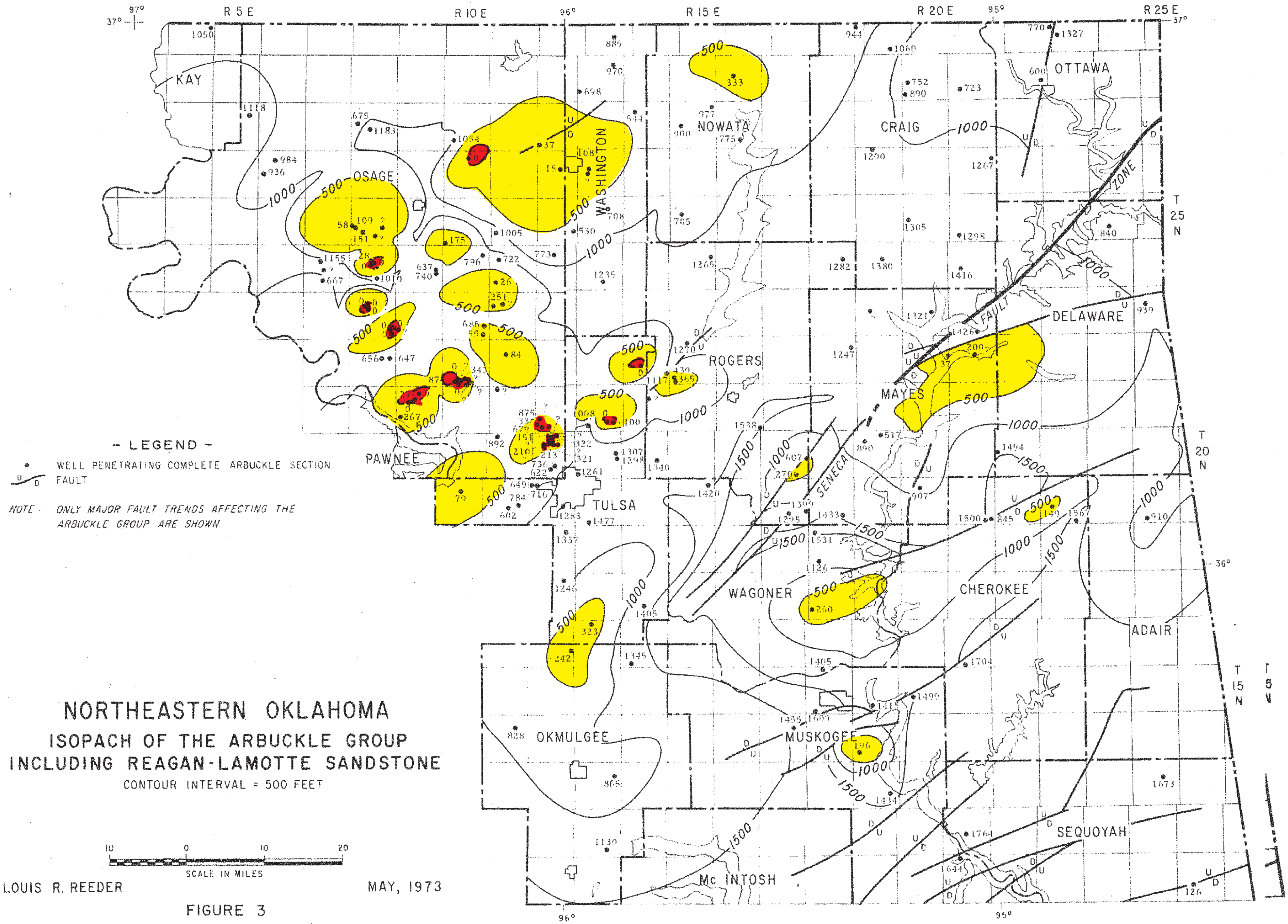
What is the Mississippian Play Without the Arbuckle and What We Need to Know About It

BY
KURT ROTTMANN, CONSULTANT

STEVE HADAWAY, CONSULTANT



Louis R Reeder, 1973
Fig. 3, Reprinted by
Permission of Oklahoma
City Geological Society

Fig. 2

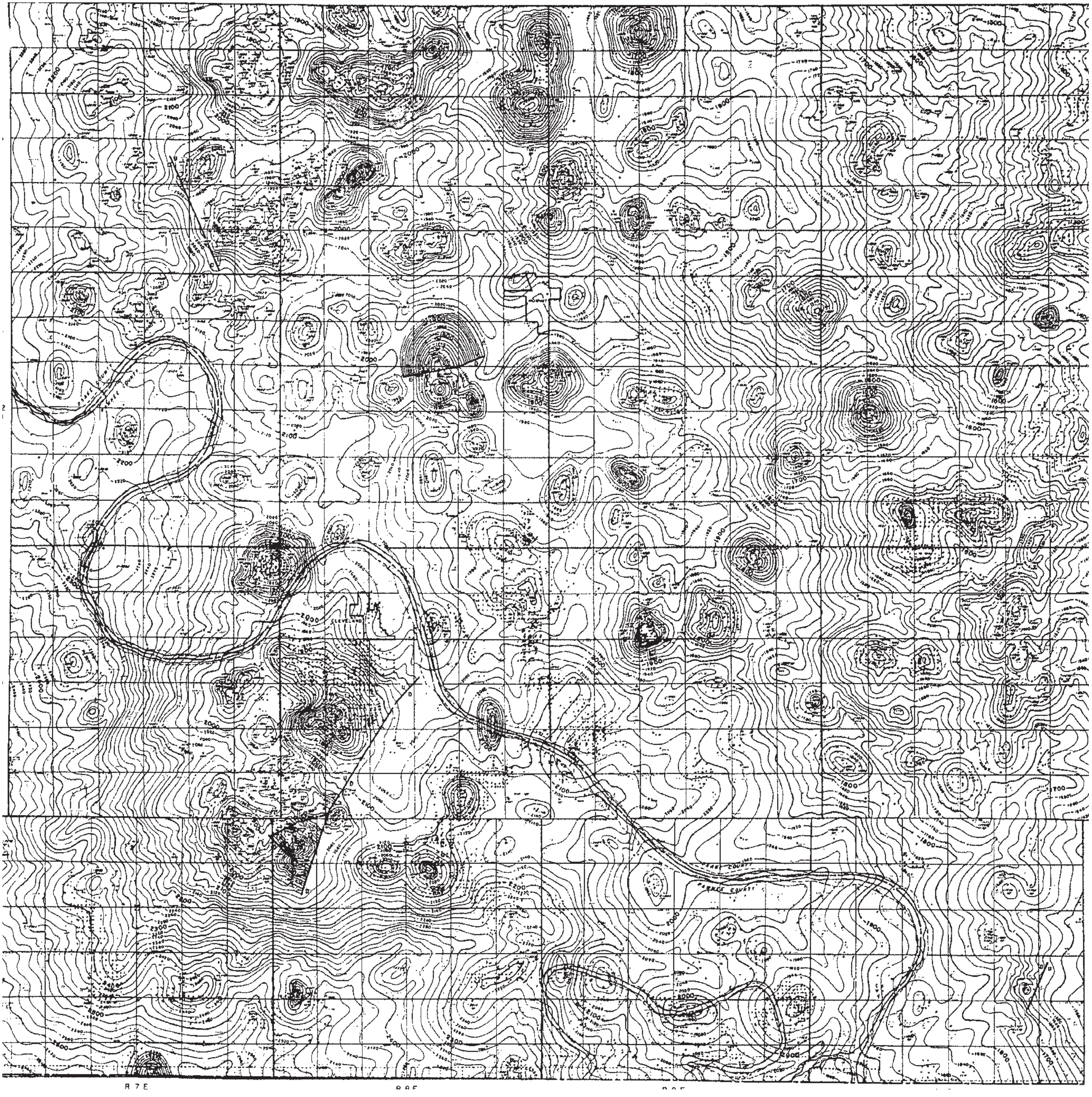


Fig 3 Arbuckle Structure, Osage and Pawnee Counties, Oklahoma

John H Rountree, 1991
Plate 2, Reprinted by
Permission of Oklahoma
City Geological Society

