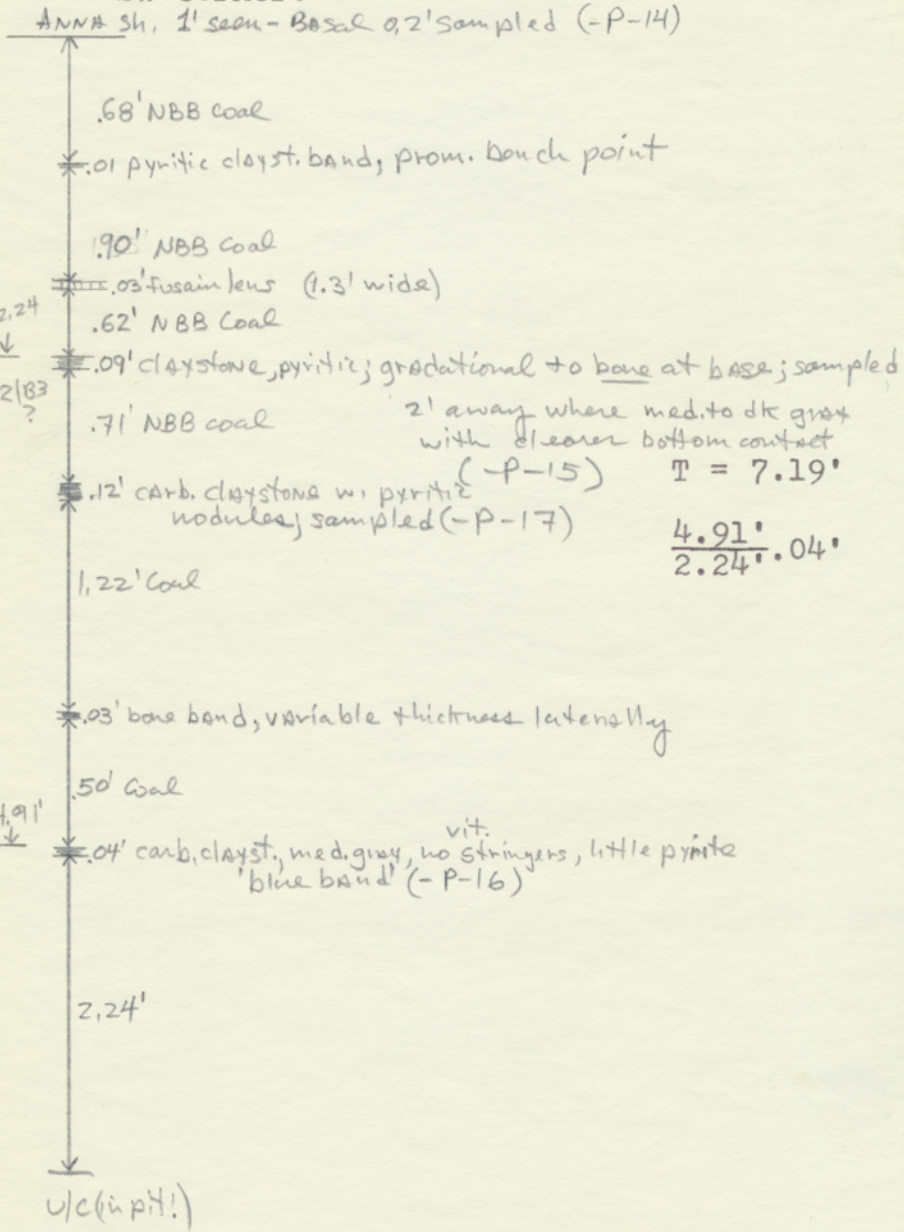
F. (Day 2) Dave Hitching took me to W. side of mine. Began at 6th W. Main where it(travelway) turns S. to 10th S.W. Desc. at 106th c/c on 6th W., 20' towards belt



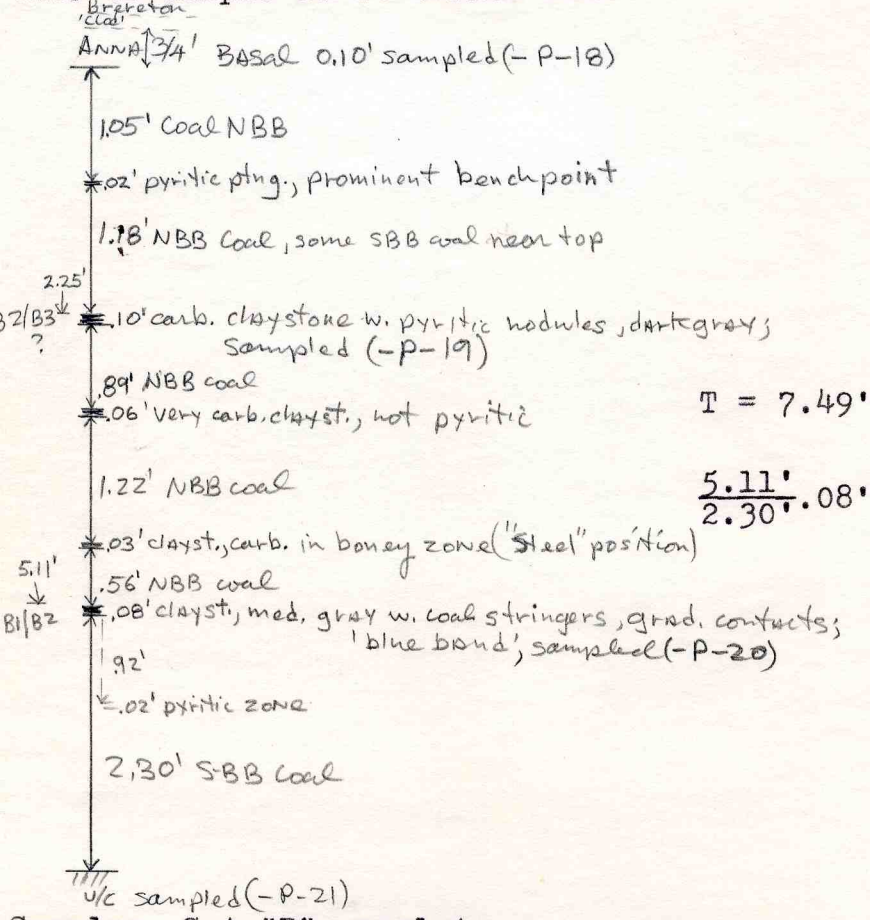
G. Stopped sec. on 6th W. at 89 c/c, NW cor. Prom. cleat from upper third of seam sampled for RDH (CII-P-10). Desc. from NE corner; heavily dusted before dedusting- only major ptngs. noted.



H. Seam desc. at 64th c/c on 6th W. Main, SW corner.



I. Seam desc. at 24th c/c on 6th West, SW corner, about 15' into crosscut; quick desc. due to time pressure, but had time to sample as it turned out.



Samples: Set "P" complete

Samples were taken for XRD analysis with special interest in pyrite/marcasite. Partings were emphasized because of on-going work on Herrin stratigraphy and depositional environments of those partings.

#	Site	Desc.
C2-P-1	C	Clayst. ptng, med. gray, w.

		blue-white mineral ( ); for XRD and carbon.
C2-P-2	D	Anna shale (w/out calcite/apatite band)-representative sample of 3.4' thickness - not esp. vitrain-rich at base.(Chem.-C-L Chou)
C2-P-3	E	Set of 4 underclay samples from immed. below Herrin into tough, underclay ls., for XRD and carbon.
C2-P-4	E	'blue band' (.06' tk.), not esp. carbonaceous ; bulk & block.
C2-P-5	F	(day 2)Weathered 'blue band';bulk
C2-P-6	F	Weathered nodule at coal/u-c contact
C2-P-7	F	Underclay right below -p-6 (XRD)
C2-P-8	F	Basal 0.2' Herrin,dull;block & bulk
C2-P-9	G	Brer.'clod'(clayst.)-(XRD)
C2-P-10	G	Calcite & Kaol. cleat;top 1/3 seam
C2-P-11	G	'blue band' (0.16' thk.); coalified rootlet traces seen; bulk & block
C2-P-12	G	Tan mineral (dolomite)from durain.
C2-P-13	G	Top 0.2' of underclay (XRD)
C2-P-15	H	Clayst.ptng.(.09') Block & bulk.
C2-P-14	H	Basal 0.2' of Anna Shale
C2-P-16	H	'blue band',carb.(.04') Bulk & block
C2-P-17	H	Nodule in ptng. 1.87'above bb (XRD)
C2-P-18	I	Basal 0.10' Anna Shale (XRD)
C2-P-19	I	Carb. clyst. ptng. (.10')
C2-P-20	I	'blue band' (.08') Bulk only
C2-P-21	I	Underclay, top 0.2", weathered. (XRD)

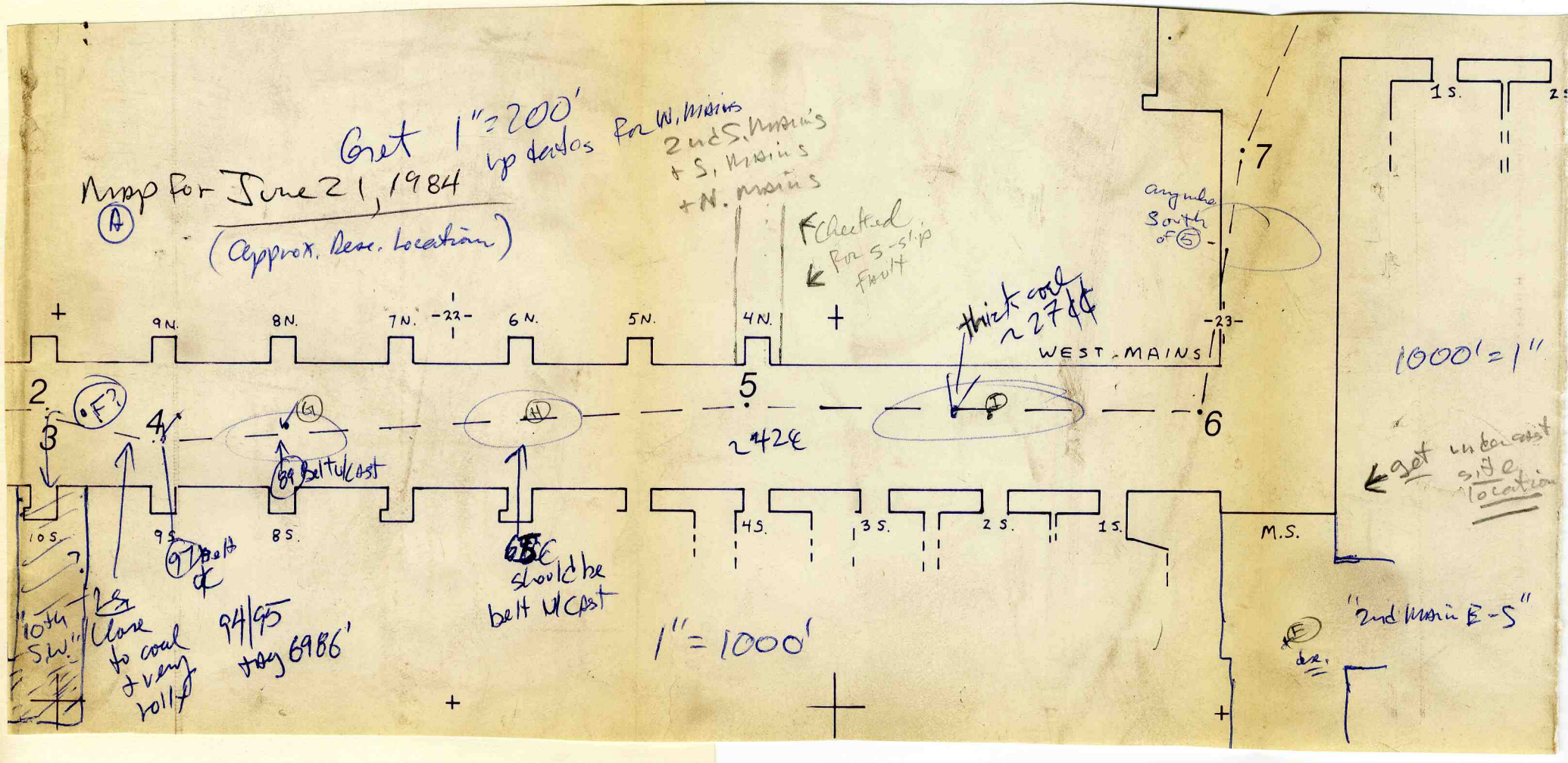
(T.12 N., R.5W. NW NW Sec. 20)

end

John C. Moore Corporation, Rochester, N.Y.

FORM 180 W

6/20-21/84 Map A



Mine Notes - Freeman Crown II - Macoupin Co.

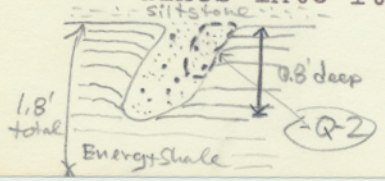
Trip: Aug. 15-16, 1984 by Phil DeMaris and Doug Cowin, escorted on the 15th by Guy Gilbert.

Coverage:
Fault check on 4th N.W. Submain
Revisit of S.J.Russell column site
Falls at base of 7th N.E. panel
Reconn. of 5th N.(E.) panel(day 2)
Coal Sample & desc. from 6th N.(E.) Panel
Seam descriptions from E. Mains
Samples (set "Q", complete)

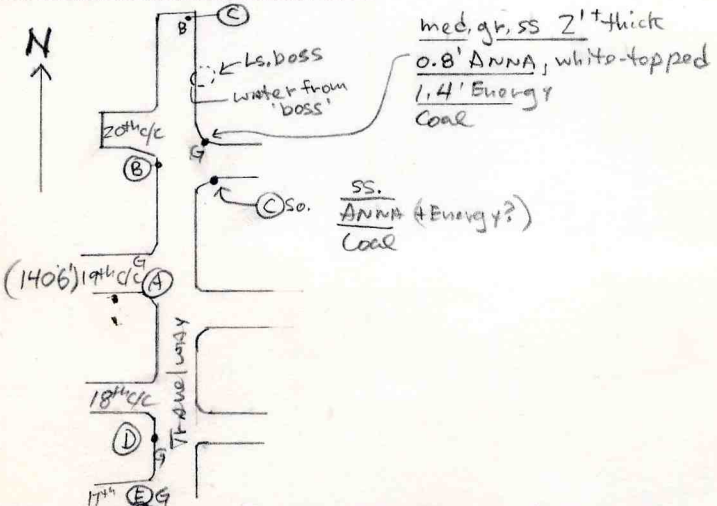
Fault check on 4th N.W. Submain

This trip follows up on sampleing & fault-checking begun on last trip (June 20-21-Intro). We checked here again because working conditions are quite wet and the face has advanced only another 150' due to wet conditions which may be induced by effects of strike-slip faulting. We followed the travelway (3rd N.) to the face which is vic. 21st c/c position. We began(A.) looking at the roof in the 19 c/c (1406') just W. of the 3rd. N. (See map, over) Roof is Energy Shale with probable Ls. nodules or thin sheets of ls. above it. Medium grained sandstone lies above that and there are local ss. dikes about ½' wide and 3/4' deep pressed into Energy Shale. Most prominent dike has E-W trend but other loadcast-like features show other orientations. Mistook base of ls. for ss. (-Q-1A) and sampled also siltstone (-Q-1B) from top of fall; all units calcite-cemented.

B. Here there is still Energy roof with Ss. and ss. dikes into it. Energy is 1.8' thick here with a pebble-filled ss. dike pressed into it. The



Map for A to E sites



dike is capped by siltstone (clearly less coarse) and the ss. dike contains rounded Anna Shale pebbles. I made this diagnosis on the basis of color, texture and by finding an Orbiculoidea inside of one of the pebbles. Sample taken from top of dike (-Q-2)- see sketch on p.1. This and the absence of any trace of the missing units in their normal position (and sharp contact) strongly indicate erosion of the normal roof sequence; the means of erosion is not at all clear. Previous work on the W. mains indicated thick sequences of "Anvil Rock Ss." Sheet siltstone facies (as we have called it) do exist close to the top of the coal in some areas, are sometimes sandy, and may exhibit linear trough-like bases, but hard evidence for erosion was lacking. See also H. This is an Anvil Rock Channel exposure - see Dec. notes AJD

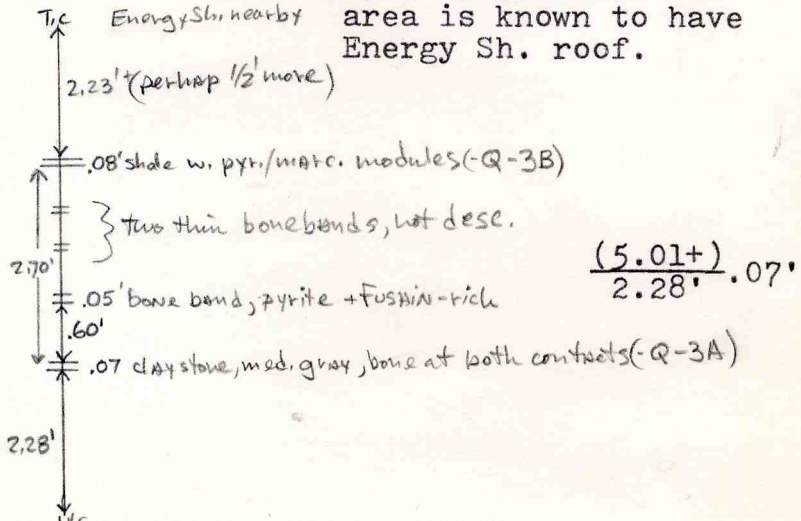
C. At the face there is 1' Anna shale with Ls. over it, and "better bolting" according to the bolters (i.e. thick ls.). On the E. rib back 30' water is flowing from fractures in a

Brerton Ls. 'boss'... the fractures may well be caused by the fault-(strike-slip), but checks of the rib produced no fault plane.

C. South (Probable location) At first look Energy so dark that I missed it. Energy/Anna contact looks gradational here, with med. gray to dk. gray Energy at base w. secondary pyrite tetrahedra at base. Vitrain shards (very thin and 1 to 3 cm. long) appear to mark the base of the Anna Sh., but prob. marine shells (brachs?) span the contact.

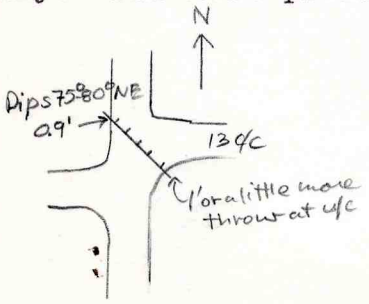
D. About 17½ c/c position - ca. .8' Energy under 1' Anna Sh. with prob. ls. remnants as irregular ovoids below 2½' min. sandy siltstone. While we did not sequentially sample the ss./siltstone here or elsewhere it appears from exposures examined and fallen pieces to fine upward; however, the transition may be abrupt, as suggested by B. where the dike-fill is much coarser than the capping lithology.

E. Made incomplete coal desc. and sampled pyr./marcasite nodules for possible X-ray standard. Desc. made where top coal present, but area is known to have Energy Sh. roof.



$\frac{(5.01+)}{2.28'}$ .07'

F. We check all possible faults as we went out of the panel. All had vertical movement only. The most prominent one was at the 13th c/c which had weathered out a little & I chipped back further to show Doug. Fault effects full thickness of Herrin; coal and roof both show brittle fracture; mineralized, pulverized coal gouge zone Mullion structure shows dip-slip movement only. Strike est.at 135-140°- no compass; dip 75-80°NE.



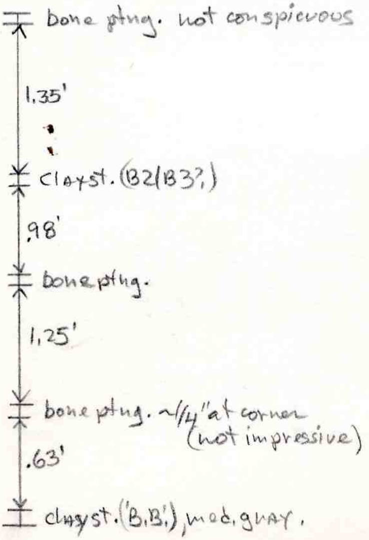
Discussion:

We did not check the roof in adjacent entries at the face, but should have. The next morning Pat Peterson indicated that he had seen open joints in the Brereton at the face on other entries, clear evidence of strike-slip effects. So while the bad roof in the 17th-20th c/c area is primarily due to missing or thin Ls. over Energy Sh. roof areas, the general water problem which has gradually gotten worse is apparently due to the strike slip fault. Water problems are not likely to improve until the plane of the fault has been passed; having black shale/limestone roof at the face should help some.

Revisit of S.J.Russell Column Site

G. Visited site to sample claystone partings from column for which there is detailed petrographic data in Suzanne's Ph.D. thesis (Penn.St.) Site is 159th c/c on 9th E. Main. Found chalk and wax pencil marks from previous visits, and sampled oriented block mounts of 4 claystone or bone partings (see sketch).

(This is Site A of June 4, 1980) I used the rough stratigraphy established by Danner & myself to located the partings; most of the parting were sampled 3 feet West of corner with chalk marks, with notes made about how parting varied across that distance from the column site.



- Q-7 Block of thin bone band - bulk sample taken further W. where ptng. was more clay-rich and pyritic.

- Q-6 Thicker (20mm.) than at corner - Fusain below band here and at corner; - Block and bulk.

- Q-5 Bone ptng w. vitrain band thinner than at corner - sample varies 16mm. to 23mm. with central 3mm. vit. band. Block only.

[Was clearly a bone or carb. sh. which was weathered out - could not sample.]

- Q-4 Block and bulk where 31mm thick, similar to corner. Here it is:

clarain above + below { 7mm bone / 18mm med gray "core" / 6mm bone

Falls at base of 7th N.E. panel

H. Development of the 7th panel has been slowed by roof falls at the base of the panel. We began at the travelway (to be) intersection with the northernmost bleeder, called "D intake west". Roof fall was 8' high and unstable:

Fallen piece sampled (-Q-8) "8' of mush", above.
5' greenish gray siltstone w. paint anchors set in 5
1' Anna shale w. many med. angle compact. faults
2' Energy shale w. many med. ∠ faults
Herrin

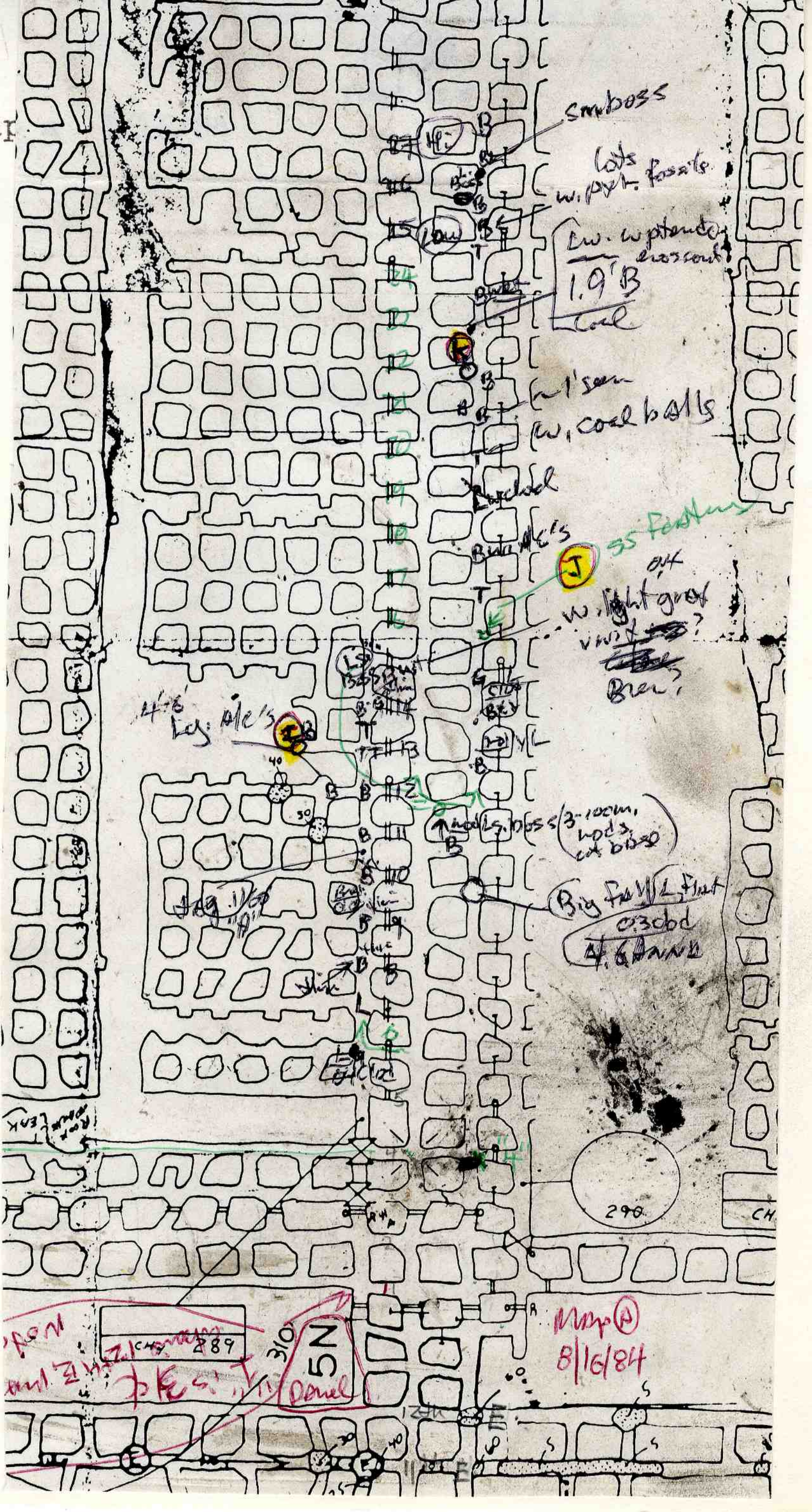
I checked along Anna contact around whole fall and saw only 3 Brereton Ls. nodules up to 1½' wide (max.); this contact is usually assumed

to be representative of continuous deposition, or where Brereton is poorly developed, repre. of a depositional hiatus; the possibility that erosion of some/most of the Brereton has occured locally must be taken seriously. (See note B.) In next c/c west (belt) the Energy Sh. is 4' thick w. 2' Anna over it (shale. seq. much thicker) We looked at two other falls w/in a short distance which showed widely varying shale thicknesses; up to 5' Energy and 2' Anna below the siltstone. If erosion is occuring on that contact, it is not producing planation of the pre-existing topography, unless peat compaction varies widely as well. Brereton non-deposition is still a likely explanation here. We are well south of the area likely to be effected by Anvil Rock channel erosion, but perhaps not sheet erosion of surrounding areas. Signs of surface exposure (oxidation) are also missing, though we may be missing them because of their thinness. The whole question on post-Brereton events needs more study, esp. to understand roof instability in these areas.

We checked for ls. thickness at the base of the panel, at the 10th E. overcast at the travelway of the 8th N.(E.) panel -"C" entry; base of Brer. is roof and it shows 3' mech. bolts, 4' of limestone checked before setting 3' bolts. As usual Brereton loss is local.

Reconn. of 5th N.(E.) panel for Anvil Rock Ch.

The Anvil Rock channel mapped on the N. Mains and first 3 N. panels was not checked on the 4th N., which is permanently sealed. Since Pat Peterson indicated the 5th N. might also be sealed before we could check it, we made a quick reconnaissance of the s. half of the panel. (See Map A)



smboss
lots w. pyr. fossils
Lw. w plenty crosscut
1.9' B
Coal
~1' seen
Lw. coal balls
55 Footers
J
w. light grey
Bren?
Big fault, flat
290
289
310
5N
Daniel
Map A
8/16/84

Pat Peterson provided the map for the 5th; note that the c/c numbers start with the 1st bleeder, which is 3 c/c north of the 12th E. (footages must be adjusted).

I. Fall in the end room at 13 c/c. Thick Anna, well disturbed with faults and w.t.; light gray material seen at top of fall (?); no sandstone seen.

J. Thin Energy, ca. .8' Anna with Ss. dikes and siltstone material injected laterally into the Anna.(-Q-9). Brer. in place where seen, but assumed missing on NE side of exposure, direction from which siltstone came, but bolted. This site taken as S. boundary of A.R.C.

K. Nice fall showing channel-fill sediments:

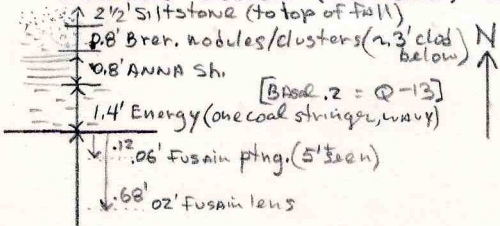
hard unit (Bk. FK. LS?)- no fossils seen.
0.3' lt. cream claystone (seen elsewhere below ls.)
0.4' impure coal ("Virden"); dull banded, cleated. (on maps) w. pteridosperm compr.
1.5' weak gray shale ("Lawson"), well-rooted, Stigmaria crosses bedding, other small u/i compressions
1.8' Anna shale under sharp, erosional contact; some bioturbation (from plants?) at top
Herrin Coal

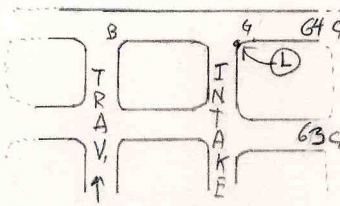
I could not examine contact closely enough to determine is any ss. was present, but did not appear so.
Comment: Next c/c north also has channel-fill units (see map); it forms the N. boundary of A.R.C. as mapped. Exposures are 7 c/c apart (420'?); channel may be wider yet since it is trending ESE here, and might be as far N. as 15 c/c judging from depression of area and tough working in rooms west of there.

Coal sample and desc. in 6th N.(E.) Panel

Since we have our own cart today, transportation is eased considerably. We came to this panel for fresh coal; work is at the top of the panel, just starting E. room; est. that site was mined w/in 48 hrs; still degassing.

L. 6th N.(E.) panel, 64th c/c, "D" entry; map: Middle bench (blocks) sampled, ptngs too.





2.815' Coal (B3)

Chipped Exposure - majors only, except steel band (checked)

2/3 .06' Clayst., gray (loc. pinched out over fusain lens) [Q-12]

.68'

.....05' fusain lens w. thin shale on top (loc.?)

T = 8.35'

5.645'
2.64' .065'

2.77' Coal [Q-14-small blocks] (B2)

.....03' bone band, weak * ('steel band' pos.)

.56'

1/2 .065' Clayst. ('blue band') [Q-11]

* meaning that it would not have been noted unless I specifically checked for it.

2.64' Coal (B1)

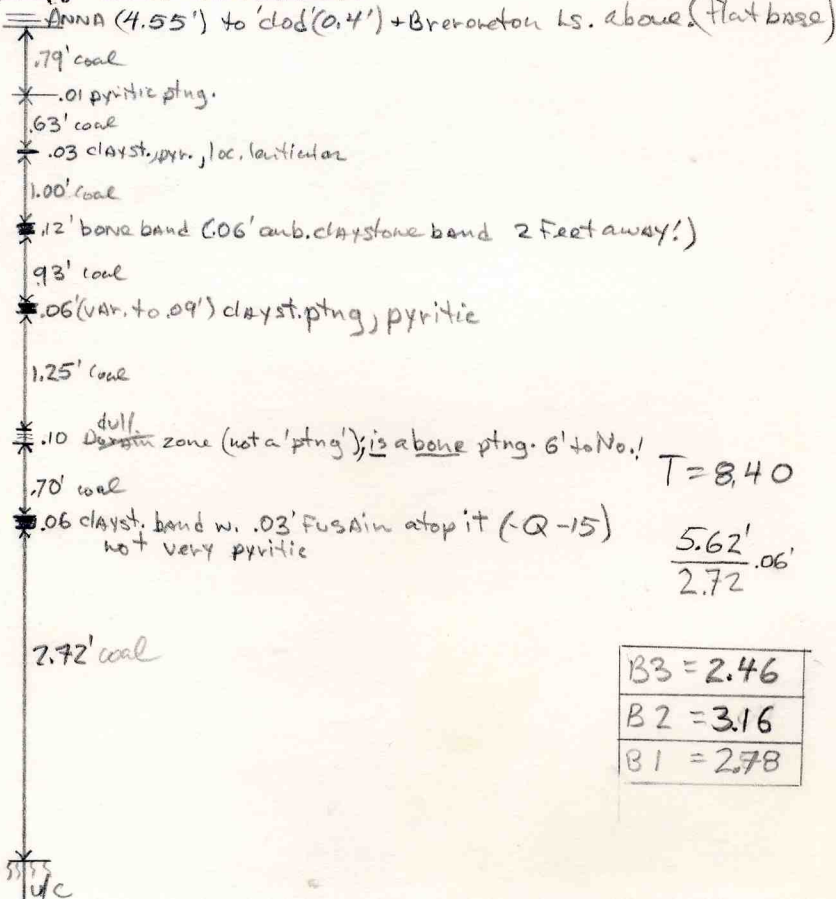
Coal NBB at base

U/C [Q-10]

Seam Descriptions from E. Mains

Trip finished off by getting desc. and ptng. samples from sites on E. Mains; sites selected to fill in gaps in across-mine Herrin cross-section. (See Map B)

M. Began at 88 c/c on 7th E. (travelway here) and tried to work S. to be closer to descs. in 8th S. panel done earlier. Could not get through easily, so made desc. on SW corner, slightly into crosscut:

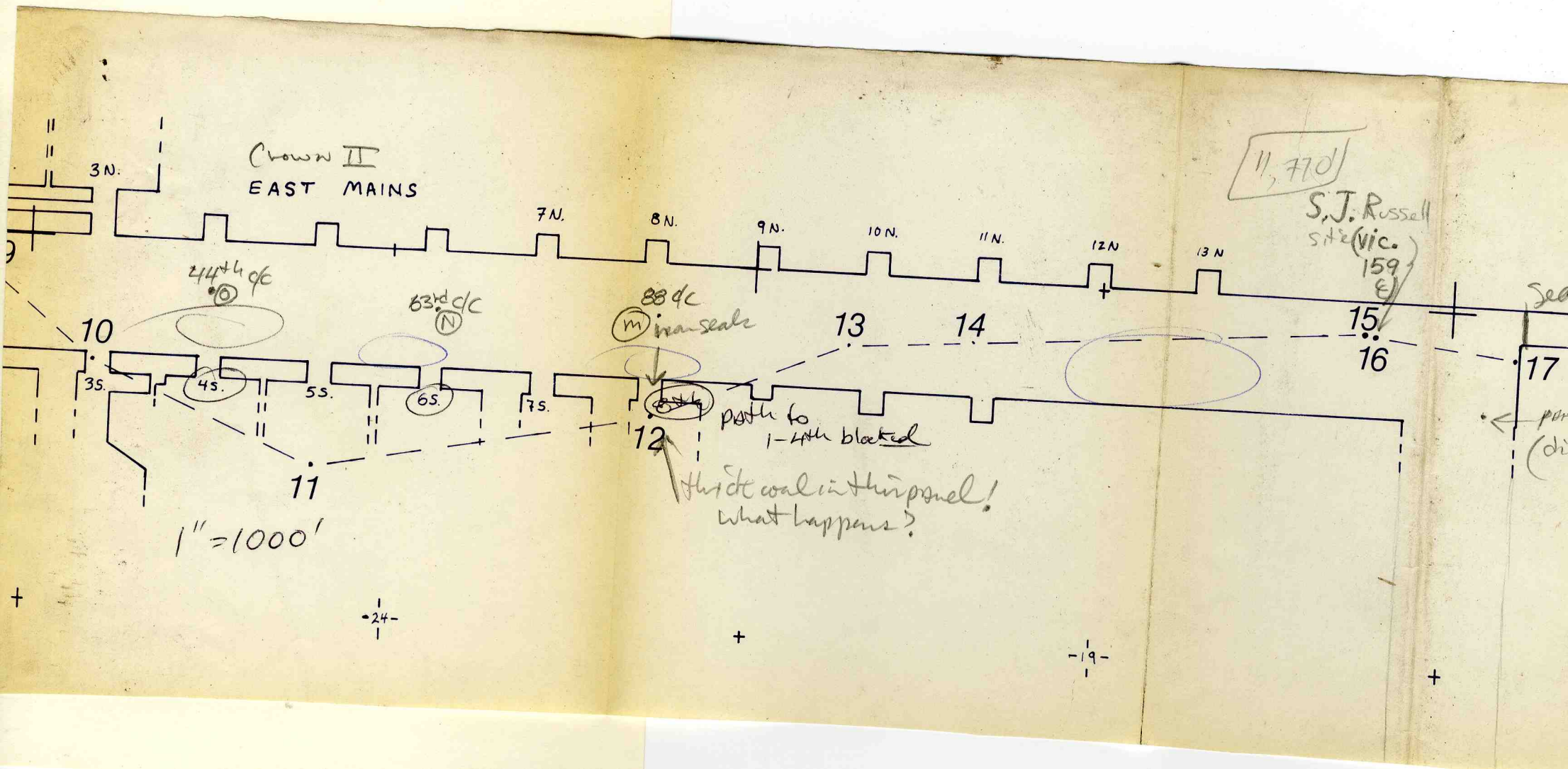


T = 8.40

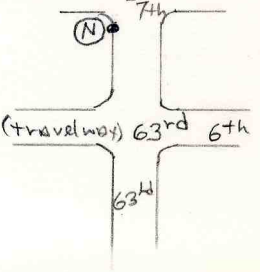
5.62' / 2.72 .06'

B3 =	2.46
B2 =	3.16
B1 =	2.78

Map B 8/16/84



N. 6th E. Main at 63rd c/c; best exposure is almost to 7th. Sketch:



ANNA Sh. 1'min., fissile

2.65' coal (top bench)

B2/3 .02' carb. clayst., pyr. (loc. bone and loc. thicker—both within 6'

.90' coal

.06' carb clayst., pyritic (loc. bone band .03') [-Q-17]

.42' coal

.04 fusain lens

1.33'

.87' coal

.02 (variable) bone band; 'steel' position

.55' coal

5.33 / 2.75' .07'

B1/2 .07' claystone, not pyritic [-Q-16] (Blueband)

T = 8.35'

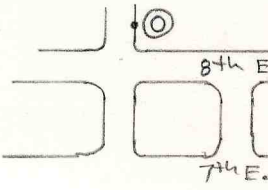
2.75' coal

B3 = 2.65'
B2 = 2.88'
B1 = 2.82'

p. 11 of 12, plus 2 maps

0. Coal desc. at 44th c/c on 8th E. Main:

Sketch:



Anna Sh. roof.