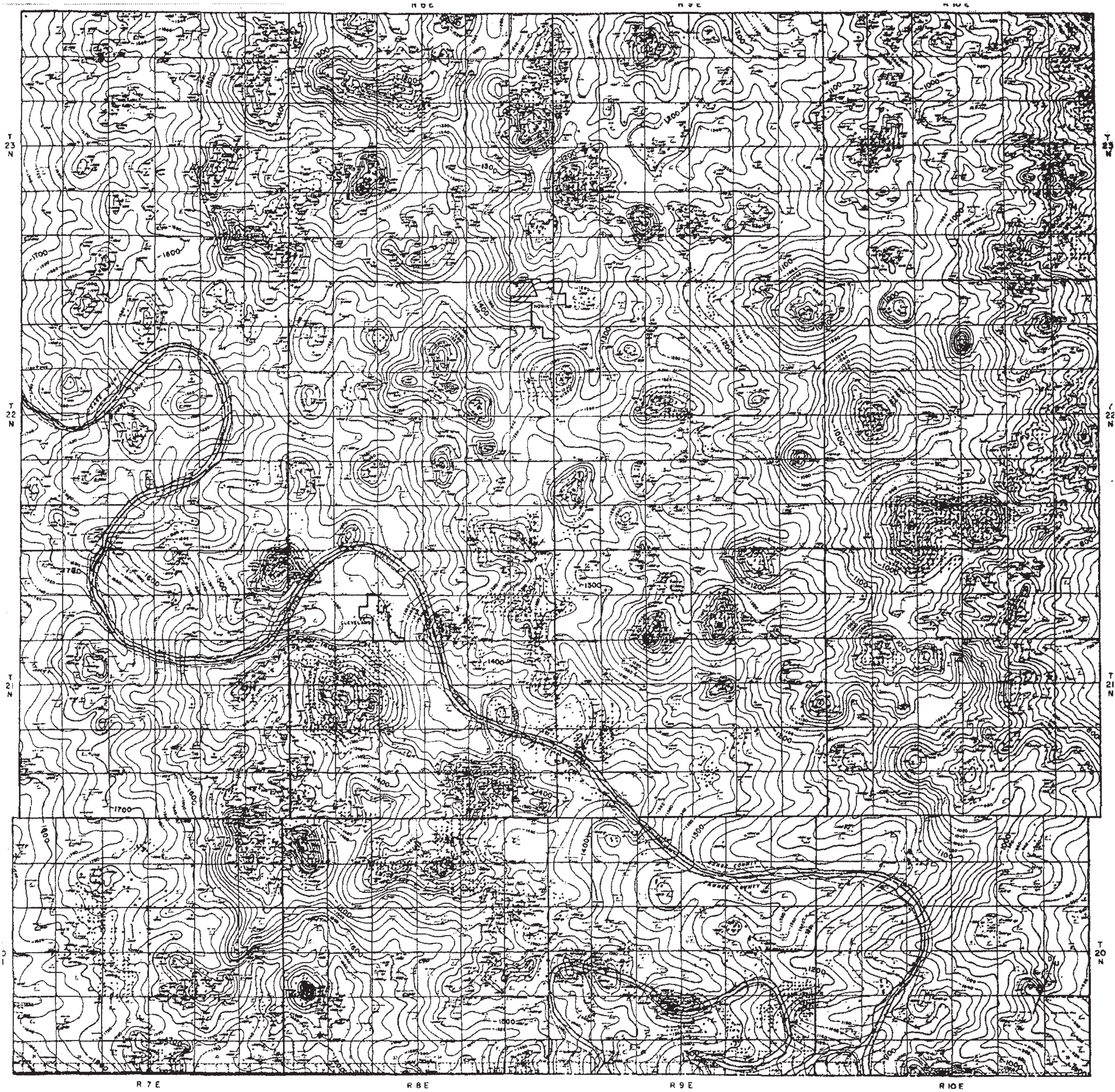


Fig. 4

Pink Lime Structure, Osage and Pawnee Counties, Oklahoma

John H Rountree, 1991
Plate 1, Reprinted by
Permission of Oklahoma
City Geological Society

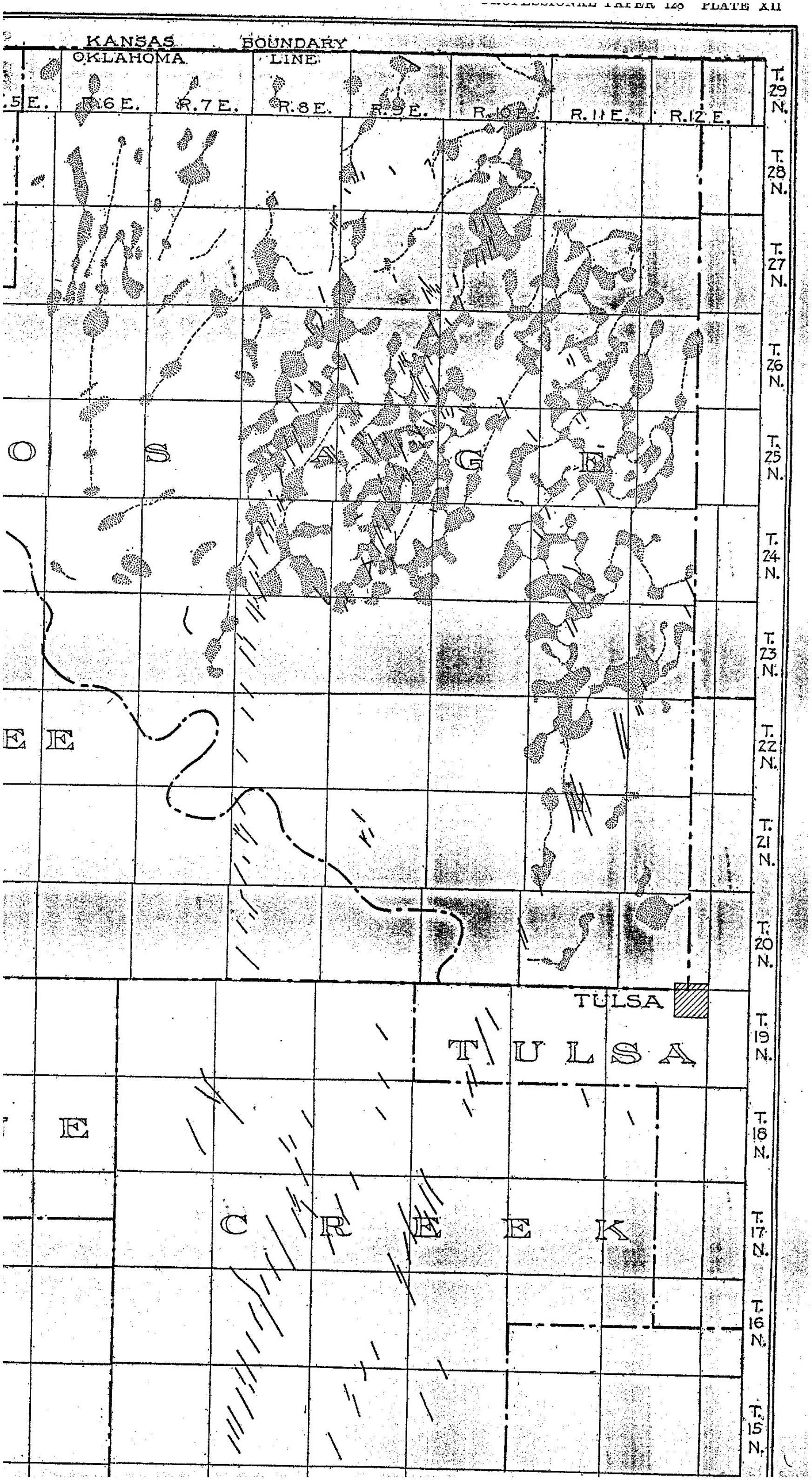


Fig 4 a En Echelon faults and northerly alinement of anticlines and domes in Creek and Osage Counties, Oklahoma

Fath, A. E., 1920, Reprinted by Permission of U.S. Geological Survey

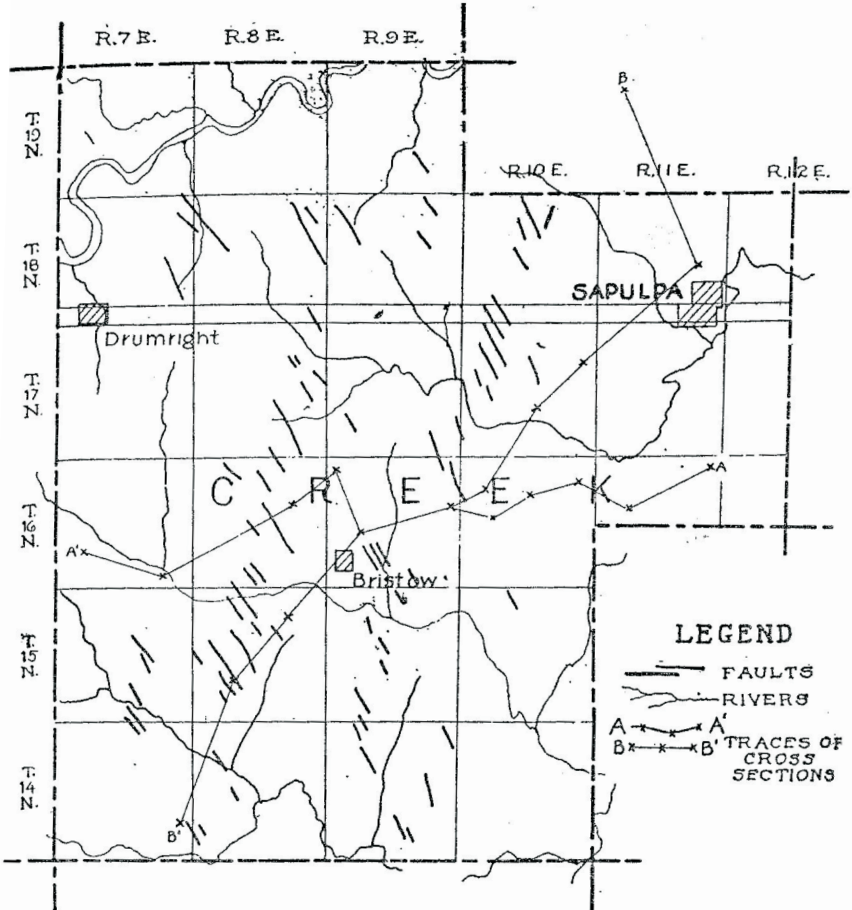
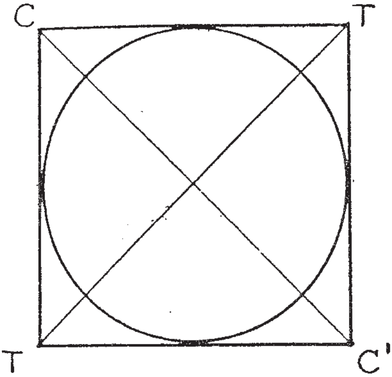


Fig 4 b

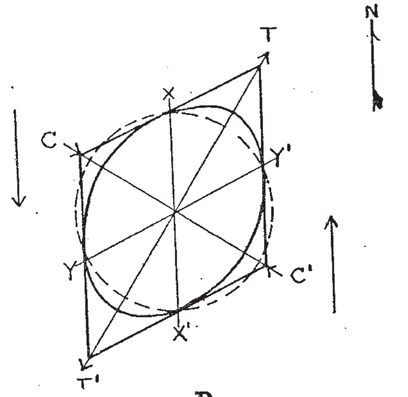
Zones of parallel faults
in Creek County, Oklahoma

Merritt and McDonald, 1926
Fig 2, Reprinted by
Permission of Oklahoma
Geological Society



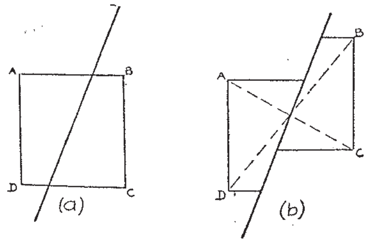
A

Illustrating the strain ellipse as developed by Leith. It is assumed that the square **CTC'T'** is a section of incompetent rocks, with the circle (representing the undeformed position of the strain ellipse), and the diagonal lines drawn on it for illustrative purposes.



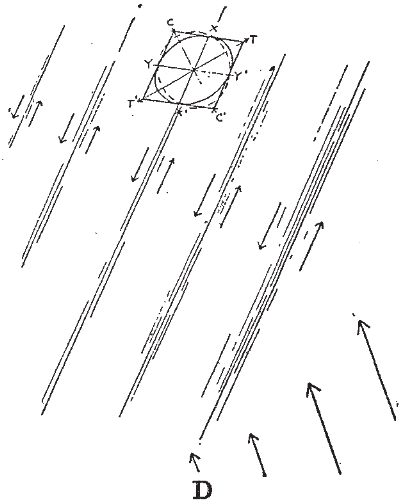
B

If sketch **A** is deformed by forces acting as indicated by the arrows the circle becomes an ellipse, which means compression between **C** and **C'** and tension between **T** and **T'**. **XX'** and **YY'** are planes of no distortion or planes of maximum shear. If **CTC'T'** be a section of incompetent sediments overlying shearing planes in the crystalline rocks, it is clear that NE-SW compression folds would tend to develop between **CC'** and tension faults striking NW-SE would develop between **TT'**.



C

Sketches **(a)** and **(b)** picture the effect of shearing in crystalline rocks. **(a)** may be considered as an undeformed section of the rocks and **(b)** the same section faulted. Notice that the distance between **AC** in **(b)** is shortened, implying compression, and that **BD** is lengthened, implying tension. There is more lengthening than shortening. In northeastern Oklahoma there are more tension than compression faults.



D

Hypothetical sketch showing the probable lines of weakness and shearing in the basement crystalline rocks. The large arrows to the SE indicate the direction and intensity of the parent thrust coming from the Ouachita-Arbuckle orographic element. The small arrows along the shear lines show the relative movement of the shearing and its intensity.

Figure 6. Illustrating the principles of the strain ellipse and its application to the interpretation of the structural features and showing the effect of shearing in the basement rocks, the origin of the parent forces, and the probable lines of weakness in the pre-Cambrian basement crystalline rocks.

Fig 4 c

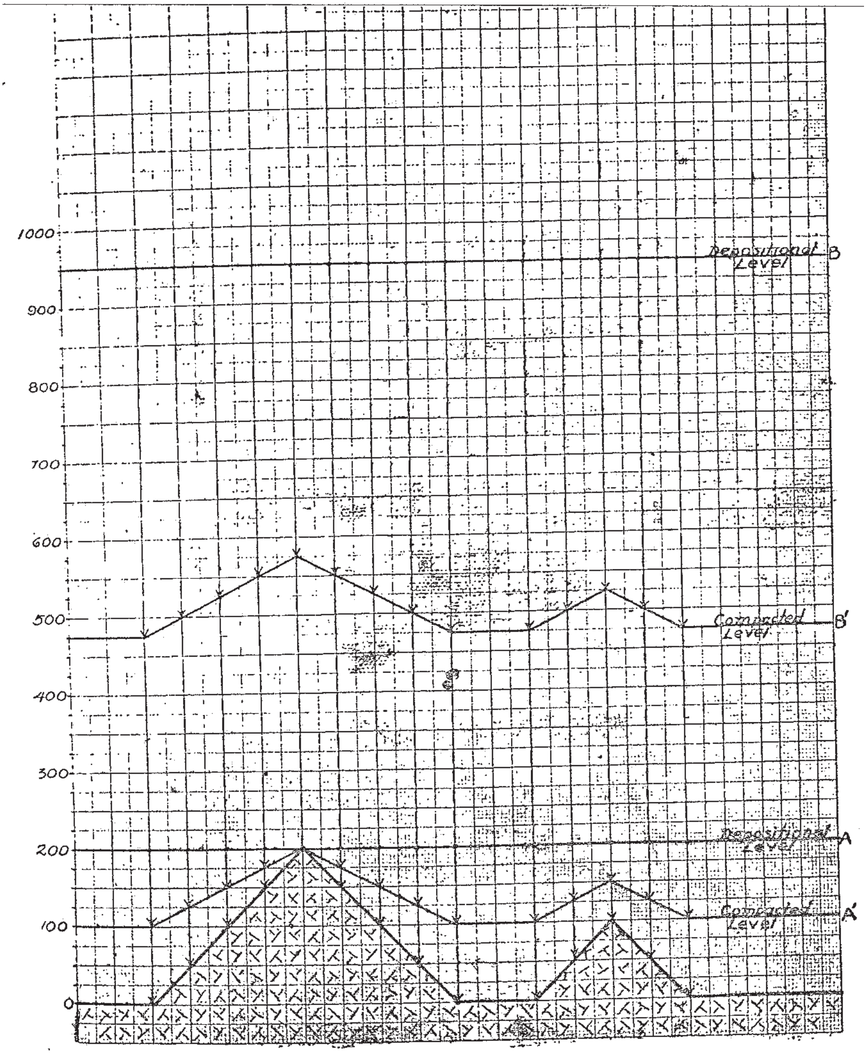


Fig 4 d

Scenario of Compaction after depostion

Merritt and McDonald, 1926
Fig 4, Reprinted by
Permission of Oklahoma
Geological Society

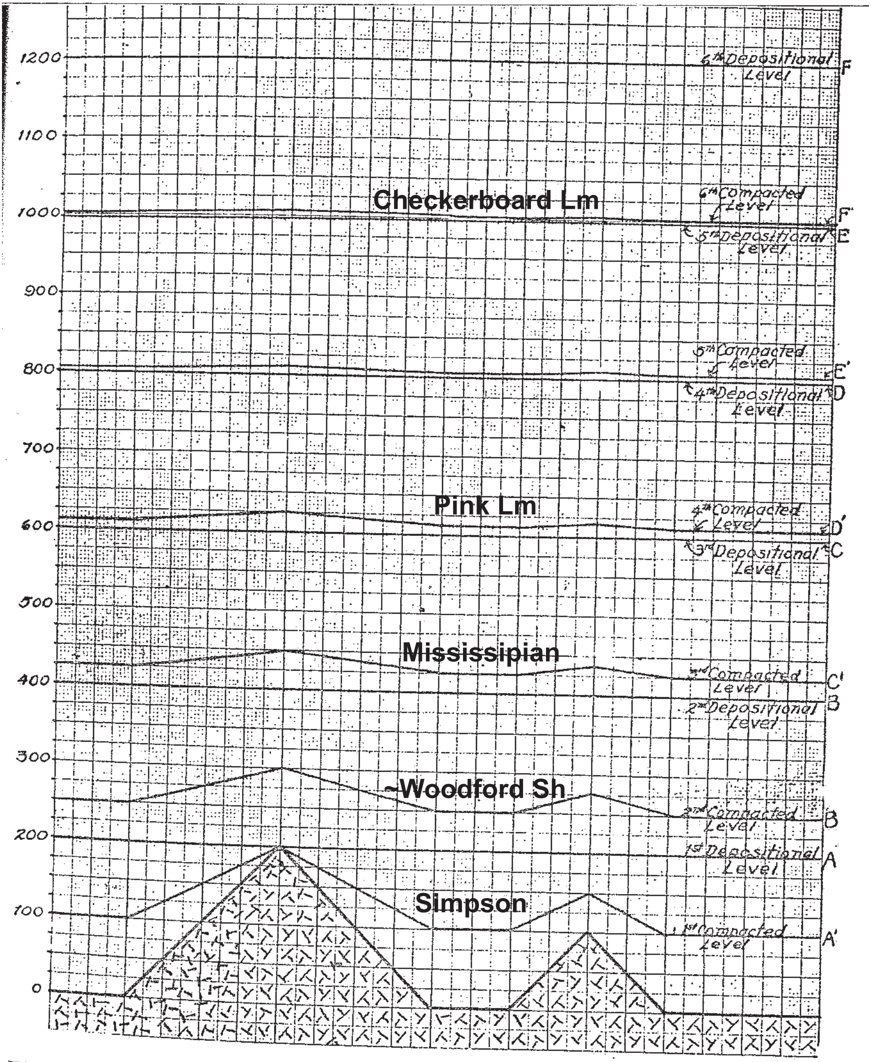
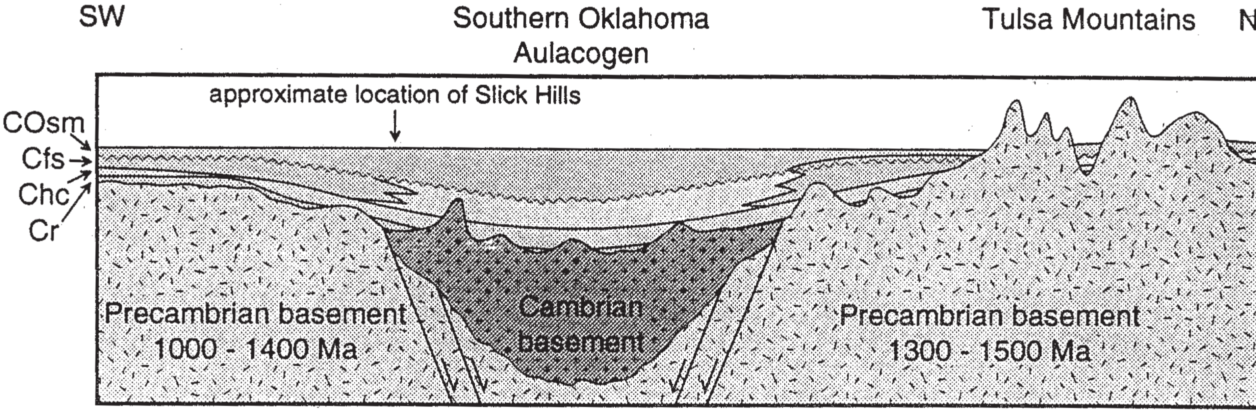