2.06' coal

2.66'

.02' (avg) clay st., pyritic, loc. laminar-bedded, loc. a .04' pyrite band.

.58' coal

B2/B3 .06' (variable) Claystone, pyritic, w. coal stringers [-Q-19]

.60

.04' bone band (appears local)

.32' coal

.07' (Ave.) clay st. band, w. pyrite to top of band.

1.20' coal

2.87'

.04 bone band, w. pyrite streaks, continuous

.57' coal

B1/B2 .07 (Ave - 6 to 7½ inches) med gray claystone band, not pyritic, no coal stringers [-Q-18]

2.52' coal

B3 = 2.66'	
B2 = 2.93'	
B1 = 2.59'	T = 8.15'

5.56' / 2.52' .07

U/c

p. 12 of 12, plus 2 maps

Samples: Set "Q" complete

C2-Q-1A	Site A	Ls. chip (Brer. or reworked Br.)
C2-Q-1B	Site A	Siltstone from top of fall.
C2-Q-2	Site B	Ss. dike into Energy sh.,orient.
C2-Q-3A	Site E	'blue band';bulk sample
C2-Q-3B	Site E	Pyr. nodules from ptng. (XRD)
C2-Q-4	Site G	'blue band' 31mm. tk. Block/bulk
C2-Q-5	Site G	bone ptng. 16-23mm. tk.; Block
C2-Q-6	Site G	Clayst.ptng 20mm.tk. Block/bulk
C2-Q-7	Site G	Bone ptng. 5mm. Block/bulk
C2-Q-8	Site H	Lamin. siltstone, lt. gray,weak
C2-Q-9	Site J	Prob.ARC sltst. injected into sh.
C2-Q-10	Site L	Top o.1' underclay (XRD)
C2-Q-11	Site L	'blue band' .065' tk.; bulk
C2-Q-12	Site L	Clayst. ptng. .06' tk.; bulk
C2-Q-13	Site L	Basal 0.2' Energy sh.,pyr.,bulk
C2-Q-14	Site L	Blocks of coal from middle bench of Herrin for marcasite check(XrD)
C2-Q-15	Site M	'blue band' .06' tk., block
C2-Q-16	Site N	'blue band' .07' tk., bulk
C2-Q-17	Site N	Ptng. 1.90' above bb .06' tk;bulk
C2-Q-18	Site O	'blue band' .07' tk.; bulk
C2-Q-19	Site O	Clayst.ptng. 2.87' above bb, .06' tk.; bulk

John C. Moore Corporation, Rochester, N.Y. 14604
MOORE'S MODERN METHODS
FORM 180 W

Freeman United Coal Mining Co. - Crown II Mine - September 18, 1984
Notes by John Nelson, with Guy Gilbert from Freeman (Asst. to Sup't.)

I visited the mine on Freeman's request, to view fractures or fault zone recently encountered in 4th North West Entries (the 4th North off the 1st West off the Main South), approx. SE¼ NE¼ NE¼, Section 22, T. 12 N., R. 6W, Macoupin County. Face of 4th N.W. is now in line with strike-slip fault mapped in eastern part of mine.

Numbers refer to locations on map.

1. Very regular, systematic and planar vertical fractures in black shale above coal. One set trends N. 50-55° E. and the other N. 40° W., the latter set lined with white mineral (calcite) both in shale and top coal; where the base of the Brereton Limestone is exposed it too is seen to contain fractures striking N. 50° E. Fractures in shale spaced 1 to 2 inches apart and locally even closer. Fractures in limestone are widely and irregularly spaced.

The NE-trending fractures appear to be the dominant set - the NW-trending ones are not developed everywhere.

The black shale varies from 0 to about 5 feet thick and the lower surface of the limestone undulates. Minor seepage of water from the roof.

2. Roof is dark gray finely laminated shale containing Pecten (Energy shale) two normal faults striking

N 70° E from a small horst. In the crosscut a small clay dike trends roughly N-S. The roof in the crosscut appears to be Anna Shale but is shot full of clay veinlets. Energy Shale has fractures or joints striking N. 40° W and very closely-spaced (less than an inch apart). Also fractures trending N. 50-52° E., more widely spaced but very planar and continuous.

3. Very pronounced fracture zone of inclined fractures and normal faults striking N. 40-45° W; fractures dip 50-75° NE and SW; some nearly vertical; they cut at least 5 ft. upward into roof and all the way through the coal. Normal displacements of several inches; coal and shale pulverized (gouge); coal mineralized in places; very definite slickensides plunge vertically (dip-slip movement). This zone extends across Entries 1 and 2 (intake air) and through intersecting crosscuts.

4. Large roof fall at intersection on Entry 1. Fallen rock blocks view of roof, but all appear to have fallen in one mass preserving the stratigraphic sequence. About 3 feet of very dark gray Energy Shale, overlain by a little Anna Shale with abundant chunks of fusain, then sharply overlain by sandstone (Anvil Rock). The sandstone is light gray, fine-grained, porous and friable, highly micaceous, abundant disseminated carbonaceous debris; thinly and irregularly laminated, very argillaceous; interlaminations of greenish-gray siltstone and silty shale.

5. Fracture zone trending N. 45° W., similar to the one at Loc. 3; includes steeply dipping normal faults, one with about 8 inches of throw, other smaller normal faults and nearly vertical fractures in a narrow, intensely shattered zone. Slickensides plunge vertically or nearly so. Both coal and Anna Shale are displaced.

The zone is best developed in the crosscut between Entries 1 and 2. It appears to splinter toward the southeast and was not traced across Entry 2 because of deep mud on the floor.

Nearby, observed open fractures in Anna Shale and upper layer of coal, striking N 55-57° E, and vertical to steeply dipping.

6. Huge roof fall, mostly hidden by steel archway, on Entry 2. It extends 25 to 30 feet above the coal. From what I can see no faults are present, but jointing and fracturing in immediate roof are very strong. Fall exposes, from the coal upward, about 4 ft. of dark gray Energy Shale, 1 foot disturbed Anna Shale, 10 feet of sandstone, then 10 to 15 feet of olive-gray mudstone or claystone, pieces of which are still falling.

The area is extremely wet and there is deep mud. Face boss reports open fractures to north.

Phil DeMaris described the roof fall on June 20. It has grown considerably since then.

7. Wide open fractures striking N. 50° E. in Brereton Limestone at face of Entry 1 (footage 1530') and in crosscut between Entries 1 and 2. The fractures are visibly open several feet upward from the base of the limestone and some are lined with small sparkling crystals, others are filled with mud and pieces of broken limestone. There is a zone of such fractures, parallel or en echelon with each other.

This phenomenon is seen elsewhere in the mine only along the strike-slip fault zone.

8. Many open fractures in limestone at the face of Entry 2 and in crosscut being turned to the west. Most of these trend NE as before, but one runs about N. 30° W. (cannot measure because metal affects compass). The NE-trending fractures appear to run only short distances and to step off in en echelon pattern. Many of them are dripping water. The water tastes fresh, not salty. The N. 30° W. fracture is lined with pulverized black shale and appears to dip about 30° NE, not penetrating the coal. None of the cracks show any measurable displacement or any slickensides.

9. Three faults (?) in crosscut between Entries 3 and 4, en echelon and parallel to each other, striking about N. 80° E and curving slightly along strike. Very difficult to make direct observations because of mud, rock dust, etc.; faults are well developed in limestone roof out of reach above my head and apparently do not cut coal, although the coal is intensely fractured near them. One of the faults resembles a vertical limestone dike and the adjacent shale shows curved and fluted slickensides indicating low-angle dip-slip movement, beside the main zone of nearly vertical fractures.

There may be strike-slip faults, but I cannot verify that.

Throughout the face area the immediate roof, whether shale or limestone, shows many locally intense fractures with the usual NE-SW and NW-SE trends. Some of the NE-SW fractures are slightly open and some of the NW-SE fractures show slight normal displacement.

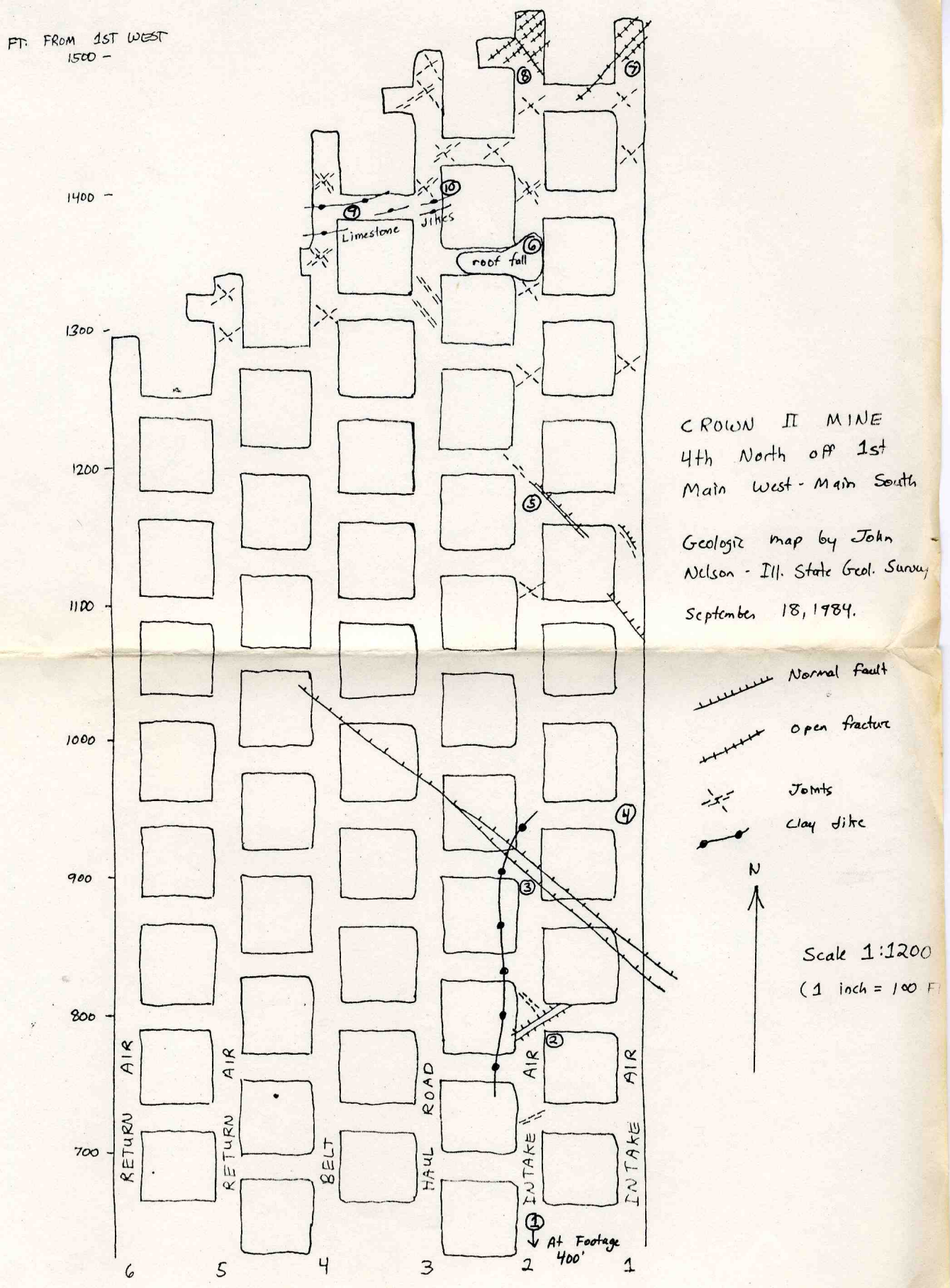
The return entries (Entries 5 and 6) are not advanced as far as the others and do not show so much extreme fracturing, although the joints are still very obvious where the roof shale is exposed.

10. Looking for continuation of N. 80° E. "faults" in Entry 3 (the haul road). I found two of them near the rib where they are better exposed and more accessible than in the crosscut. They are not faults, but appear to be a form of limestone dike. One is broken open exposing internal fractures; nodular dense very fine-grained brassy pyritic limestone, with numerous small vugs lined with crystals. They are about 6" wide and protrude downward about a foot into the underlying shale, Which is greatly disturbed, slickensided and shot full of green clay veinlets. Although they are nearly straight and parallel, I am quite sure they are not tectonic fractures, but probably some kind of load structure.

This area is one of highly variable stratigraphy - Energy and Anna Shale, Brereton Limestone and Anvil Rock Sandstone all come and go; contacts irregular, shales highly disturbed. All are broken by planar vertical open fractures running NE-SW, and vertical or steeply dipping NW-SE fractures, some showing normal offsets.

See Phil DeMaris' notes of August 15-16. He evidently saw the "faults" and reached the same conclusion I did.

See also my letter to Guy Gilbert, September 19, 1984.


FT. FROM 1ST WEST
1500
1400
1300
1200
1100
1000
900
800
700
Limestone
Jikes
roof fall
RETURN AIR
RETURN AIR
BELT
HAUL ROAD
AIR
AIR
INTAKE
INTAKE
At Footage 400'
6
5
4
3
2
1
CROWN II MINE
4th North off 1st Main West - Main South
Geologic map by John Nelson - Ill. State Geol. Survey
September 18, 1984.
Normal fault
Open fracture
Joints
Clay dike
N
Scale 1:1200
(1 inch = 100 F

 pl. of 5, plus 2 maps

Mine Notes - Freeman Crown II - Macoupin Co.

Trip: December 3, 1984 by Phil DeMaris, escorted by Guy Gilbert, Assistant to Superintendent

Coverage: Introduction
Examination of face of 4th N.W. Submain
Interpretation and Speculation
Samples: Set "R", begun

Introduction

This trip was set up in response to a call from Dave Webb, now Superintendent, concerning puzzeling exposures on the 6th entry of the 4th N.W. Submain. A fault of unexpected strike (NE-SW) had been hit and the exposure at the face showed coal split by 2' of something (Limestone?) tough to cut. I scheduled a half-day trip, which proved to be just enough to identify the two specific problems.

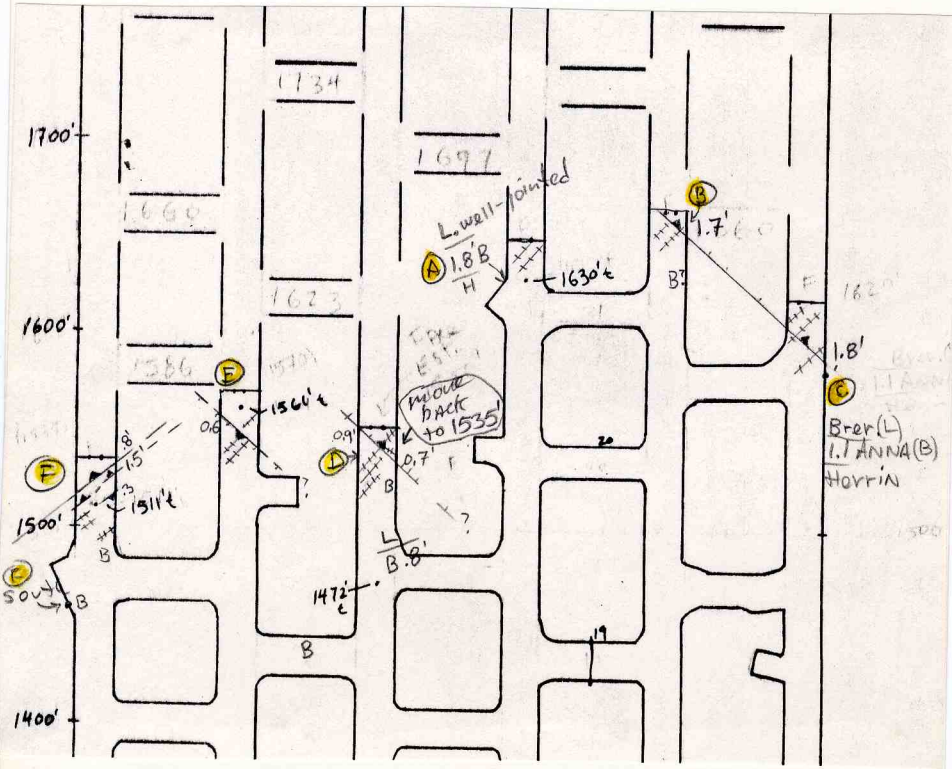
Examination of face of 4th N.W.