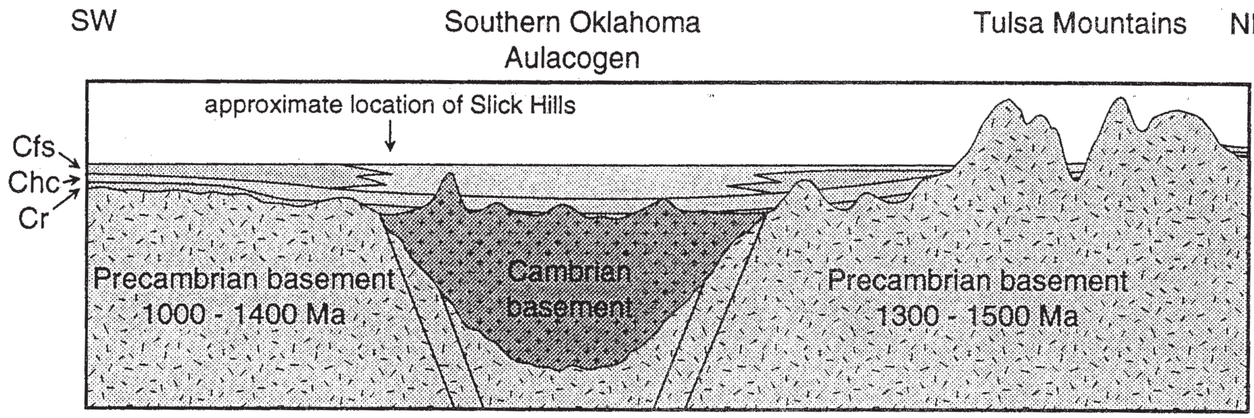
Fig 4 e

Scenario of compaction during deposition

Merritt and McDonald, 1926
Fig 2, Reprinted by Permission of Oklahoma Geological Society



STAGE III - Reactivation of basin margin faults and deposition of Cambro-Ordovician Signal Mountain Formation in deeper waters? (Trempealeauan - Canadian)



STAGE II - Deposition of Cambrian Timbered Hills Group and Cambrian Fort Sill Formation. (Franconian)

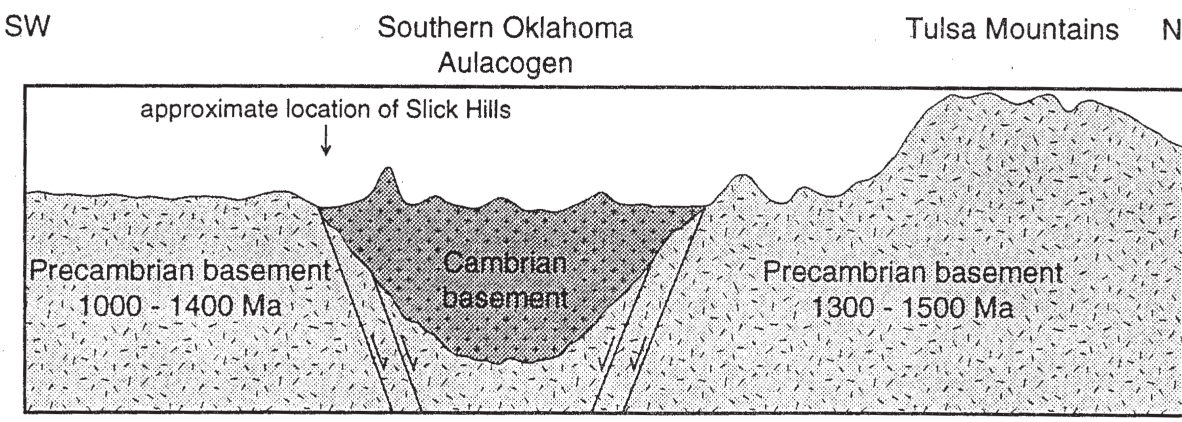


Fig 5

Pre-Cambrian Unconformity surface

Hosey and Donovan, 2000 Fig 13, Reprinted by Permission of Oklahoma Geological Society

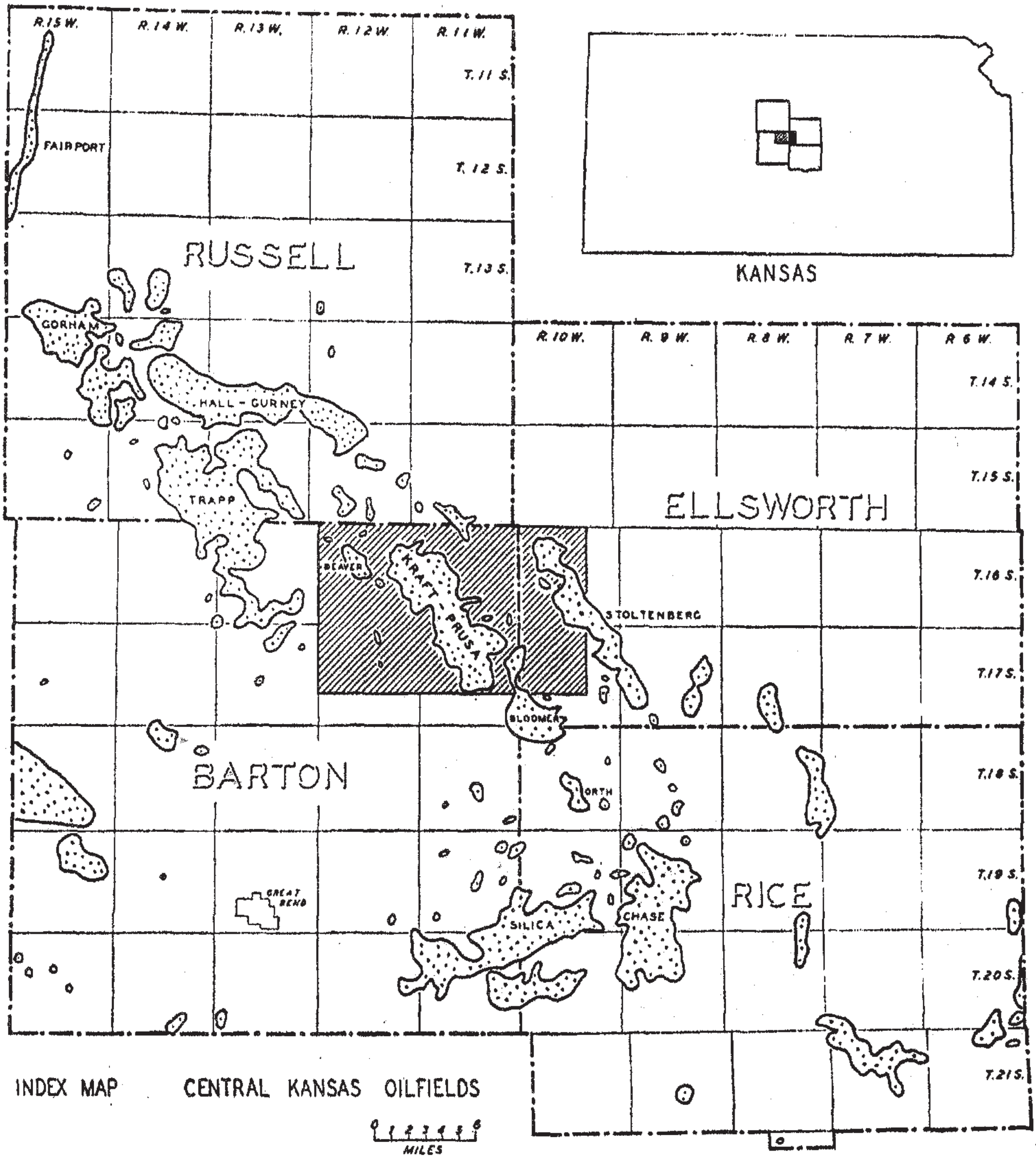


Fig. 6

Exposed Pre-Cambrian "hills" in central Kansas

Robert Walters, 1946
Plate 2, Reprinted by Permission of American Association of Petroleum Geologists

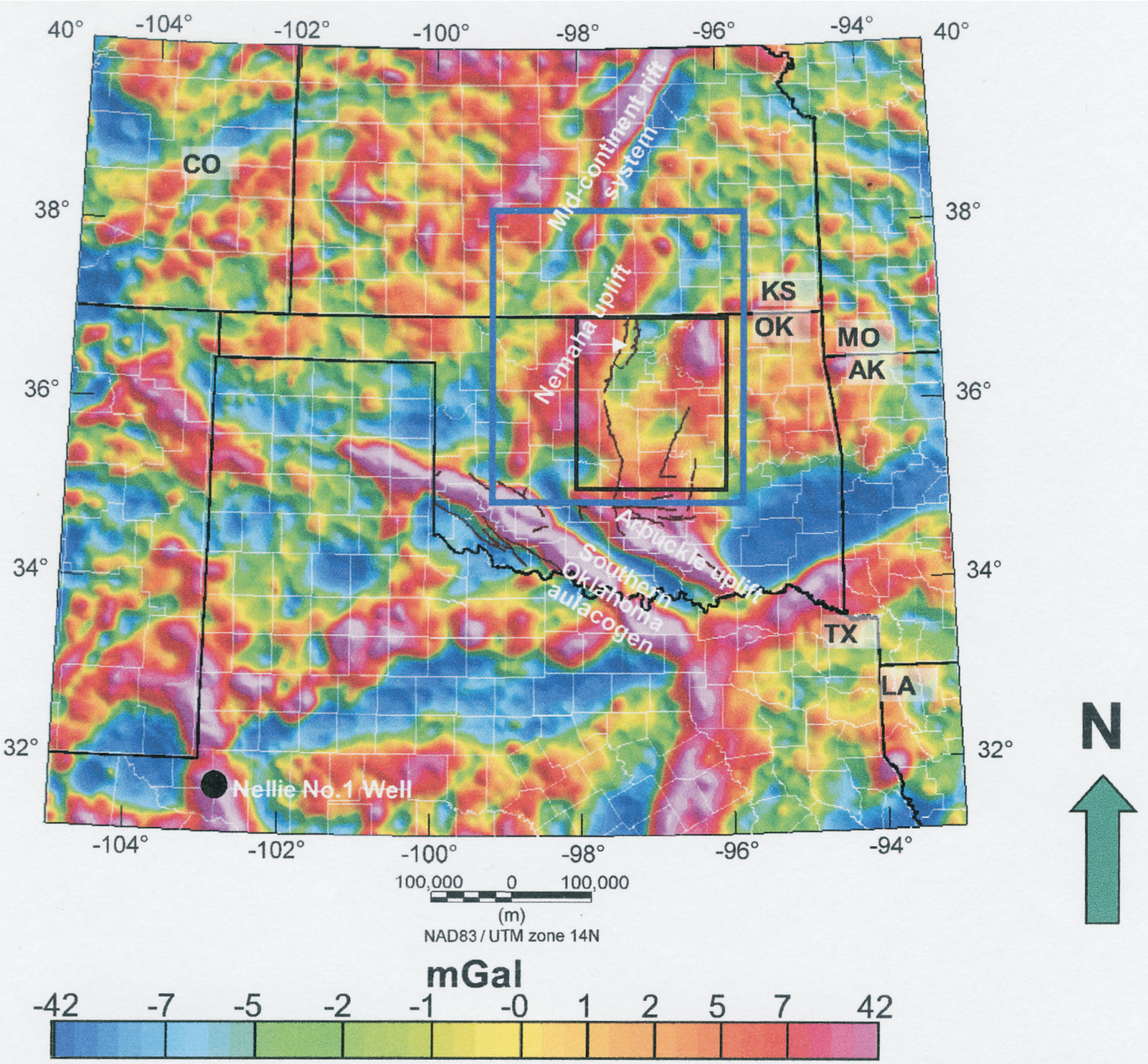


Fig 7

Simple residual Bouguer anomaly map of the mid-continent region

Elebiju et al, 2011
Plate 2, Reprinted by Permission of American Association of Petroleum Geologists