Because of rail bars used as roof supports compass reading mere unreliable - fault orientations are thus estimated by their alignment with the entries. Work has been slow in this section since summer due to wet conditions, and plenty of wood roads, cribs and rail bars have been put in place. See map A.

A. Near the face of 3rd entry (travelway) there is well-jointed Brereton Limestone over 1.8' of Anna Shale on the W. rib. Jointing is NE-SW and close-spaced.

B. At the face of 2nd entry (about 1670'N.) there is a normal fault striking roughly 305°, down 1.7' to the NE. Clear vertical mullion in Brereton lip and in coal as well. However, the Brereton is highly fractured

Map A 12/3/84



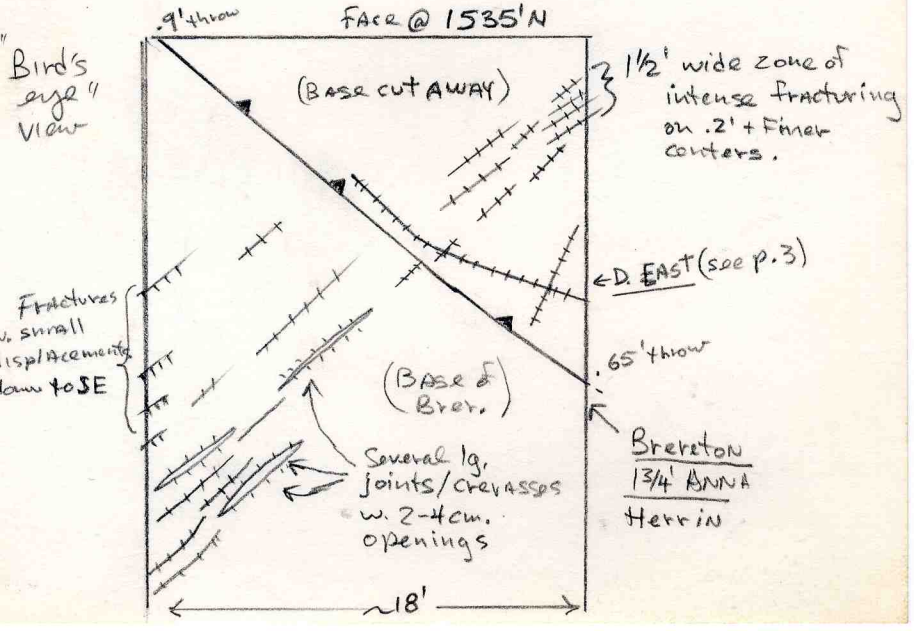
Crown II

4th North West Submains

on a NE-SW direction, more so than at site A.

C. Same fault as at B. crosses entry here (strike roughly N35-40°W) with apparent vertical movement. On E. rib the roof sequence is Brereton over 1.1' Anna shale; again the Brereton is well jointed. On W. rib there is 2' of Anna with some injection of light-colored clay into the top--in retrospect this may be deformation associated with channeling (see F.) or with typical soft-sediment deformation of the Brereton. The fault dips 75°-80°NE here, produces a single 1" plane of crushed coal, and has 1.75' of throw. Roof Anna and Brereton jointed NE-SW (primary).

D. 4th N. Entry shows another fault trending roughly NW-SE intersecting the W. rib at 1535'N. Throw is 0.9' down to the NE there and 0.65' down to NE on the E. rib and shows vertical mullion. Roof Anna and Brereton are intensely fractured--Anna was cut or has fallen and faults were rough-mapped at base of Brer. Intensity and widespread nature of the Brereton fracturing (almost brecciation) indicates that this effect is somehow associated with the strike-slip fault zone.



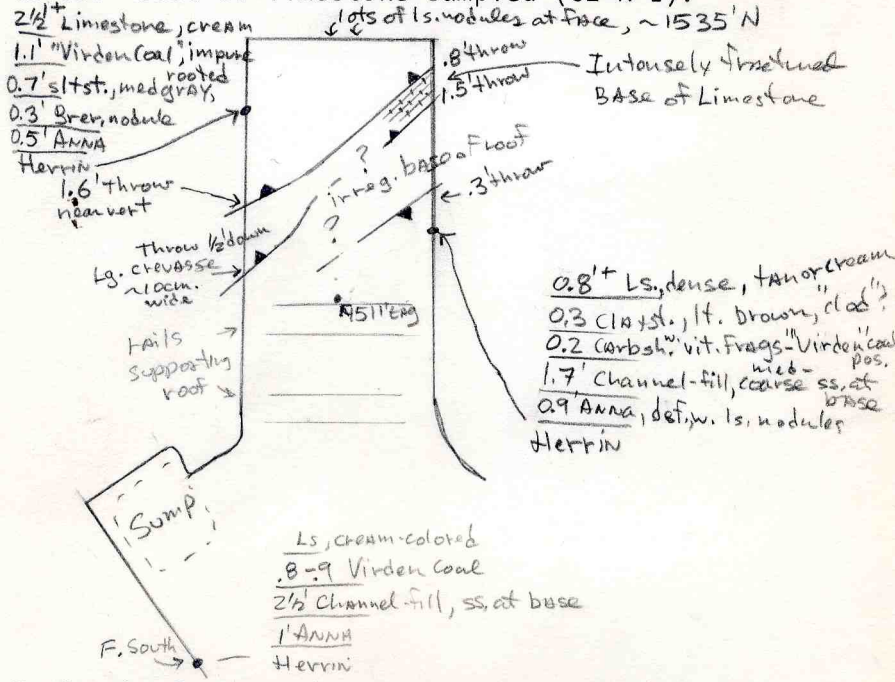
 p.3 of 5, plus 2 maps

D. East Examined the intersection of two fracture sets near the base of the down-thrown block. The NW-trending set is either healed with calcite or lined with fine pyrite crystals on fracture surfaces. The NNE-trending set is unmineralized. This suggests that the NW-trending fault and related healed fractures are older than the NE-trending fractures.

E. 5th Entry face is at 1570'. Fault intersects W. rib about 1556'; fault is down to SW 0.60' on W. rib, vertical by mullion and strikes roughly NW-SE. View of NW corner shows thin "clod"(?) on Anna with probably limestone nodules pressed through it to top of coal. (After seeing F., this is probably a channel fill sequence with remnant Anna and remnant nodules limestone or a sandstone channelet pressed or cut through to the top of coal.) Intensely jointed Brereton Limestone; joints perpendicular to the fault plane on down-thrown side; a lesser number of fractures are sub-parallel to the fault. Fracturing is probably widespread but base of Brereton is bumpy (nodular) due to some deformation, so fractures are less easy to spot.

F. As we approach from the south the seam rises 3-4 feet from the E. rib corner at 1485' and the seam at the face appears to be split with 1½' of material which Dave Webb said was hard to cut. Found sandstone over siltstone (or remnant shale?) at 1520' on E. rib, then went to face, about 1535'N. The coal above the "split" was found to be impure (dull-banded, with gradational lower contact), had pteridosperm petiole impressions on the base (just as in AR Channel in N. panels) and there are root traces in the siltstone below the coal. This is the channel-fill coal or "Virden Coal" (see full description below). The "hard cutting" at the face is due to .8' to 2' long remnant "pillows" of Brereton left in the fill. Superimposed on the channel-fill units is a set of NE-SW trending faults, perpendicular to ones seen on the other entries. All of these faults are high

angle (within 15° of vertical) and the main fault on the W. rib has vertical to slightly reversed dip. The roof limestone is cream-colored, finely crystaline, and is thought to be the Bankstone Fork Limestone, and could be seen to be at least 2½' thick using fractures. Base of limestone sampled (C2-R-1).



F. South Just to the south a sump has been driven on the W. side of the intersection. Description on SW intersection corner shows thickest channel fill sequence with friable sandstone with some carbonaceous interlaminations at base. Cannot tell trend of Anvil Rock Channel but a NE-SW trend is compatible with both trends of thicker sandstone development and the known channel to the North. This would mean the E-W submain will cross (has crossed?) under the channel also.

Interpretation and speculation

Faulting

 p.5 of 5, plus 2 maps

It is clear that the area of the 4th N.W. from 800'N. to the face (1530-1670'N) has been subjected to a type of fracturing we associate with the strike-slip fault, which has been mapped for several miles to the East. While the density of the fracturing and the NE-SW trend of the dominant fracture sets is compatible with the left-lateral faulting seen to the east, no strike-slip fault has been seen so far, nor has horizontal movement been found on the faults mapped to date. See attached fault compilation. (Map B)

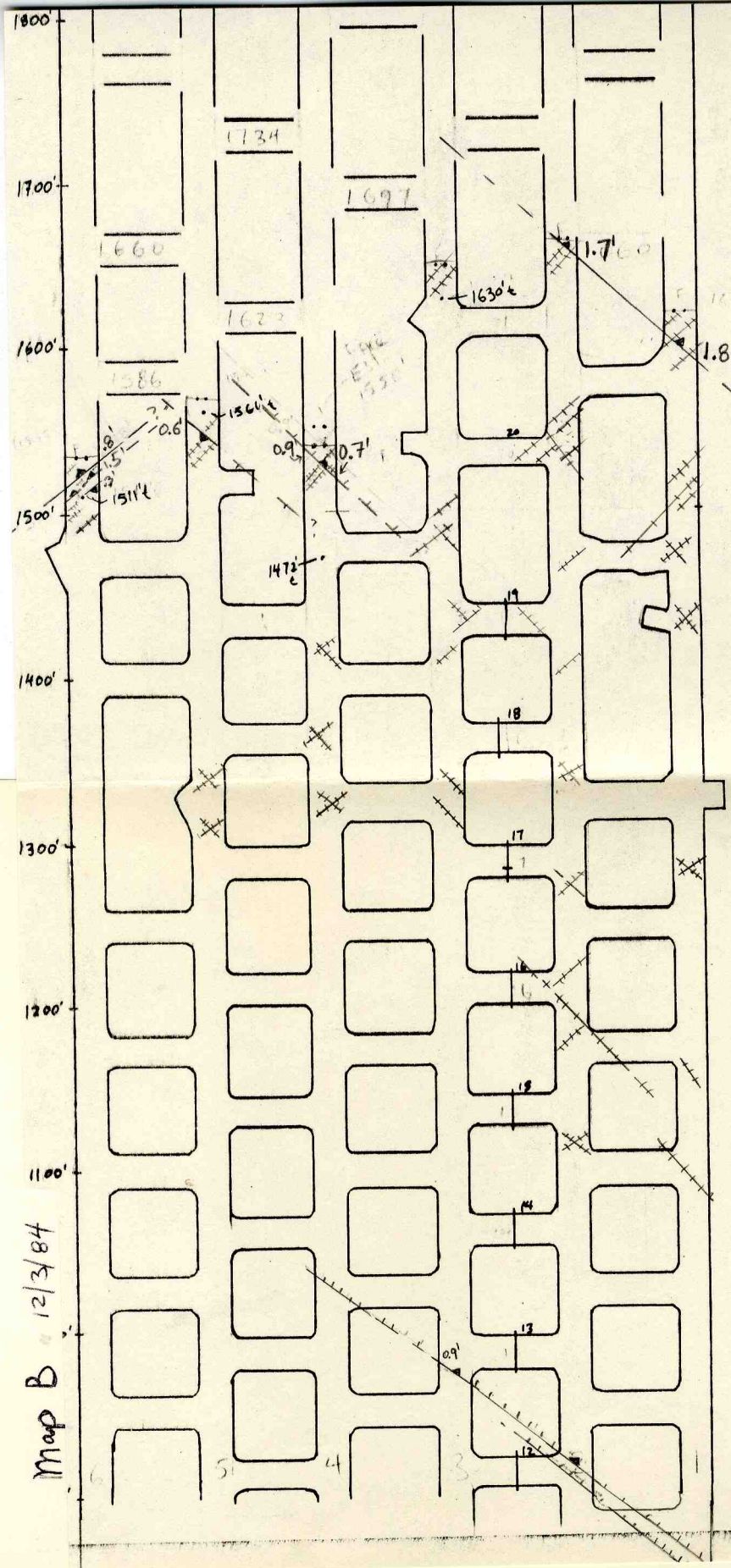
It may be that the strike-slip fault has not yet been mined through. If it is not encountered within the next 100', it seems likely that only the NE-SW fractures associated with this stress field will be found. Hopefully our next mapping visit will clarify this.

Erosional channel

Although I first noted erosion of normal roof units on August 15th at 1530'N. on the 3rd entry, this was not recognized as an Anvil Rock channel exposure because no certain channel-fill sediments were seen. It is clear now that this is a channel exposure, perhaps towards the southern side of a NE-SW trending channel. Similarities in clastic fill units, i.e. types (especially sandstone and coal) and thicknesses, between this channel and the channel mapped in the North mains and panels make it likely that they are the same feature. It is also likely then, that the same channel has been crossed on the West mains, perhaps with less trouble. A possible crossing area is around the 10th panels position on the W. mains where the base of the Brereton has sublinear troughs in it. I remember being suspicious when sandstone was found above the limestone, but again no certain channel-fill sediment were seen.

Samples: Set "R" begun:

C2-R-1	Site F.	Small sample of cream-colored limestone believed to be Bankstone Fork Limestone.



FORM 180 W

Faults + fractures

Compiled from 3 trips to Dec. 3, '84

Crown II

4th N.W. Submain

1" = 100' P.J.D. 12/84

K+E "00"

Freeman United Coal Mining Co. - Crown II Mine
Notes by John Nelson, July 9, 1985.
Visit with Jose DeLeon, Assistant to Superintendent.

4th North (Submain) panel off Main West - fault zone. The face has been advanced only 2 or 3 crosscuts since my last visit. The area is heavily fractured, but no longer is water dripping from the roof.

1.) In No. 2 entry (from east) about 1600 feet into panel. Fault strikes N. 40° W; dips about 75° NE, throw 1.7 feet down to NE on SE corner of intersection throw decreases to 0.7 feet on northwest. Very prominent slickensides indicate dip-slip or nearly dip-slip displacement - a normal fault.

Anna Shale is highly fractured; vertical fractures trend N. 40° W. and N. 45° E. Open fractures trend NE in Brereton Limestone.

2.) No. 3 entry about 1700 feet into panel. This area is highly fractured - dominantly vertical NE-trending fractures penetrate coal, shale and siltstone in roof. Many fractures are open and/or have small displacement. Conditions not good to observe structural details.

The immediate roof is Anna Shale, 2 to 3 feet thick. This is overlain with a sharp irregular contact by silty mudstone, siltstone and very fine sandstone; light greenish-gray to dark gray, streaked and banded, and micaceous. It is moderately competent and breaks with blocky fracture.

A particularly prominent fracture zone crosses the entry, trending about N. 60° E. It shows indications of both strike-slip and extensional movement. Strike-

slip suggested by horizontal slickensides in places on the walls of the fracture, extension by open fissures extending several feet into roof and ribs. At the roof line, where country rock is gray siltstone, the fracture is filled by green-black mottled mud up to a foot wide. Farther down in the Anna Shales blocks of siltstone and sandstone have dropped or been squeezed downward.

3.) Exposure of roof strata on north rib of crosscut between No. 3 and No. 4 entries, about 1800 feet into panel.

1' + Limestone, cream to buff, very fine grained has brecciated texture, angular fragments in fine matrix, irregular contact.

0.2-0.3' Shale, brown, hard, poorly laminated, sandy micaceous, calcareous; streaks of greenish clay. Irregular contact.

0.1-0.3' Shale, black with brownish streaks, soft, weak, locally very thinly laminated, coaly streaks and stringers - almost bone coal in places. Sharp and fairly even contact.

0.8-1.7' Mudstone, olive gray, firm, non-calcareous, slightly micaceous, occasional thin laminae of light gray sandstone, occasional coal stringers. Basal contact very uneven, clearly eroded into Anna Shale. Lenses of light gray sandstone in low places, with fragments and large angular chunks of Anna Shale.

2.1-2.9' Anna Shale, black. Upper portion nearly massive but contains calcareous laminae and inclusions of siderite and pyrite. Lower 1 foot hard, fissile, well-jointed with calcite in the joint faces.

Herrin Coal.

Within 30 feet to the west, the olive mudstone pinches out, and the black coaly shale above becomes a bright-banded blocky coal, up to 0.7 feet thick and lying directly on the Anna Shale. This coal is overlain by calcareous shale and limestone, as before.

4.) No. 4 entry, about 1750' into panel. Northward and in crosscut to west the Anna Shale is overlain by the stray coal, with locally small lenses of olive mudstone between stray coal and Anna. Southward the mudstone thickens abruptly, and the stray coal rides up over it. The body of mudstone therefore locally trends NE-SW.

Farther south, light gray sandstone comes in at the base of the olive mudstone. Around 1700' survey marks there are numerous NE-trending tensional open fractures

5.) In No. 4 entry 1660' into panel; an intensely fractured zone about 10 feet wide, trending about N 50-60^{o} E. Coal and Anna Shale are crushed in places; many small offsets; bedding tilted and jumbled; details not readily observable due to rock dust. Appears to be mainly tensional faulting producing open fissures in roof and ribs.

6.) Continuation of fracture zone into No. 5 entry. There is a large breccia-fault zone, inclined toward the southeast and striking NE-SW. The zone is several

feet wide in places and contains blocks and fragments of coal, shale, sandstone, etc. jumbled together at all angles, in a matrix of crushed material. The strata southeast of this zone have dropped downward several feet, necessitating grading the entry. Adjacent to and parallel with the breccia zone are numerous open fractures, some of which show small offsets.

The roof of the entry is the cream-buff colored limestone (Bankston fork?). This has behaved relatively competently and broken in large tilted blocks. The underlying olive mudstone is weathered to claylike material in places. Coal and Anna Shale are shattered and crushed.

Brereton Limestone comes in just south of the breccia zone. It is shattered in places and the fractures lined with calcite.

The channel-fill material, which cuts out Anna and Brereton, is olive-gray, very silty, micaceous shale or mudstone loaded with large and well-preserved plant fossils - mostly straplike leaves and calamites stems.