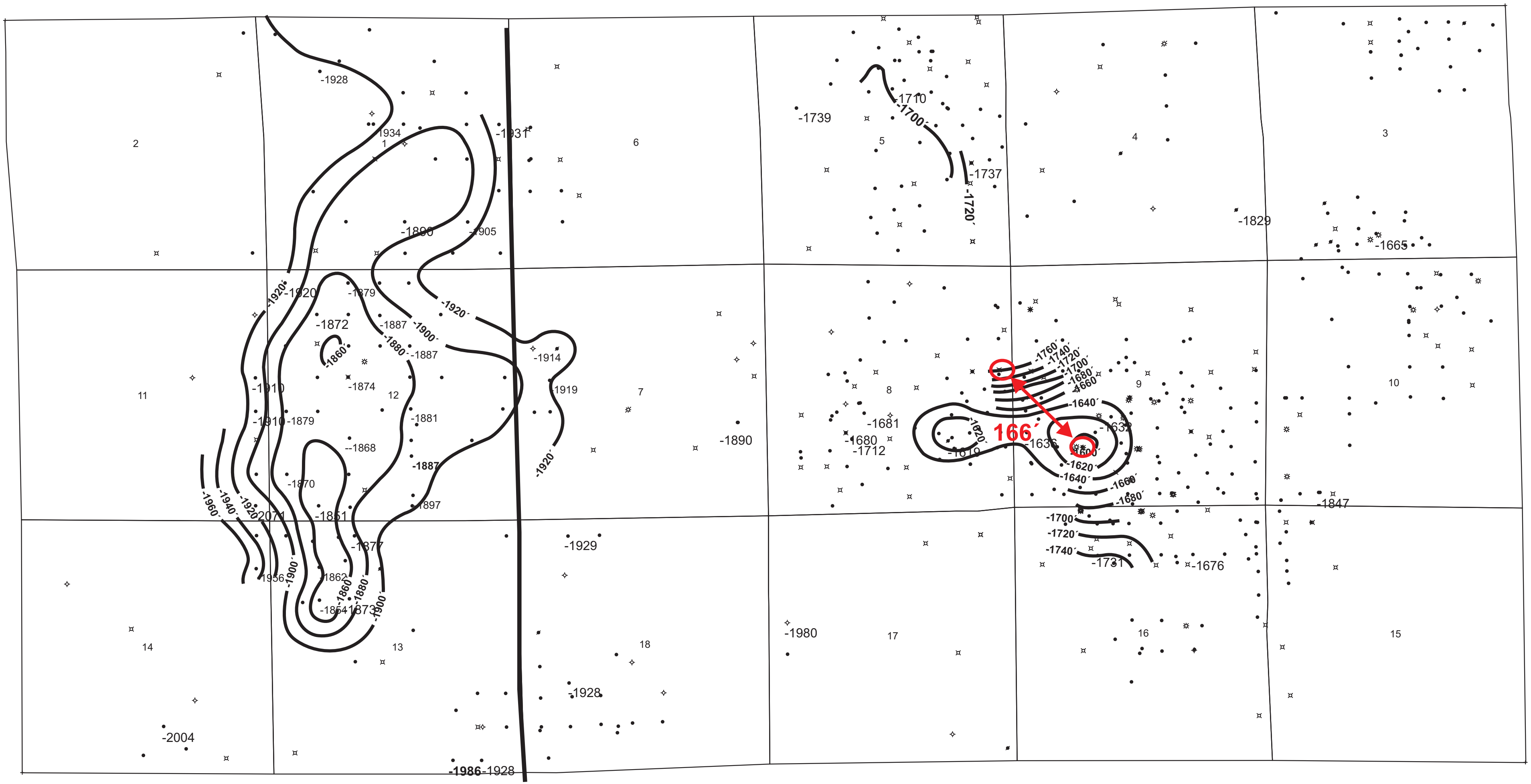


Fig. 9a

Arbuckle Structure

Barker Field Study
Osage County, OK

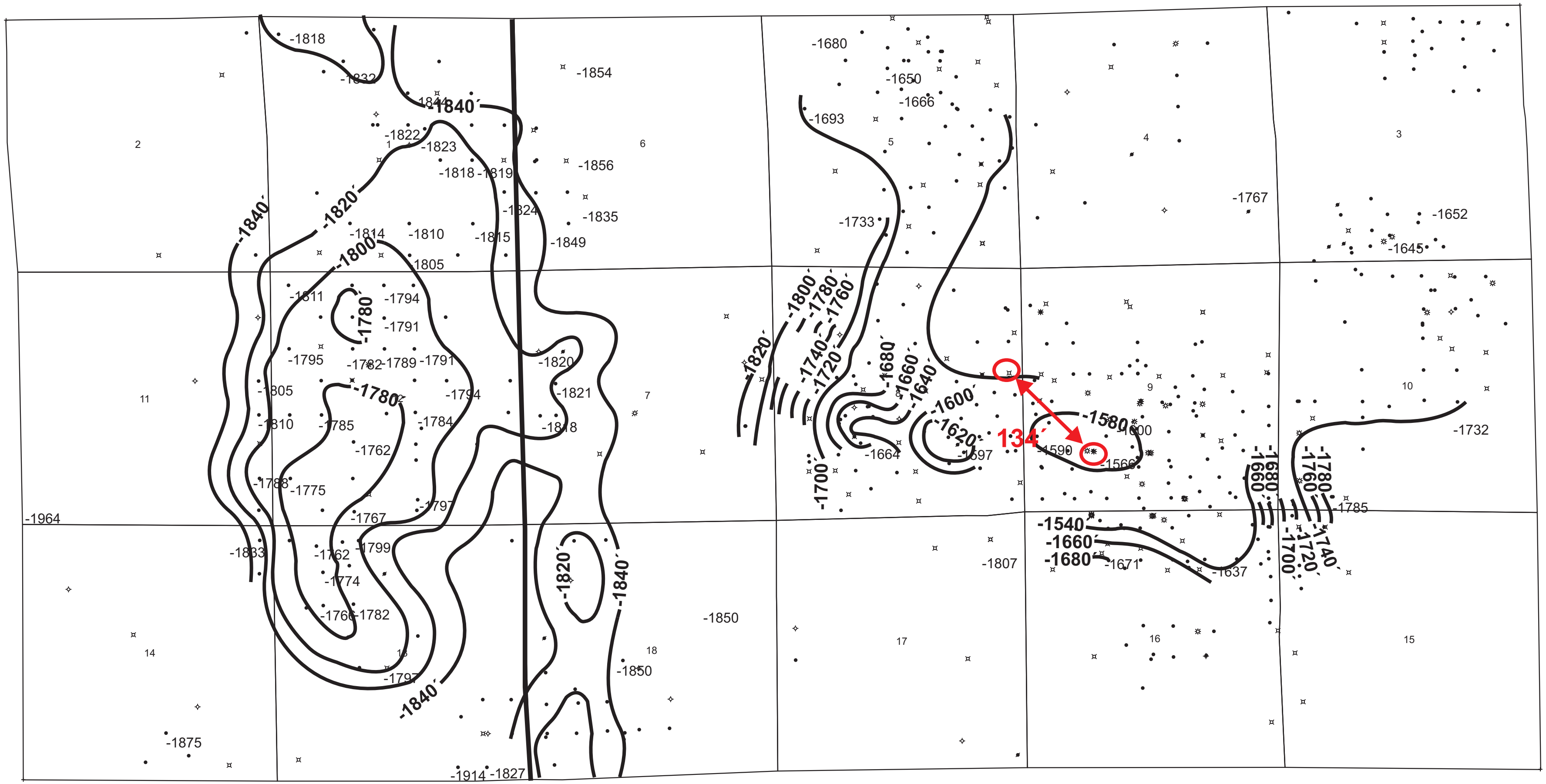


Fig. 9b

Simpson Structure

Barker Field Study
Osage County, OK

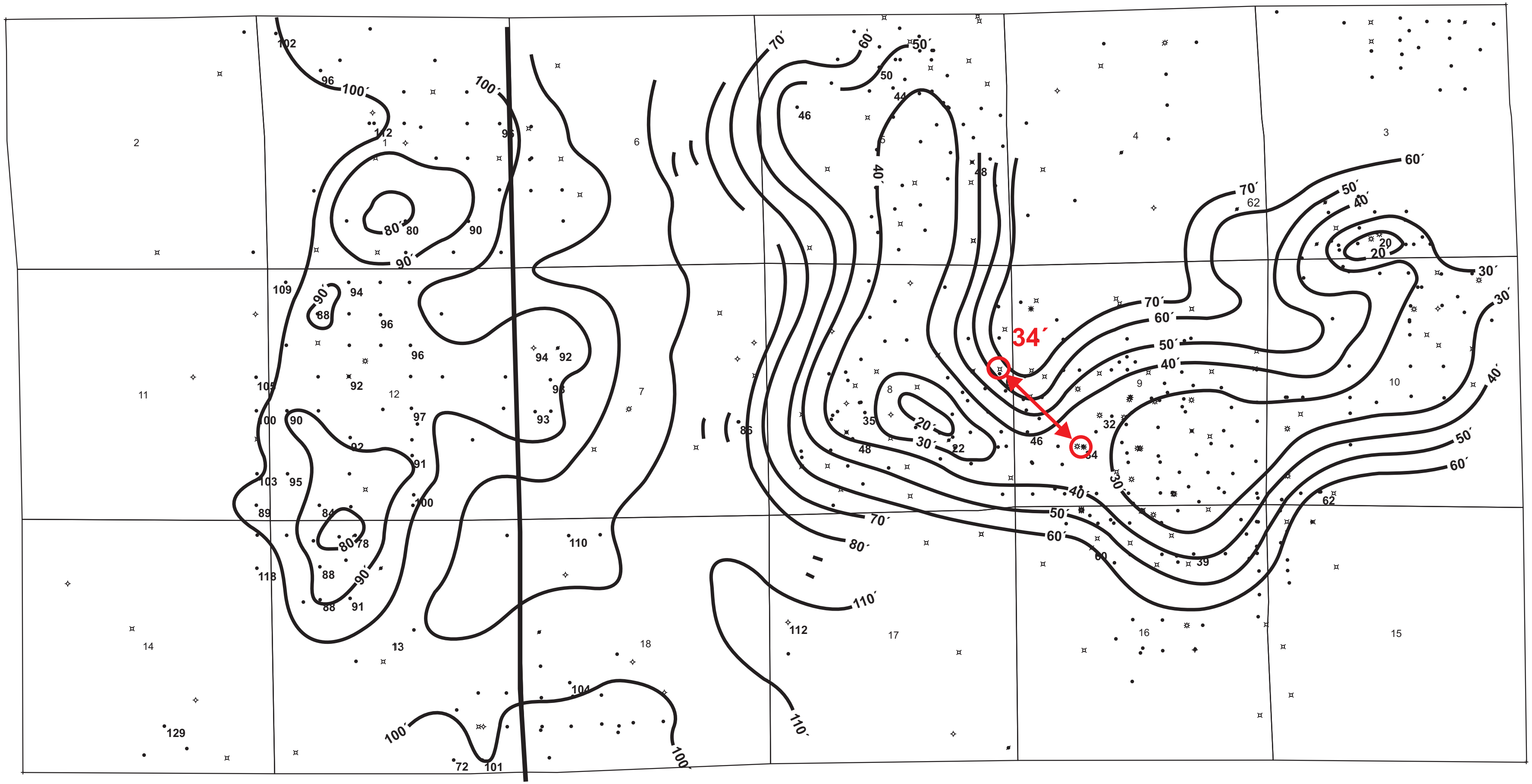
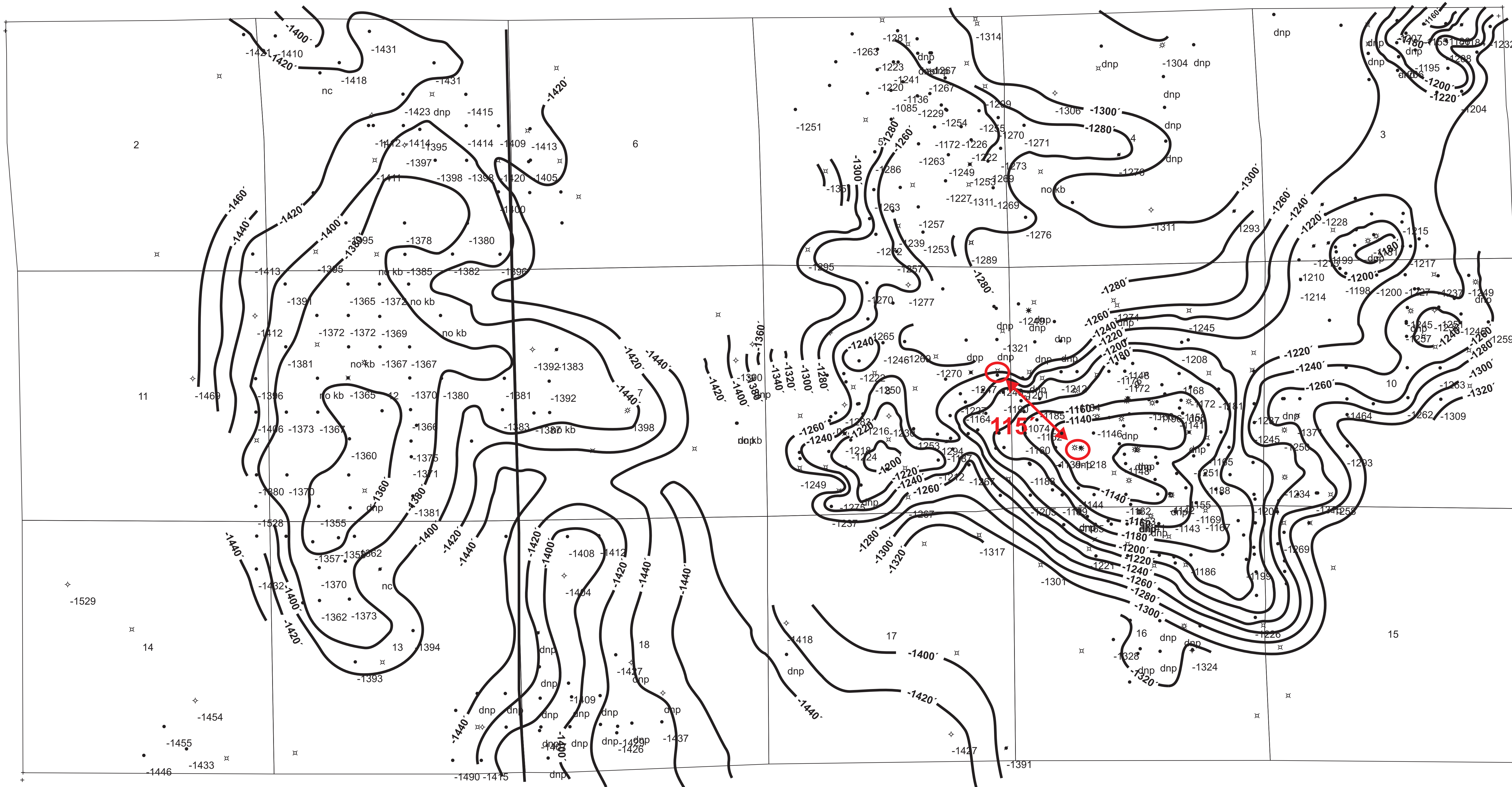


Fig. 9c

Simpson Isopach

Baker Field Study
Osage County, OK



Barker Field Study
Osage County, OK

Fig 9d

Pink
Structure

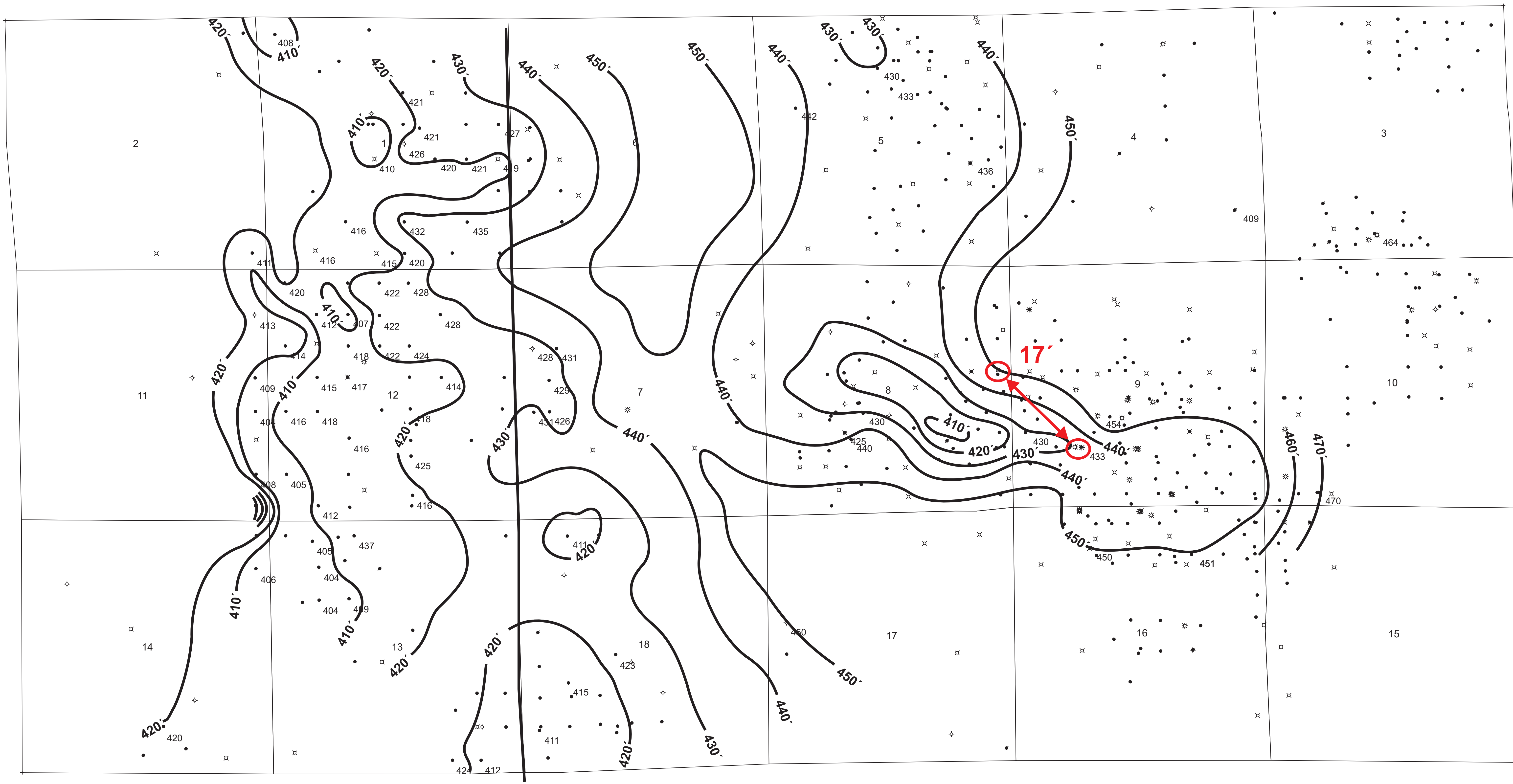


Fig. 9e

Pink-Simpson Isopach

Barker Field Study
Osage County, OK

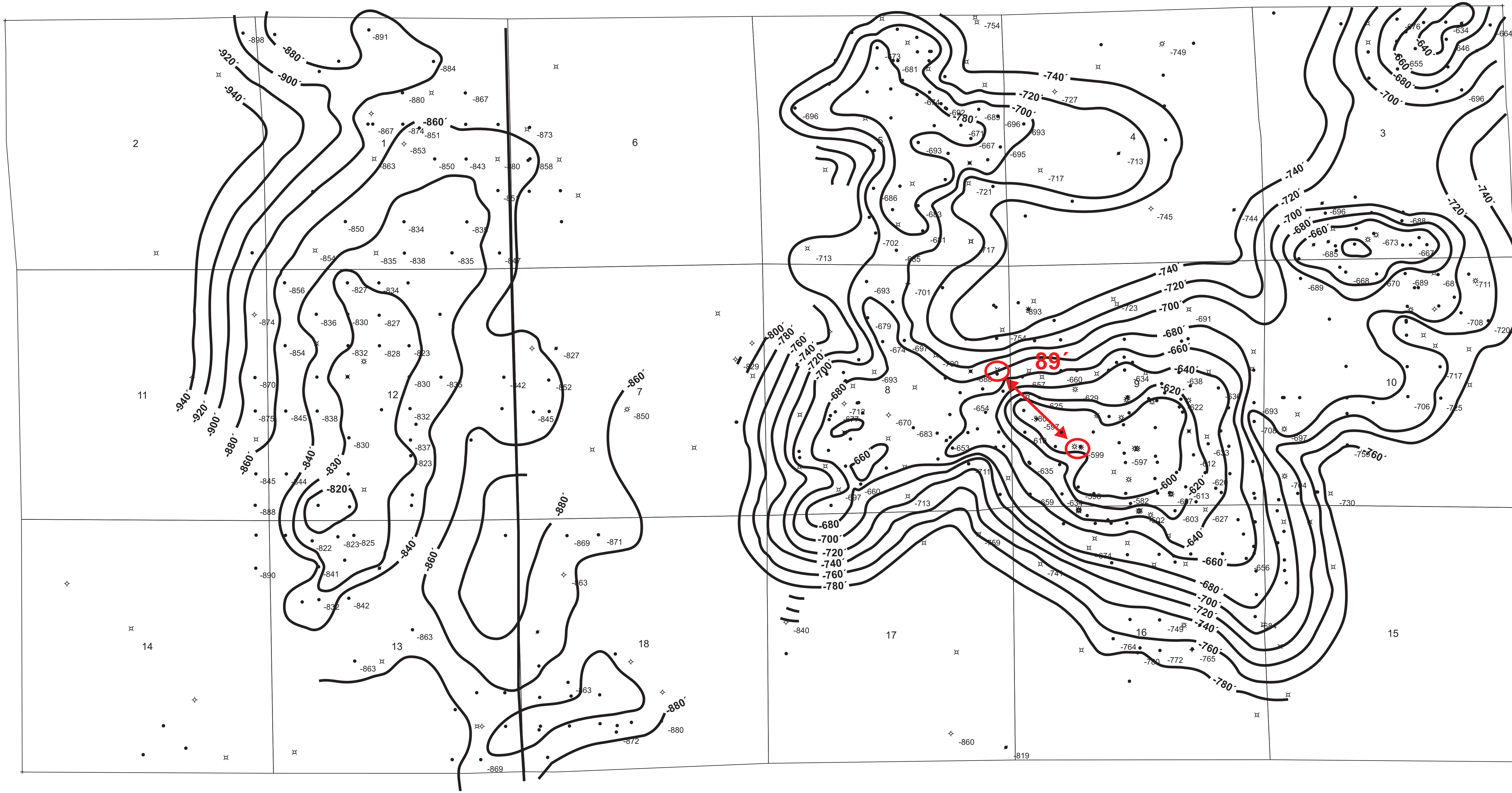


fig. 9f

Checkerboard Structure

Barker Field Study
Checkerboard Structure

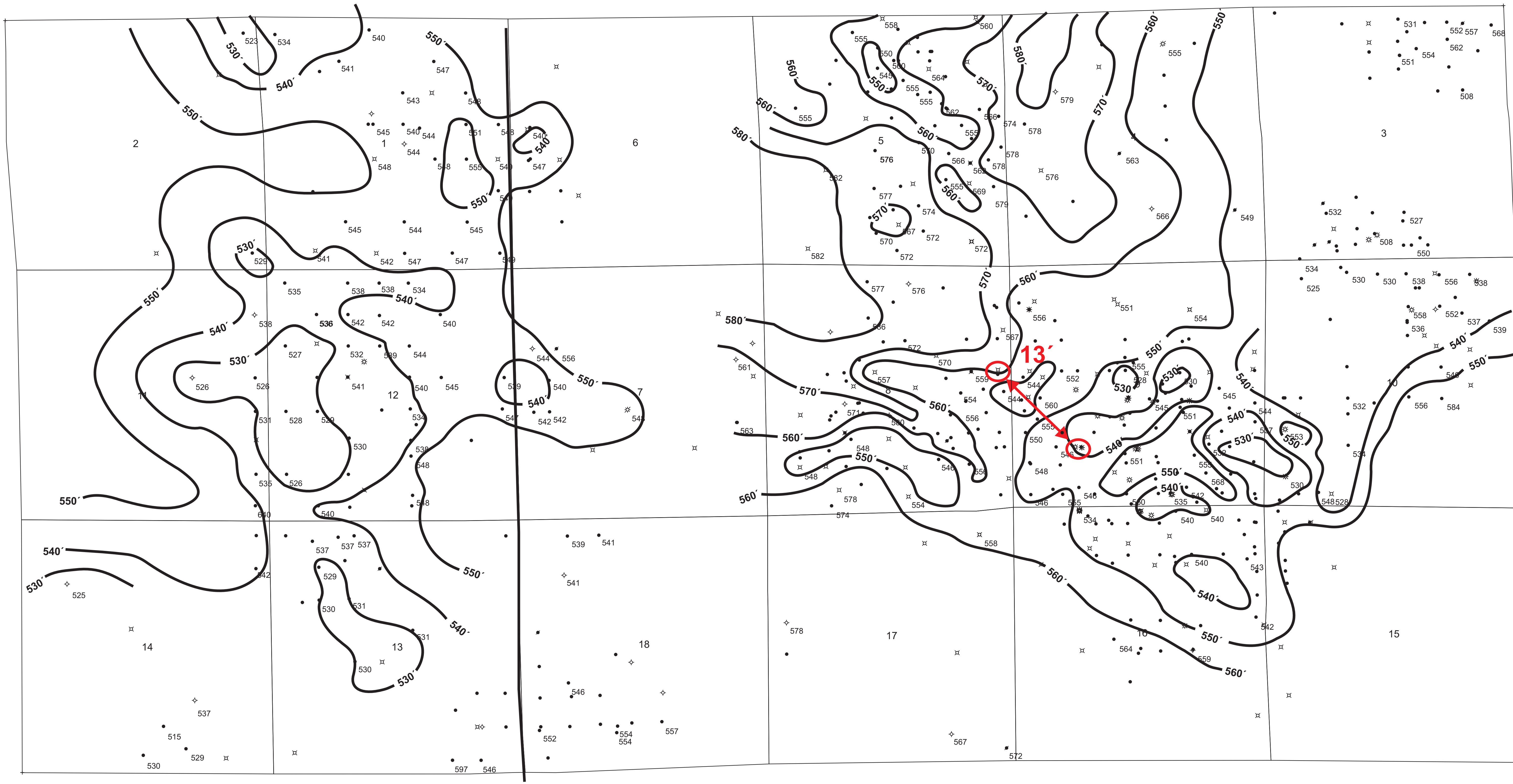