7.) No. 5 entry about 1700 feet into panel. The "stray" coal is well exposed again and thicker than half a foot in places. The lower part is brightly banded and blocky; this grades upward to bone coal or hard laminated coaly black shale. A few inches of olive-gray mudstone are present below the coal. This lies on Anna Shale with erosional contact, as before.

An excellent Stigmarian root seen in Anna Shale, below the coal - indicates in situ growth of trees in abandoned channel.

8.) No. 6 (westernmost) entry, about 1750° in. Roof strata:

Top	Limestone, cream to buff
0.5'	Shale, brownish, calcareous
1.1'	Coal, bony at top, rest bright-banded
0-0.5'	Mudstone, olive-gray, with plant fossils
1.0'	Anna Shale, with concretions. Joints NE-SW and NW-SE

Herrin Coal

9.) No. 6 entry, about 1550' in. Breccia-fault zone (as at Locations 5 and 6) well exposed. Here the zone is narrower, 3 to 5 feet, and more sharply defined than at Locations 5 and 6. The fault dips southeast and the strata are downthrown about 5 feet to the southeast.

Well-developed slickensides on limestone plunge about 45° to northeast. Indicate southeast block moved northeast and down (left-lateral and normal faulting).

The fault zone at the top contains greenish and black claystone, probably from above Bankston Fork Limestone Below is the usual jumble of large and small blocks of coal, shale, and limestone, etc. in matrix of crushed material. Minor water seepage from fault zone

South of the fault zone the roof strata are well exposed. Limestone forms the top of the entry, then the thin brownish calcareous shale, which has fine parallel laminations. The stray coal varies abruptly

in thickness from a couple of inches to a little more than a foot. The lower layers generally are bright and the upper layer very shaly and bony, grading upward to black shale. Below is mudstone, olive gray and mottled, possibly rooted. Anna Shale is thin and locally absent.

About 20 feet south of and parallel with the main fault is a zone of intense fracturing. The rocks are shattered, but displaced very slightly if at all. Some fractures are open, others filled with crushed rock or clay.

10.) No. 6 entry about 1400 feet into panel. On the west rib is a sandstone-filled channel about 20 feet wide and clearly scoured into the Herrin Coal. The sandstone is about 3 feet thick at the most, and overlain by siltstone. The siltstone forms the immediate roof north of the sandstone lens. The siltstone is dark gray, well laminated, sandy, coarsely micaceous, very carbonaceous with abundant plant debris; a Lepidodendum truck was noted.

South of the sandstone the immediate roof is Energy Shale - dark gray, fine, smooth, well laminated, with little plant debris; occasional pyritized Pecten. This shale is topped by Anna Shale to the east toward the south, siltstone and sandstone overlie Energy Shale.

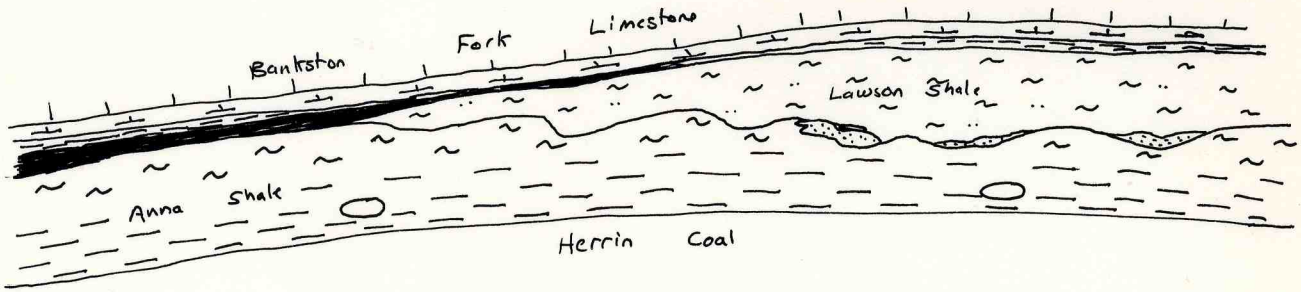
No. 4 Entry

W

Location 3 - north rib

No. 3 Entry

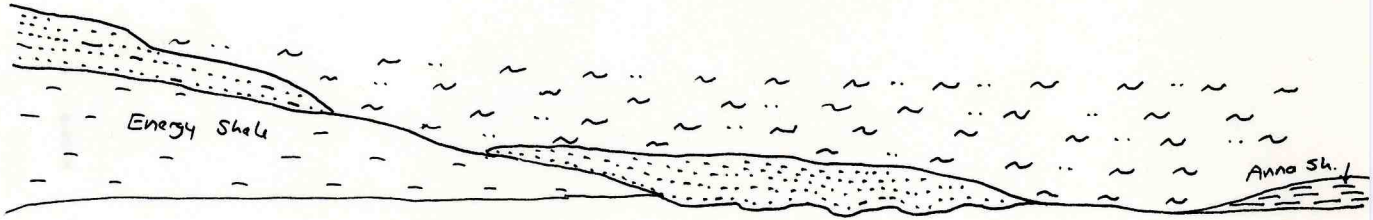
E



Location 10 - west rib
width about 100 feet

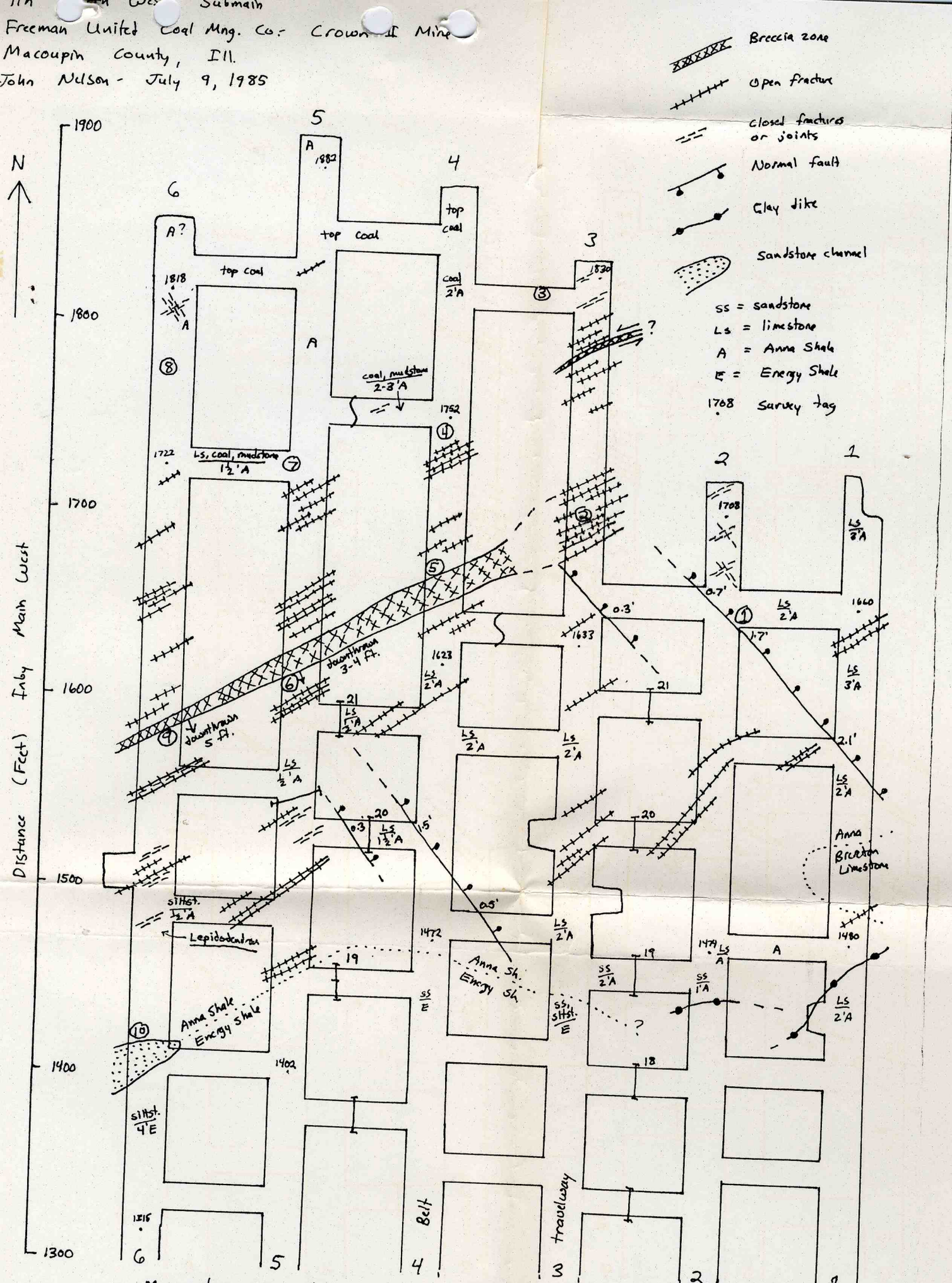
S

N



FORM 180 W

Freeman United Coal Mng. Co.- Crown II Mine
Macoupin County, Ill.
John Nelson - July 9, 1985



Map redrawn from sketch map made in field, using survey tags for reference- sizes and shapes of pillars were not measured, but merely estimated.

Freeman United Coal Mining Co. - Crown II Mine - Macoupin County - Notes by John Nelson with Phil DeMaris - Jose DeLeon from Freeman. January 15, 1986.

4th North West Panel

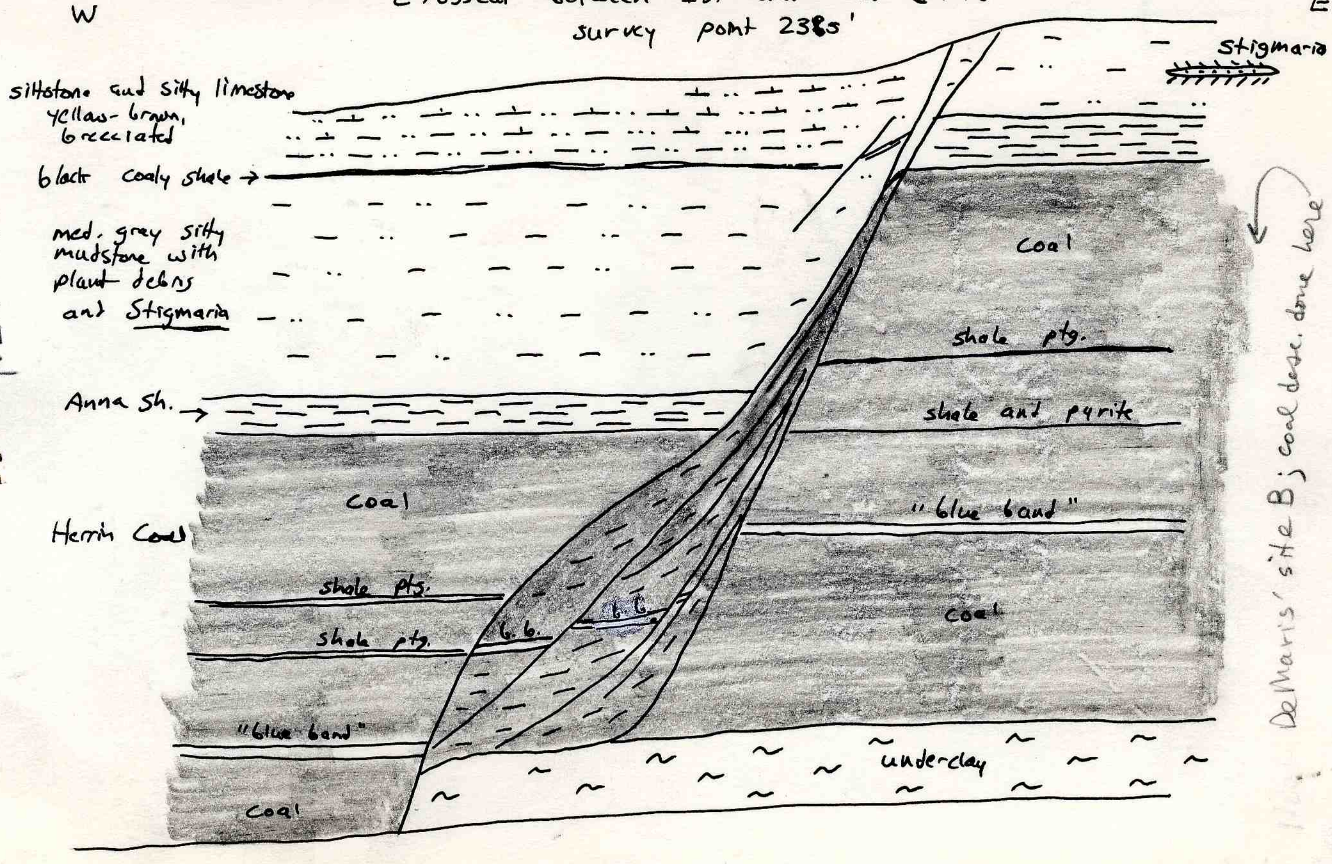
This panel has been driven north and has almost joined the Main West North entries, which run west from the slope bottom. A set of normal faults is seen in the 4th N.W. about 2500 feet into the panel. The faults trend about N.40°W. and the southwest side is downthrown up to about 3 feet on the largest fault. This fault zone is parallel with the fault that crosses the Main South, but the displacement is opposite. See Phil's notes.

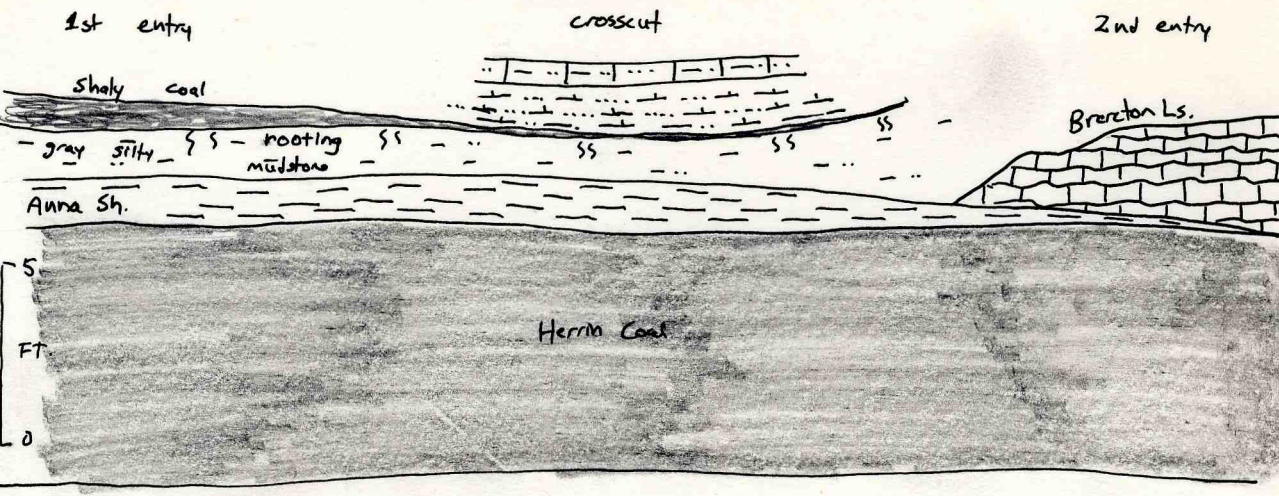
A good exposure is seen in the 1st and 2nd entries from the east, and in the crosscut between (sketch, next page). The fault is more or less a single plane in the roof, but it splits into a wide lens-shaped zone as it passes through the coal.

This same exposure shows the Anna Shale to be overlain with erosional contact by a gray silty shale or mudstone that contains well-preserved Stigmaria. This mudstone is 1 to 2½ feet thick and is overlain by 1 to 2 inches of black coaly shale. Above this is a yellow-brown to gray calcareous siltstone or silty, argillaceous limestone that has a slightly brecciated texture (soft-sediment deformation?). It is thinly laminated, but the laminae are discontinuous, broken and slightly deformed.

In the 2nd entry along the fault, only about 40 feet from the place I sketched, the coal is overlain by what appears to be normal Brereton Limestone - gray, fine-grained, in thin nodular beds.

Crosscut between 1st and 2nd entries
survey point 2385'





Sketch, facing south; matches DeMaris' B. (has a measured section)

Crown II Mine (Cont)

In the 1st entry the roof sequence is about the same as in the crosscut, except that the thin coaly shale above the gray silty shale has become a rather dirty seam of coal about 8 to 12 inches thick.

South of the fault in the 1st entry, beautifully preserved Stigmaria can be seen in the Anna Shale. They have weathered to a bronze color. These roots must be from the impure coal above the Anna (which cannot be seen here, but is exposed along the fault).

In the 2nd entry about 200 feet south of the fault, the Herrin Coal is directly overlain by medium-dark gray, very silty shale or argillaceous siltstone. It contains both lycopod bark and large Stigmaria with excellent preservation on both.

Small thrust fault

Seen in the 1st entry at about survey point 1790 feet. The fault plane can be seen in the roof and strikes about N.85°W. It dips southward about 45°. On the east rib the Anna Shale has been thrust about 1½ feet above the sandstone to the north. Displacement in the coal and on the west rib is very small.

This is part of the strike-slip fault zone which I examined last summer.

2nd Main West off 10th South
(southwest part of mine)

Last summer these entries had been driven up to the edge of an area of water-bearing sandstone roof. Now the entries have been driven through the sandstone area and the faces now have limestone roof and are dry, about 2000 feet inby the 10th South.

Exposures of sandstone can be seen in the southern headings about 1700-1900 feet inby the 10th South. The immediate roof is very soft, disturbed black to greenish-gray mottled shale or claystone a few inches to about a foot thick. This is overlain by greenish-gray, very fine-grained sandstone or siltstone, argillaceous, calcareous, thinly bedded, and having fine parallel laminations. The area is wet and the roof has fallen in many places. Lingula fossils are found in shaly layers within the sandstone. These fossils suggest a brackish-water setting, a mixing of normal marine waters with fresh water from nearby streams - therefore not a channel deposit.

Siliceous Lenses

Lenticular bodies of extremely hard dark brown to black fine-grained silica occur at the top of the Herrin Coal in two places - one on the No. 3 Entry at 2000' Survey tag, the other on No. 7 entry at about 1800 feet. At the latter place the lens extends across the full width of the entry and is up to about 18 inches thick. Thin stringers of coal extend up over the lenses and separate it from the overlying Brereton Limestone. Below and alongside the silica is normal-appearing Herrin Coal.

This resembles the siliceous coal balls I have seen in the Peabody River King Underground Mine, St. Clair County, and the Lee Coal Co. Calefy Mine near Danville, Vermilion County. These siliceous lenses apparently represent peat replaced by silica under acidic, oxidizing conditions.

John C. Moore Corporation, Rochester, N.Y. 14604
FORM 180 W

Mine Notes - Freeman Crown II - Macoupin County

Trip: January 15, 1986 by Phil DeMaris and John Nelson (ISGS) and José DeLeon (Freeman)

Coverage: Introduction
4th N. Submain off W. Mains
2nd Main W. off 10th South
Samples: C2-R-2 to -7

Introduction

This trip combined the collection of a ROM sample with checks of geologic features of continued interest in-mine. The superintendent is Dave Webb, and we were escorted by the assistant-to-the-superintendent, José DeLeon. Underground we mapped one entry under an Anvil Rock channel and looked at an area of variable roof at the far west margin of the mine which Dave Webb requested. After a half-day visit to Crown III (see notes) we returned to Crown II to get some fresh ROM coal, which will be used on the fine coal cleaning project.

4th N. Submain

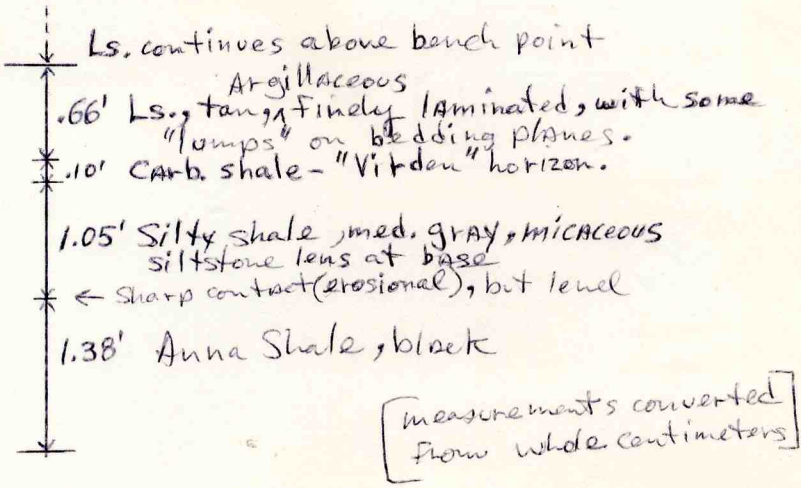
We began by revisiting the 4th N. Submain, a set of 6 entries connecting the old West Main with the new West Main to the north. They are within a cross-cut of opening the six entries, but are waiting for undercasts to be built in the old West Mains; when completed the submain will solve some ventilation problems. We are interested both in the channel-fill exposures and also in the strike-slip fault which crosses the same area and the NW-SE striking normal fault zone which was encountered near the end of the submain. We went to the far end of the submain to reach power, and worked our way south.

4th N. Submain (Cont)

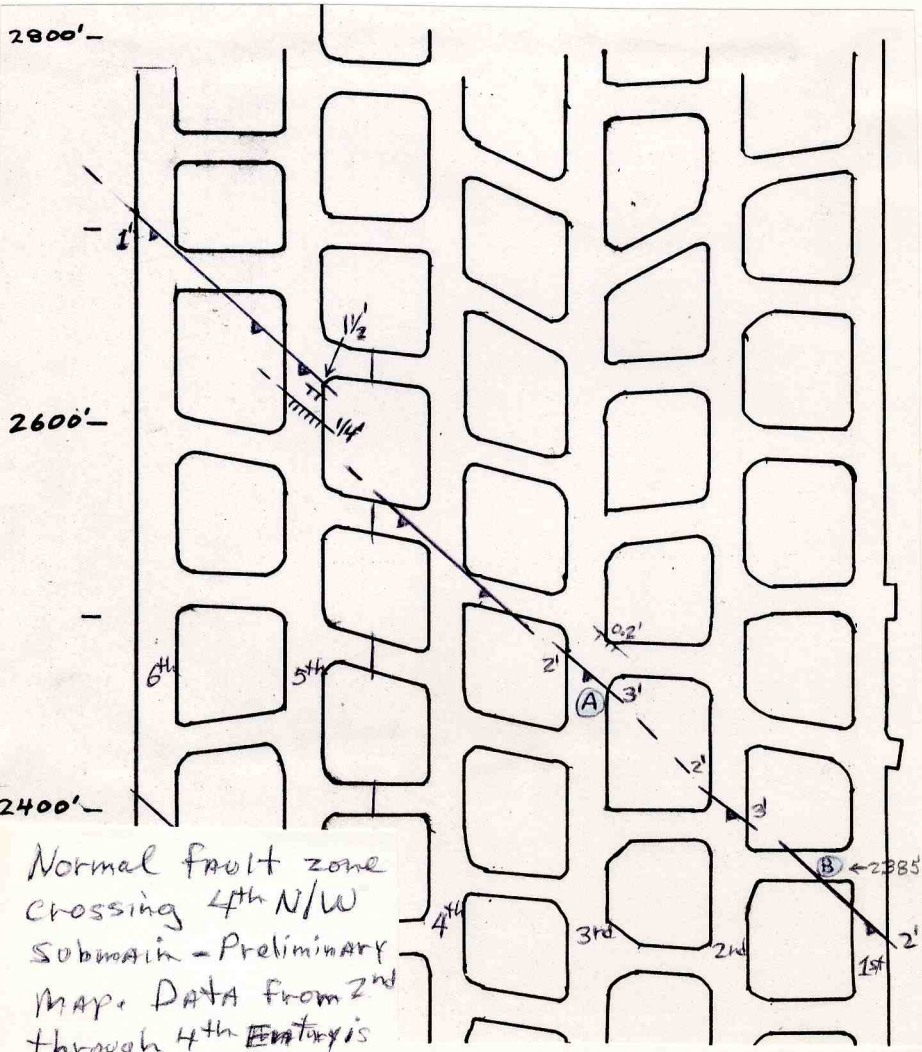
A. At about 2470' N on the 3rd N. the normal fault crosses the entry striking about N.40°W. It shows a clean break at the bottom of the Brereton, about 3' of throw down to southwest and about 60° dip. However the fault splits into 2 planes in the Herrin (one 1' and the second 2' of throw) and the second one has produced a low-angle zone of crushed coal. Dip-slip slickensides are present on many vertical surfaces. A small parallel fault was seen 30' to the N. on a pillar corner with about 0.2' displacement.

We then walked north to see if there were other related faults, walking to the end of development - the last set of crosscuts are at 2775'N.

B. We came back south on the 1st N. toward the channel-effected area. Our first confirmed exposure of Anvil Rock channel sediments was in a roof fall at 2385' crosscut between 1st and 2nd. Description on south rib (which matches center of Nelson's sketch, p. 2B):



1/15/86 Map A



Normal fault zone crossing 4th N/W Submain - Preliminary Map. Data from 2nd through 4th ~~Entry~~ is From Pat Peterson, Freeman United C.M.C. (in part.

. (Cont)

n the north rib, where John described roof lithology nd did sketch of fault, I did a basic coal description where weathering was good and rock dust minimal.

eeee siltstone, with pebble lag on contact to Anna

Anna Shale, about 1' thick

T = 232 cm. = 7.61'

Σ parts = 7.61'

.98' Coal

.10' mineralized coal, pyrite

.38' Coal

.03' clAYst. ptng

.95' coal

.07' bone ptng, loc. w. pyrite nodules

.72' Coal

.07' clAYst., med. gray, loc. w. pyrite nodules

1.20' Coal

.05' bone ptng., fairly pyritic

.57' Coal

.08' claystone, medium gray, locally with pyrite nodules (R-2) (Blue band)

.44' coal

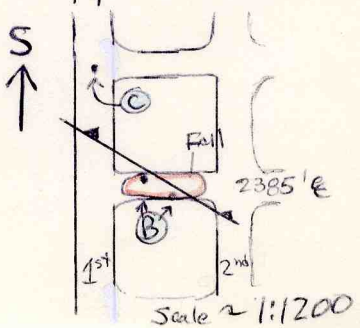
.03' bone ptng, pyritic, appears discontinuous

.89' Coal

.03' bone ptng., laterally a dirtain band, appears discontinuous

1.02' coal

U/C



B. (Cont)

Around the corner to the south the small fault which crosses the fall area offsets on west rib about 0.3' of impure coal ("Virden") with about 0.3' of weak light gray claystone below a limestone (probably the Bankston Fork). This shows how quickly the coal thins near the edge of the channel.

C. About 1 foot of Anna is found here, with channel-fill siltstone overlying it. The channel-fill material has plant debris up to 20 cm. long. Here there are lots of Stigmarian axes in both the siltstone and the Anna, apparently from the period of "Virden" coal development. At the plane of Anna concretions (about ½ foot up?) stigmarian rootlet area density was about 30% over a 2 square meter area. Just as in the N. Main rootlets are seen to penetrate the interior of Anna concretions, indicating that they were at least plastic at that point.

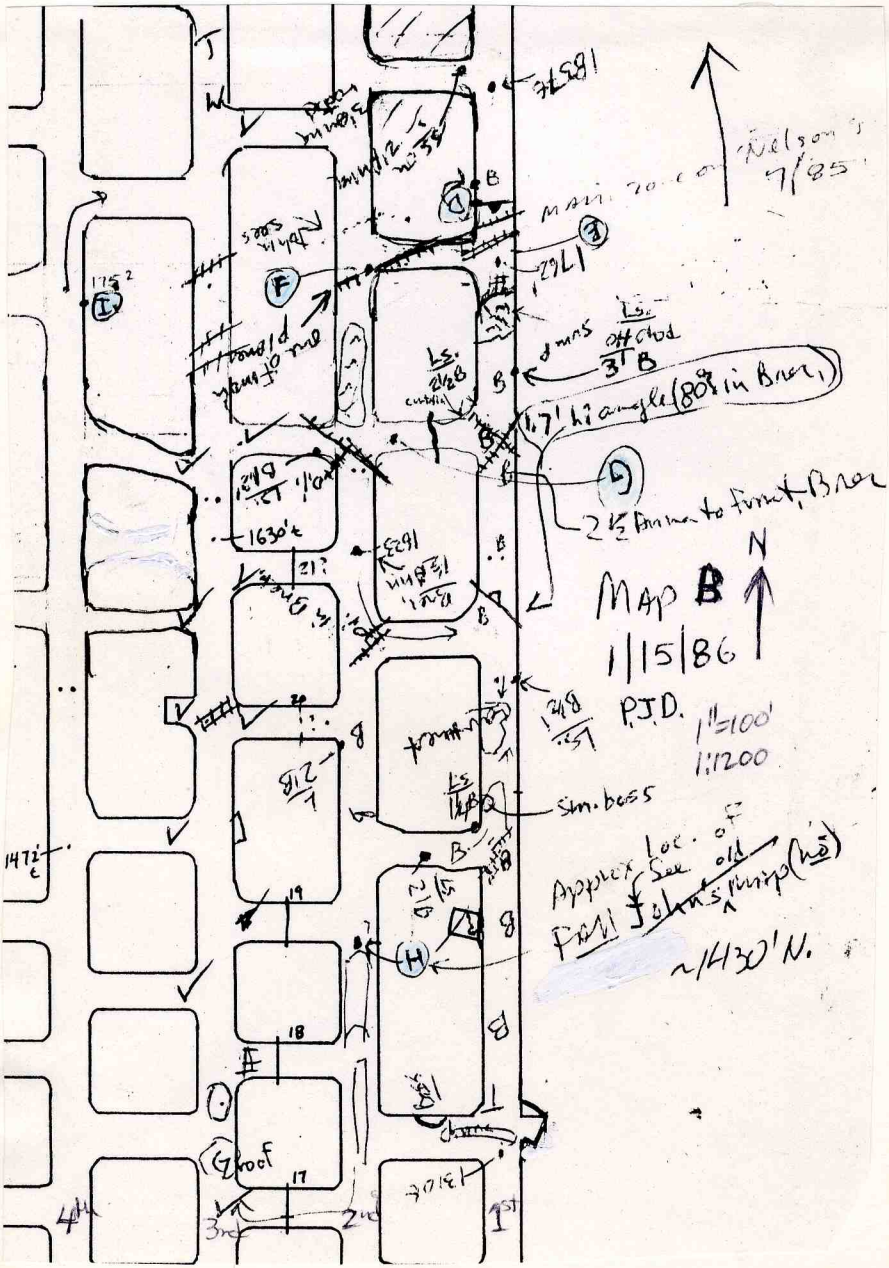
C. South Another crosscut and a half south on 2nd N. (vicinity 2200') I sampled a lycopod compression from the channel-fill siltstone for identification (-R-3), and took a bulk sample of the gray, rooted siltstone (-R-4). At a further crosscut, but north of 2093' crosscut, the channel-fill ("Virden") coal is 1 foot thick, quite dull in the top, and lies over 0.4' of siltstone. Probable limestone caps the exposure. One more crosscut south channel-fill siltstone was seen on the Herrin.

D. (See map A). In the vicinity of 1800'N of 1st, this sequence was seen in a fall:

1.'+ Siltstone, to top of fall
0.4' Sandstone, light gray
4.3' Anna Shale, top 0.4' bioturbated.
Herrin

FORM 180 W

1/15/86 Map B



D. (Cont)

The bioturbation may well be due to plant activity. John notes a thrust fault (part of strike-slip activity) just to the south.

E. In the intersection, there is Brereton roof over 3½' thick Anna; Brereton is well fractured on 4" to 2' centers over a band 20' wide running across the entry.

F. Exposure here shows 3½' thick Anna, no Brereton, and 1' siltstone to top of exposure.

G. One foot of Anna with probable Brereton above it. Anna thickens rapidly to 2½ thick just 40' to the east at pillar corner on 1st entry.

H. Visit of 5' high fall between arch supported area and crosscut which has rail supports (vicinity 1425'N.). N. thought channel-fill coal was present, but it was Anna (ca. 1' thick) over thin Energy. Above the Anna was about 3' light gray sandstone, and no channel-fill ("Virden") coal was seen.

I. At vicinity 1745'N. on 4th we found a 4' fall with these units:

Limestone roof, tawny gray, 0.4' seen, appears stable
0.1' Carbonaceous zone
2.0' Channel-fill siltstone
0.5' Channel-fill sandy siltstone, micaceous
1.' Anna Shale (varies)
Herrin

We went back to the north end of the Submains for lunch, then we checked out the normal fault zone on the 5th and 6th entries. We did not have a base

I. (Cont)

map covering the area, but I was able to later add my sketch map to Pat Peterson's map (See map B).

2nd Main West off 10th South

Two units are working west here, the "1st and 2nd Right", each cutting 6 of the 12 entries. Dave Webb requested we look at the roof, some of which is sandstone.

J. On the third entry (1st Right) vicinity 2000' W. we found several silicate (?) coal balls near top of seam. Could get only a chip with nice bluish-white concentric vug-filling (-R-5).

K. On the 5th entry (vicinity 1900' W.) we saw roof falls with siltstone (sandstone?) in them, and did description at one ovate fall, 5' high.

On the south rib, there was a Brereton nodule in 0.5' of claystone (appears naturally nodular, not erosional remnants) sitting on 0.7' of Anna. The Anna Shale is highly effected by fine-scale clay injection, or perhaps syneresis; the material apparently comes from above and has some similarities with cases where injection is known to be lateral. On the opposite rib the material in Anna is clearly as coarse as fine sandstone; most appears to be silty. Above the claystone with limestone nodules is the sheet sandstone/siltstone we consider the sheet facies of the Lawson/Anvil Rock; here we saw Lingula and small bivalves.

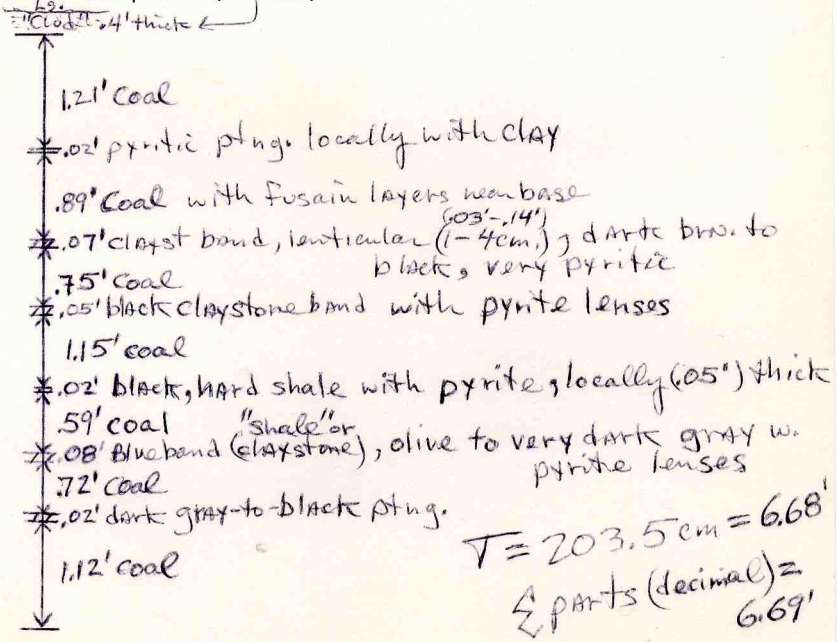
This appears, then, to be a normal roof sequence with poor Brereton development and the sheet sandstone

K. (Cont)

(usually fine sandstone to sandy siltstone) above it, this time with clearly marine influence. The fall ends against a flat-bottomed, competent unit (is bridging about 18' here) which may be a limestone. Thin Brereton development has been seen before locally and was previously a problem in the south panels off the W. Mains (see 1980 notes on 3rd S. off W.) and as seen most recently by me in the 7th N. Panel off E. Mains, and in farthest 1st-12th West Mains where development was stopped.

K South. Further south we found silicified peat at the top of the seam. Roof here is thin "clod" under Brereton Limestone. We sampled silicified peat here (-R-6A) for XRD and petrographic analysis.

L. Site on 7th Entry in vicinity of 1880' W. was selected for basic coal description. Partings marked by PJD, and described by WJN. "Clod" of Brereton sampled (-R-6B).



M. At the face of the 9th Entry at 2590' W. we examined a roof fall which had been bolted in the previous shift. Brereton here is nodular or thin (0.4') and is ineffective as roof; above it is 4-4½' of siltstone. Bridging the fall is a dark-based competent unit which is hard; bolters at the face think it is less than a foot thick. If it is the Bankston Fork, this would not be surprising since it is often benched. Siltstone above Brereton Limestone sampled (-R-7).

At the end of the shift we picked up maps at José's office. The West Mains maps were useful, but 4th N.W. Submain footages were measured backward from the north and was less usable. We solved this problem at the Engineering Office where we were lucky to get a 1" = 200' map including the area done by Pat Peterson, who had corrected the map from the projected version.

Sample for fine coal cleaning project taken next day (C24256).

Samples: -R-2 to -7

No.	Site	Description
-R-2	B	Blue band where 2½ cm. (.08'), medium gray claystone, some pyrite (XRD and Chemistry, C24273) 3100A
-R-3	C south	Lycopod compression from channel-fill siltstone (for identification by DiMichele)
-R-4	C south	Channel-fill siltstone, bulk sample (XRD)

John C. Moore Corporation, Rochester, N.Y. 14604

MOORE'S MODERN METHODS

FORM 180 W

Samples (Cont)

No.	Site	Description
R-5	J	Small fragment of silicified peat for petrography*
R-6A	K south	Siliceous peat in Herrin Coal (Bulk sample, for XRD) → 3098A, B, C carb.s
R-6B	L	"Clod" of Brereton, fossiliferous, (for XRD) or bioturbated Anna?
R-7	M	Siltstone, light gray, micaceous above poorly developed Brereton; seen locally to have marine fossils.

* Similar silicified peat sampled at Crown III on 1/16 was confirmed as alpha-silica by XRD on sample 3096A.

Freeman United Coal Company
Crown II Mine

April 23, 1986
Macoupin County

Notes by Steve Danner. Accompanied by Cynthia Morgan (I.S.G.S.) and José DeLeon (company engineer).

The purpose of this visit is to confirm the presence of a fault in the 1st East Panel off the Main South. Jose thinks that the miners have encountered an extension of the NW-SE trending normal fault that cuts across the Main South 1000 to 1500 feet south of the bottom area. This same fault was encountered in the 1st and 2nd south panels off the Main East. On the Main South, the coal is downdropped 4 or 5 feet on the northeast side of the fault.

When we arrived at the face of the 1st East Panel, Jose had some trouble finding the alleged fault. At first glance, the fault appeared to be little more than a tension fracture in the black shale roof. In the northernmost panel entry we found the fracture in the fourth cross-cut outby the face. It was trending about N.30°W. We traced it diagonally across the set of four panel entries to the fist crosscut outby the face. It died out near the face of the southernmost entry.

The only clue that this is a fault is a slight offset at the top of the seam. The offset varies from zero to three inches. Six inches below the top of the seam the coal banding is uniform and level. Away from the ribs there is some chipping of the black shale along the fault, but nothing significant. At this location the fault is rather unimpressive.

Jose is concerned as to whether this is the same fault encountered in the South Mains or a minor branch of it. From the limited exposure in this panel, it

is difficult to say. While this could be a branch fault, it is also possible that the main fault has died out and we are near it terminus. The next panel to the south has not advanced as far as this panel, so they would not have hit the fault yet, if it is present at all in that panel.

10-16-86

I talked to Jose DeLeon at IMI this afternoon. He said they had finished the 1st East Panel without encountering any more faults. Also, they encountered no faults in the 2nd East Panel. Thus it appears that the main fault had died out.

S.K.D.

John C. Moore Corporation, Rochester, N.Y. 14604
MOORE'S MODERN METHODS
FORM 180 W

Mine Notes - Freeman Crown II - Macoupin County

Trip: October 29, 1986 by Phil DeMaris, Keith Hackley, Steve Hawk, Jack Liu with Jose DeLeon, Assistant to Supt., of Freeman C.M.C.

Coverage: Introduction
9th N. Panel off E. Mains
1st E. Panel off South Mains
2nd Main West off 10th South Submain
Sample set "R" completed (to -R-12)

Introduction

I (PJD) am assisting Hackley, Hawk and Liu in getting coal samples for sulfur isotope study (CRSC project) at comparable positions in the seam under known roof lithology. This team took 2 sets of small cores at each site using a portable electric drill. At each site the roof and/or roof bolts were sprayed with orange paint to aid in relocation for further sampling. Freshly mined sites were chosen to avoid any preferential weathering of sulfides.

9th N. Panel off E. Mains

We went into this panel first. We stopped at a fall on travelway near the base of the panel to examine Anvil Rock Channel exposure. Fall shows Anna roof with sharp contact to carbonaceous siltstone (?), cleaner siltstone (?) and probably Bankston Fork Limestone at top. No channel-fill coal was seen, suggesting this was probably an edge position in the channel. This is roughly in line with channel we mapped to the west - a drill hole is near here, but the block it was in was avoided as too wet. We continued north

Freeman Crown II -2- of 6, plus map Macoupin Co.

to fresh workings at Room 18 west, vic. 1400' north. We located our first desc. and sample site on a pillar corner near a shallow fall which showed channel-fill silty shale with lots of plant compressions, including pteridosperm petioles and u/i pinnules. Clear erosion of Anna roof confirmed in next crosscut south.

A. Description/sample site. Roof is .06' pyritic siltstone (local) under .3' minimum gray silty shale with abundant plant fossils (A.R.C).

[measured in cm.]

(Distinction between fusain band and fusain lens is only that the lens was seen to end within the limited exposure.)

siltstone

- 1.67' Coal, NBB
- .05' fusain lens
- .77' Coal, NBB (2.49')
- .10' clayst. band w. pyrite nodules, locally over fusain (-R-8)
- .21' coal, NBB
- .02' fusain lens
- .10' coal, NBB
- .03' fusain band
- .54' Coal, NBB (3.49')
- .05' clayst. band w. grad. contacts top + bottom, locally with pyritic lenses (-R-9)
- .20' coal, NBB
- .03' fusain band
- .29' coal, NBB
- .03' fusain band
- .78' Coal, NBB (4.87')
- .03' very pyritic band, some clay [6th core taken just above ptng]
- .53' Coal, NBB (5.43')
- .10' claystone, only slightly pyritic, prob. blue band (-R-10)
- .40' coal, NBB
- .05' claystone band [7th core taken just above ptng.]
- .57' Coal, NBB
- .05' mineralized band (if pyrite, very fine grained)
- 1.48' Coal, NBB [8th core taken near center]

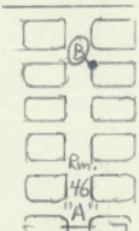
T = 8.09' conv. of 246.5 cm.

Σ parts (converted) = 8.08'

u/c

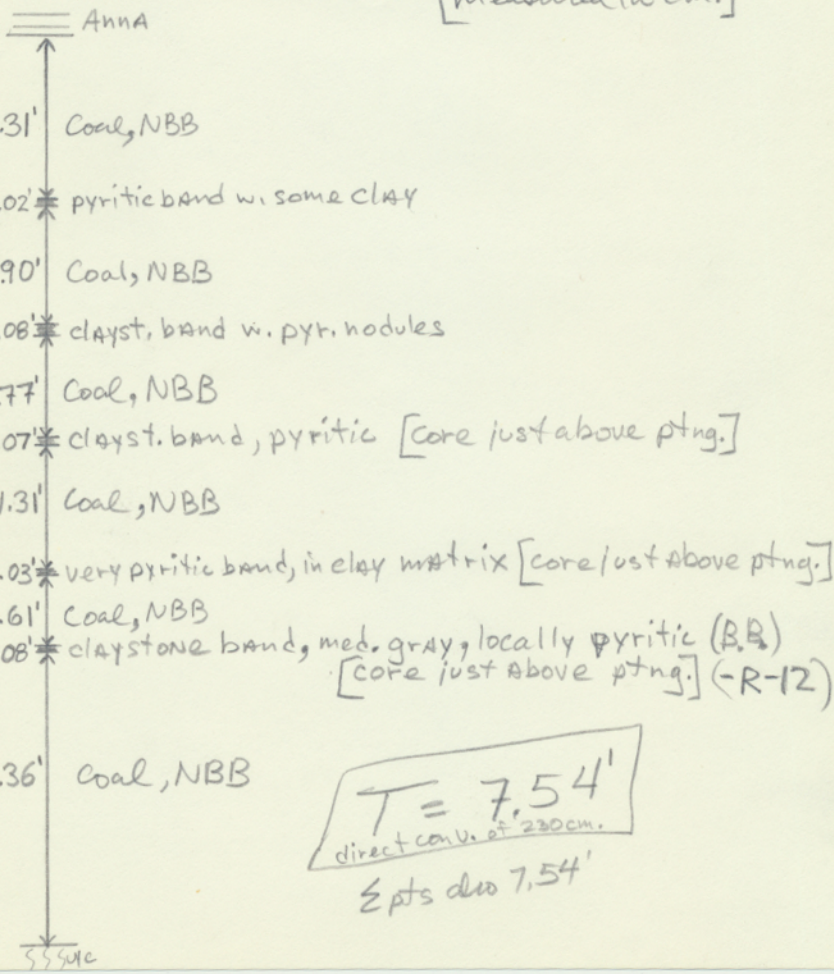
1st East Panel off South Mains

Next we went south to a panel which has fresh mining and some normal faults we want to plot. We went directly to Room 46, to the 5th of 6 crosscuts into West rooms to a site with Anna roof. After rough stratigraphy was established, cores were again taken between partings - see Keith's notes.



[measured in cm.]

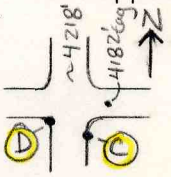
B.



Having gotten the samples we then sought and tracked a small normal fault from the travelway across north rooms of the panel (See map A). The fault dies out before hitting the north rib - rooms 22 to 32 were checked. The fault is roughly in line with the normal fault zone which crosses the Main South and effected the 1st and 2nd S.; a projection across 2nd E. Mains will be sent to Jose when completed.

2nd Main West off 10th S.

Over lunch we chatted about what had been seen on the west side of the mine. Jose indicated that there was much sandstone roof on the 10th S. Submain, an area we have driven through quickly, but not examined it. On the way out we stopped at a fall on the travelway and took a quick look around at sandstone roof. Here there was a basal sandstone with bedding features all around the crosscut, with probably silty shale above; clearly a channel sequence of some kind. The persistent sandstone reminds me of what Potter saw in the Virden South Mine, just to the NW. The mapped channel in the North Mains and panels only locally had a thick sandstone. We turned west and went to the working face, stopping at the 4218' crosscut (57th from 10th S.) on the 6th West entry.



C. Keith took his samples here while I described at D., due to limited time. Checks below the blueband indicated there was 0.25' to 0.35' less coal here than at D., 20 ft. away.

D. Rough description of fresh coal, dusted and now soupy, at vicinity 4218' E on 6th West entry off 10th S.

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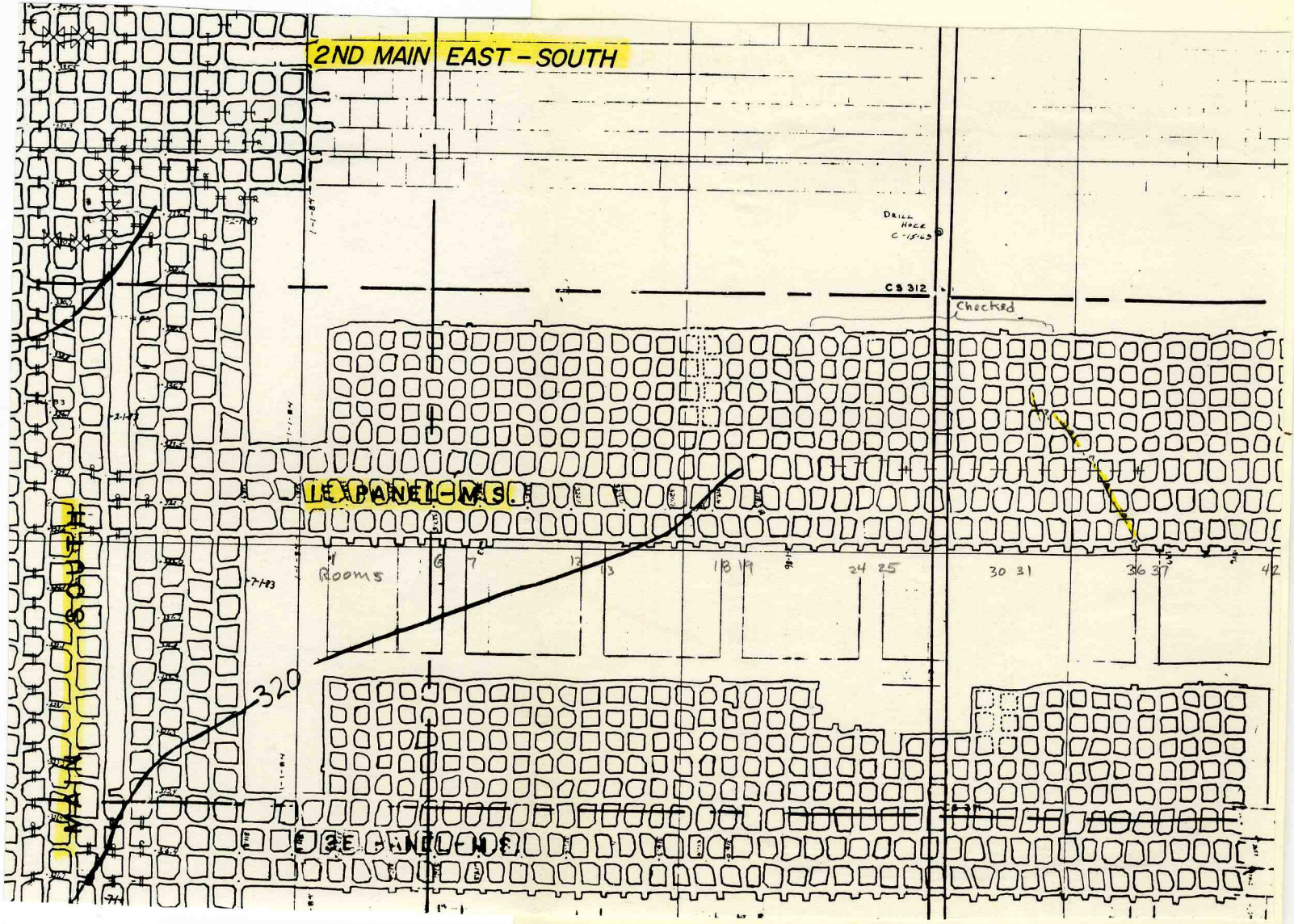
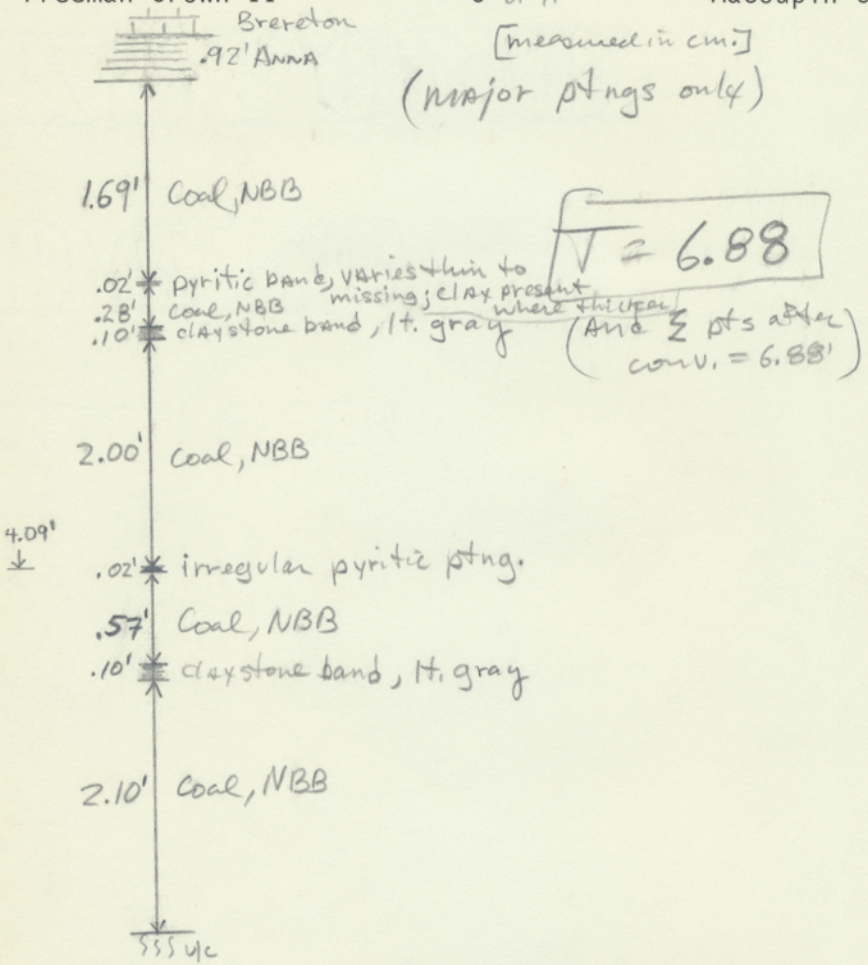
Crown II map A
10/29/86



Map of small (<1' throw) fault in 1st E. panel

Freeman Crown II -5- &G, plus MAP Macoupin Co.



The roof in this area is generally thin Anna under Brereton. Brereton was benched in one exposure we saw. Base of Brereton is "rolly" to "knobby" and a couple shallow "bosses" were seen.

Freeman Crown II -6- of 6, plus map Macoupin Co.

Sample set "R" completed

	Site	Description
-R-8	A	Claystone parting, dark gray, 3 cm. thick, 2.49' down from roof, locally overlies fusain, loc. pyritic.
-R-9	A	Claystone parting, medium to dark gray, 1½ cm. thick with carbonaceous top and bottom contacts, 3.49' down from roof, loc. with pyritic lenses.
-R-10	A	Claystone parting, medium to dark gray, 3 cm. thick, 5.43' down from roof, loc. with pyrite nodules, probable blue band.
-R-11	A	Underclay of Herrin, medium gray with carbonized rootlet traces, very friable.
-R-12	B	Blue band where 22 mm. thick, locally with pyritic lenses, medium to dark gray (block and bulk).

11/12/86

Mine Notes - Freeman Crown II - Macoupin County

Trip: April 14, 1987 by Phil DeMaris, Keith Hackley and Steve Hawk with José DeLeon (Freeman C.M.C)

Coverage: Introduction
Revisit of A. sample site
Visit to 10th S. off W. Main
Revisit of B. sample site
Samples: Set "S" begun

Introduction

Purpose of trip is to resample sites with useful inorganic/organic S isotope ratios. Best site from 5 sampled in October was A. here at Crown II which occurs under (Anvil Rock Channel) silty shale roof. This has also prompted a planned trip to Crown III to sample coal under the channel there. I also wanted to look around at the channel running subparallel with the 10th S. submain, to both see where the nice sandstone-filled Stigmaria root Jose gave me was located and confirm that this is an Anvil Rock Channel. As time allows, we planned to revisit the B. site which also had potentially useful isotope ratios, and resample laterally.

Revisit of A. site of October 29, 1986

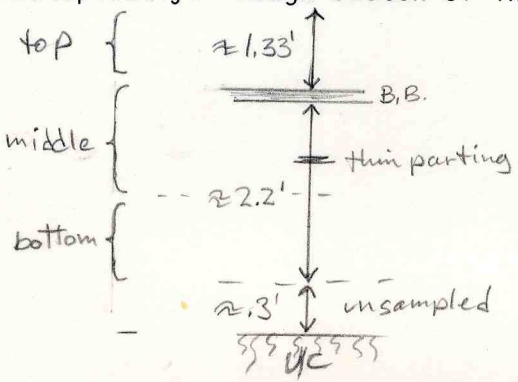
Previous sample location is in 9th N. panel off E. Mains, Room 18 West, at 3rd room West of the belt. A suite of samples lateral to the previous set was taken, and these ranged from 45 cm. above the blue band to 40 cm below the blue band. Coal samples (small cores) taken are centered:

"R1" 45 cm above b.b.
"R2" 15 cm above b.b.
"R3" 3 cm above b.b.
"R4" 13 cm below b.b.
"R5" 40 cm below b.b.

Also collected were:

blue band	
pyritic "steel" band	15 cm. above b.b.
pyritic coal	30 cm. below b.b.

We discussed when a bulk sample for "coal bank" use should be taken; I argued from logistical point-of-view that we should take what was easily sampleable now. A bulk sample of estimated 70-80 pounds in three segments was taken, and the three intervals will be screened isotopically. Rough sketch of intervals follows:



I next checked around to see where we were in the channel and how wide it was. At the 1st room of 14th crosscut (just to E.) there was a roof fall showing 2' to 3' of channel-fill sediments with the base of the Virden coal sloping down to the N. At the 1st room of 11th crosscut (door) Anvil Rock Channel sediments including traces of coalified material are present over 1' Energy Shale, 3/4' Anna and local erosional remnants of Brereton limestone. E-W clay dike also seen here. We moved east of belt and checked sites along travelway. At 20th crosscut just E. of travelway there was Energy roof, with no evidence of Channel. At 21st crosscut (room), just E.

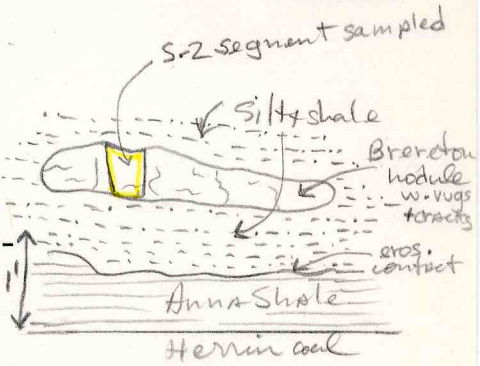
of trav. (N. rib) the roof sequence is 3/4' Energy Shale with irregular (interp. as erosional) contact to weak claystone, medium gray, dark gray at top; 0.1' impure coal "Virden" (loc. a trace only); 0.2' gray claystone, bioturbated; tan limestone prob. Bankston Fork, only 0.2' exposed. This site was interpreted to be on the N. side of the channel, probably near the edge. Site A. is probably near the south edge of the channel, but this was not nailed down.

Visit to 10th S. off Main W. Prob. Anvil Rock Ch. erosives?

Visit was timely because seals are being built to close off everything to west beyond the 4th N. submain. Traveled S. on travelway to the 17th where the door to the west is located. We traveled south 2 crosscuts and examined in vicinity; area is cribbed. Whole area has Brereton Limestone that rolls and is slightly to very nodular at base. This can be seen where falls occur to be due to sheet sandstone over Brereton, apparently an erosional contact within the original unit. Site with Stigmaria root was found and two more small root segments removed. Sandstone-filled root sampled (-S-1) was growing in (at?) the top of the Anna shale; rootlet traces seen in Anna and a few rootlets (12-14 mm diameter) were seen partly sandstone-filled, but broken off from root. Sandstone is coarse with big mica (1 mm.) flakes; is filling root below at least some nodular Brereton, and laterally the sandstone is seen to be coarse, micaceous and tabular (0.4' thick). or eros. remnants

Not very far north an exposure of channel sediments containing isolated and probably transported Brereton occurs. The Brereton nodules have vugs with secondary

mineralization. A vertical segment of a long nodule was sampled (-S-2); it has both top and bottom of the whole nodules. This is a potential carbon isotope sample - story of recrystallization of carbonates in a closed system after erosion will be interesting.



We looked for areas where channel sand or silty shale, etc. was roof to Herin, but none were seen, even after going further south and turning west on new west mains. Isotope samples would have been taken if that condition was met.

Revisit of B. site

Site B is in the 1st E. panel off the South Mains, well into the 46th West room (see October notes). Lateral variability in some earlier samples was high, so two further sets of resamples were just to the north ("left") of the original samples. See Keith's notes for spacings. Core samples taken are:

1st column

R1 23 cm above b.b., just above "steel" band
R2 2 cm above b.b.
R3 34 cm below b.b.
R4 55 cm below b.b.
R5 72 cm below b.b.

2nd column

R6 22 cm above b.b., just above "steel" band
R7 1 cm above b.b.
R8 39 cm below b.b.
R9 54 cm below b.b.
R10 70 cm to 74 cm below b.b., almost to base of seam (block)

Also collected were:

Blue band (?)
"Steel" band
Mineralized coal zone 11 cm below b.b.

Samples: Set "S" begun

K. Hackley will number the bulk isotope samples. Coal cores were given R-numbers (resamples) as noted. Samples for my own work are:

#	Site	Description
-S-1	10th S./W.	Segment of sandstone-filled lycopod root (Stigmaria) growing in Anna shale now under channel sediments. Part of feature provided by DeLeon see below.
S-2	10th S./W.	Segment of erosional remnant of a long Brereton nodule, isolated within channel-fill sediments of an Anvil Rock Channel. Orientation probably with clay-rich crack-fill to bottom.
S-3	A.	Claystone parting .05' thick at .40' below the blue band. To be sampled off middle block from bulk sample.

Previously collected in the 10th S./W. was a 3.3' long section of the sandstone-filled root in 3 connecting sections (one end section knicked by a bolt hole) given to me by José DeLeon. Currently on display in Coal

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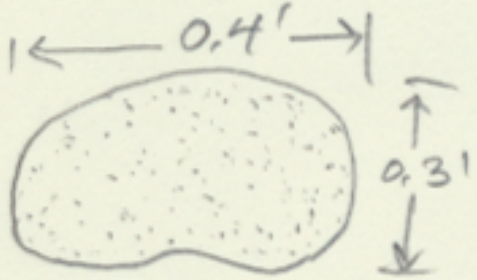
FORM 180 W

Section, but should ultimately go to Paleobotanical collection. Specimen has a couple of bumps where sandstone partially entered rootlets. Non-contiguous section also donated to Illinois State Museum traveling display via Devera.



folded up on base — WAD says this is a collapse feature, not a morphologic feature.

4/30/87

Freeman United Coal Mining Co. - Crown II Mine Macoupin County. Notes by John Nelson, with Phil DeMaris, October 15, 1987.

Crown Fault (strike-slip) in No. 1 and 2 entries of 4th North Panel off Main West.
(Submain)

Sketch map (over) shows the overall pattern in these two entries. There are two east-west faults about 40 feet apart. Between them are many northeast-trending vertical fractures, many of them open. Few fractures are present north and south of the east-west faults.

1.) South fault in No. 2 entry and adjacent crosscut. Sharp planar fault in Brereton Limestone trends due east, dips about 70° north, south side downthrown 0.4-0.8 ft. (reverse fault). Appears to have horizontal slickensides. On west rib dip of fault sharply reverses in Anna Shale, it splits in the coal into a complex zone of crushed and tilted blocks, very little displacement in coal.

2.) South fault in No. 1 entry. Fault is difficult to trace in limestone; very little displacement. Again it splits in the Anna Shale and the coal. The coal is much fractured and offset along a series of small step-faults with the south side downthrown overall. Coal is locally crushed and small blocks have rotated. Minor calcite and pyrite mineralization on fractures in coal. No mineralization in shale.

3.) Extension fracture zone between two east-west faults. Individual fractures strike N.42-55°E. and are vertical or nearly so. The largest one has up to 1.0 feet of throw down to the southeast but dies out at both ends. Along this fracture is a breccia zone up to 0.9 feet wide of angular fragments of Anna Shale,

limestone, and gray shale, with yellowish mud matrix. Other fractures have little or no vertical displacement and are discontinuous along strike, forming an en echelon or imbricate pattern. Many of these also contain breccia and the limestone along them is coated with finely crystalline calcite (?). Quite a few are open fissures, although they may have originally contained breccia that has fallen out.

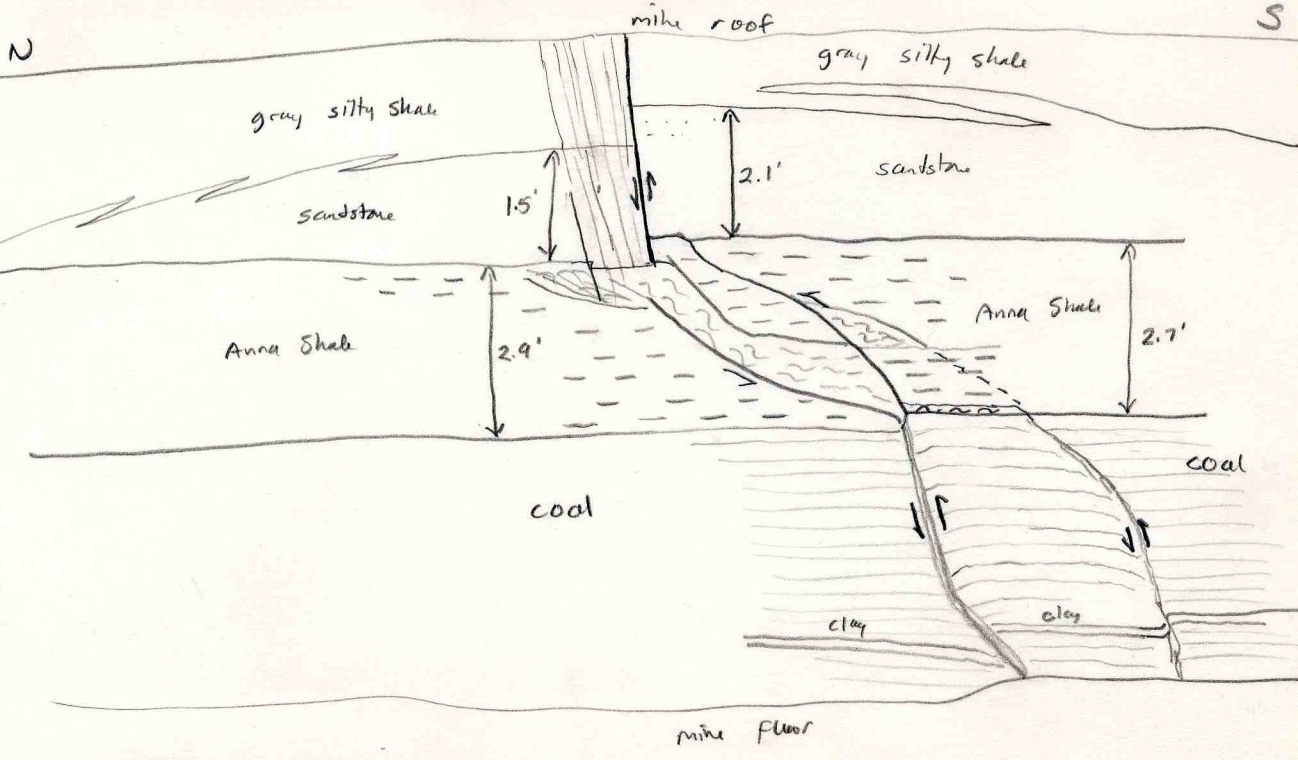
4.) North fault in No. 2 entry. In the roof (sandstone and gray silty shale of Anvil Rock Member) the fault plane strikes N.80°E. and dips steeply south, in places nearly vertical. Indefinite horizontal slickensides and mullion. In Anna Shale the fault flattens abruptly and imbricates. The displacement is reverse, a few inches to half a foot. On the east rib the fault steepens abruptly in the coal (see sketch). The coal is pulverized along the fault plane. On the west rib there are two south-dipping shear planes, about 2 feet apart, in the coal. Both display reverse movement.

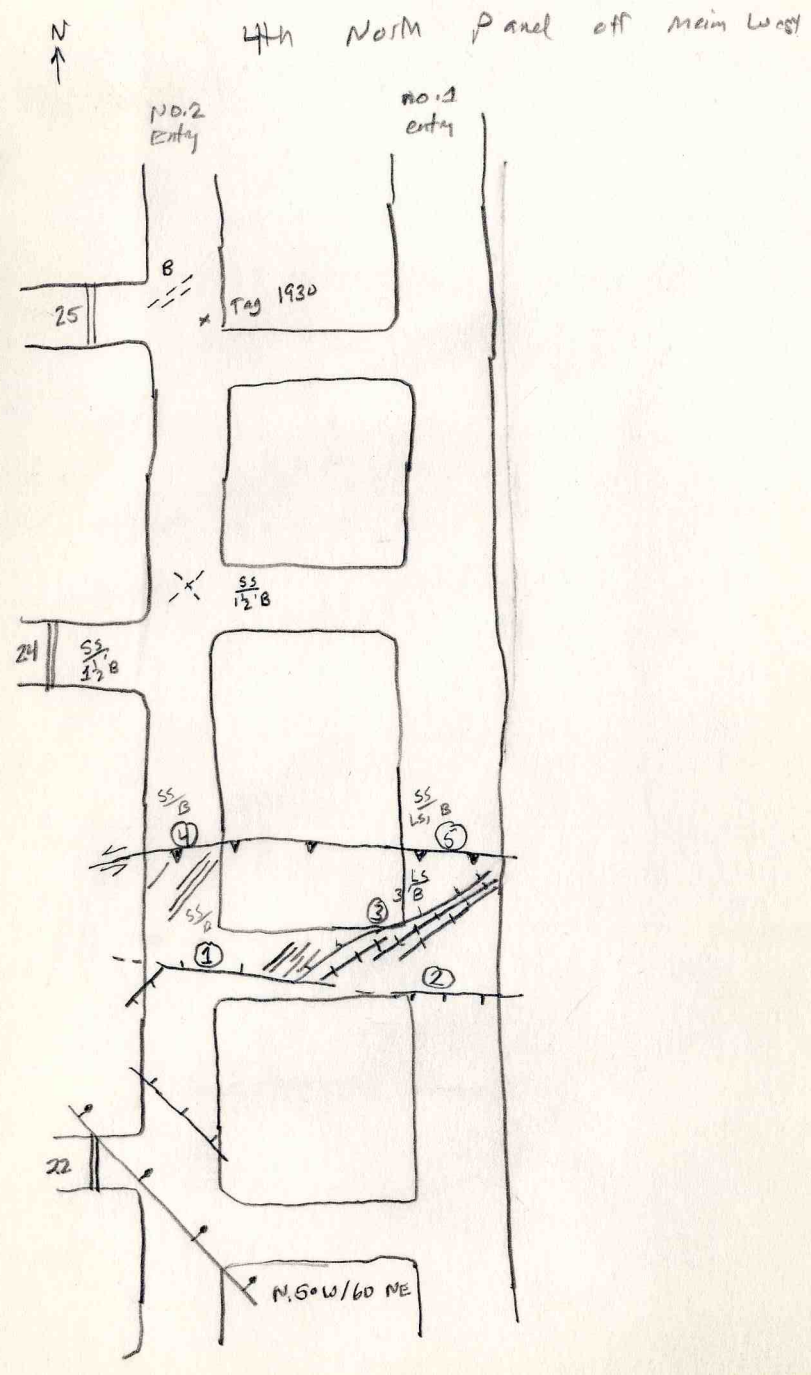
Lateral movement indicated by difference in thickness of sandstone on opposite sides of fault. On east rib (see sketch) sandstone is 2.1 feet south of fault and 1.5 feet thick north of fault. On west rib there is about 0.3 feet of sandstone north of fault and no sandstone to the south. This sandstone body is lenticular. Observation of the pinch-out near the west rib indicates a few feet of left-lateral movement along the fault.

5.) North fault in NO. 1 entry. Fault in sandstone roof strikes N.85°W. and dips south. Fault pattern similar to that at Loc. 4 - the fault flattens and imbricates in the Anna Shale, and steepens in the coal. This fault shows a combination of reverse and

strike-slip movement. Reverse faulting is best shown on the east rib where the Anna Shale on the south is thrust over very thin Brereton Limestone and Anvil Rock Sandstone on the north. Vertical offset is about 1.5 feet at the top of the Anna and less than half that in the coal. Displacement on the west rib is less than a foot. Definite near-horizontal slickensides in Anna Shale. Direction and amount of lateral slip cannot be determined. North of fault Brereton Limestone is very thin due to erosion at base of sandstone. South of fault only the base of the limestone can be observed.

Location 4- Fault on east rib of No. 2 entry.




N
4th North Panel off Main West
No.2 Entry
No.1 entry
B
25
Tag 1930
SS 1½'B
24
SS 1½'B
SS B
SS LS1 B
LS 3 B
SS ½
1
2
3
4
5
22
N.50W/60 NE

From base upward: Herrin coal bed; gray Energy Shale (note parallel laminations); black Anna Shale, lower contact unconformable; Anvil Rock Sandstone, lower contact unconformable.