Fig 9g

Checkerboard-Pink Isopach

Barker Field Study
Osage County, OK

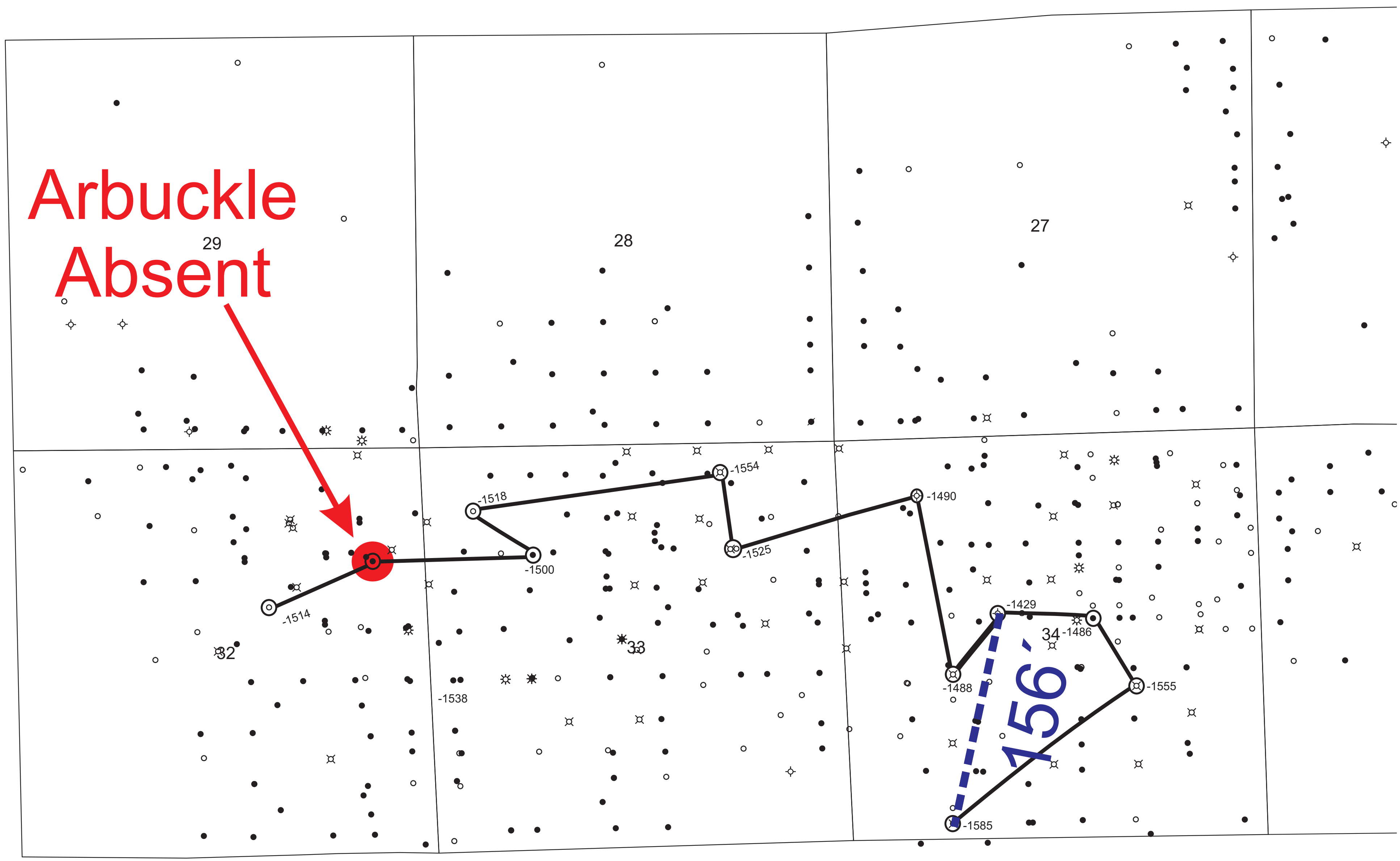


Fig. 10

Arbuckle Structure

Wildhorse Field
Osage County, OK

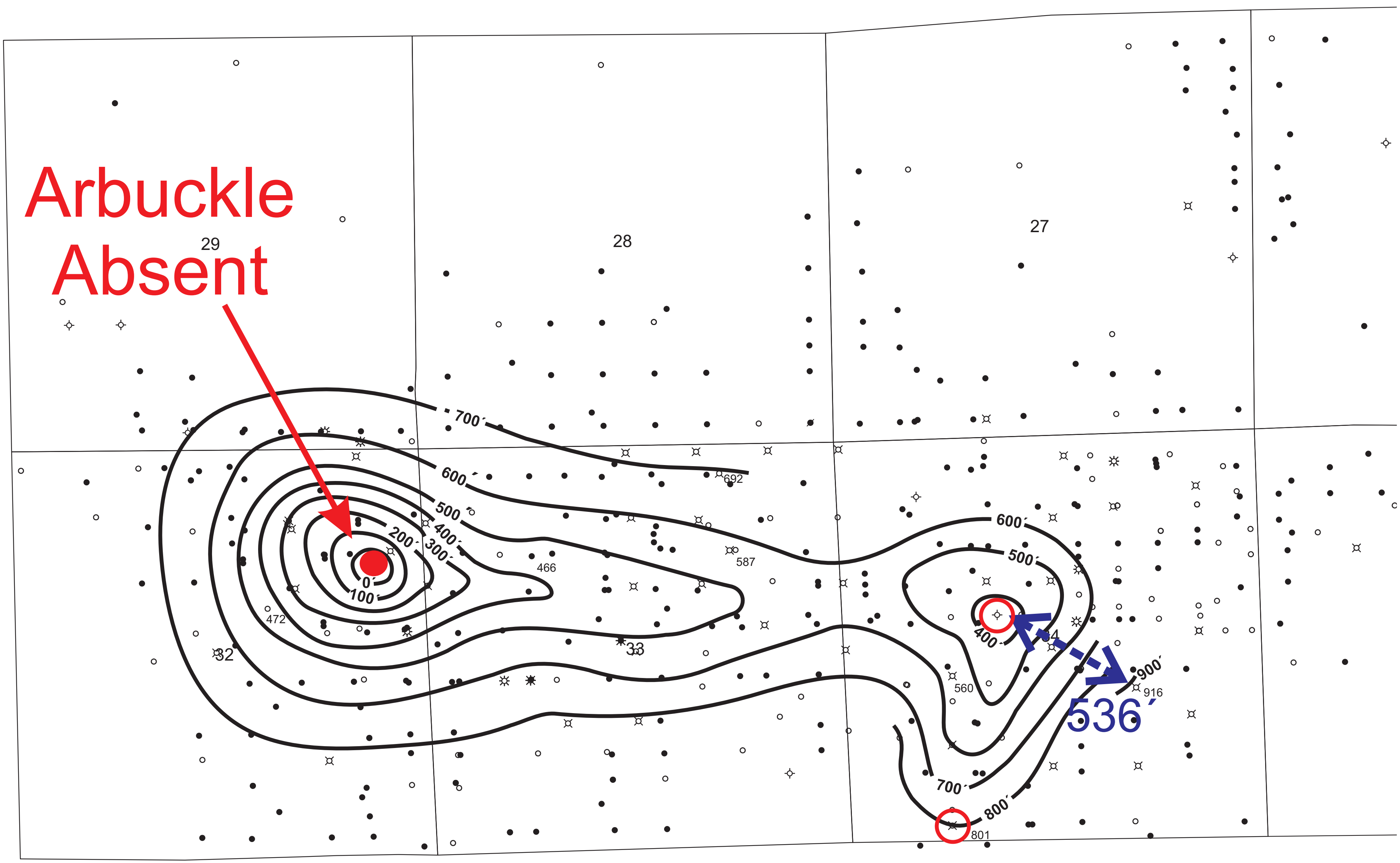


Fig. 10a

Arbuckle Isopach

Wildhorse Field
Osage County, OK

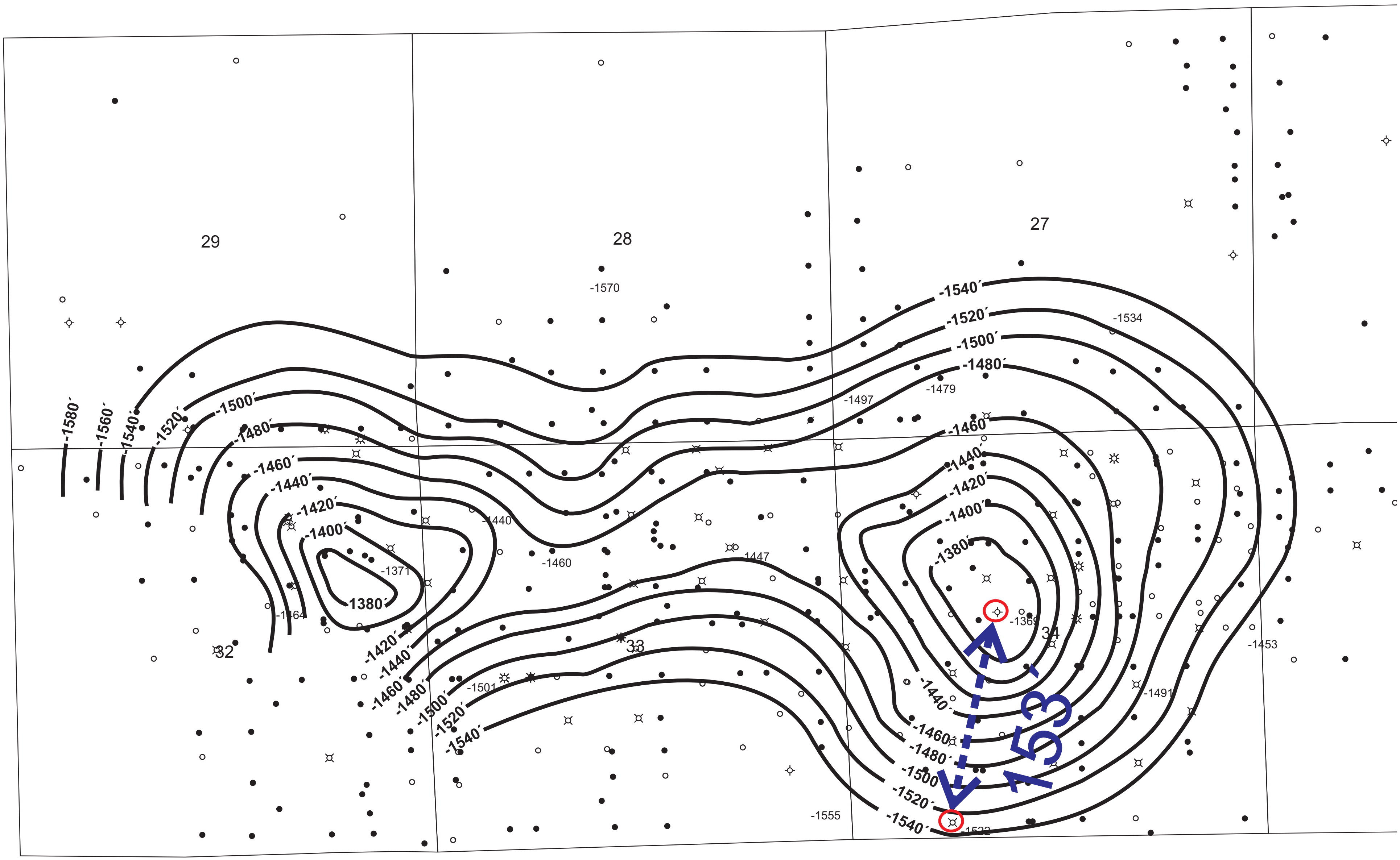


Fig. 10b

Simpson Structure

Wildhorse Field Study
Osage County, OK

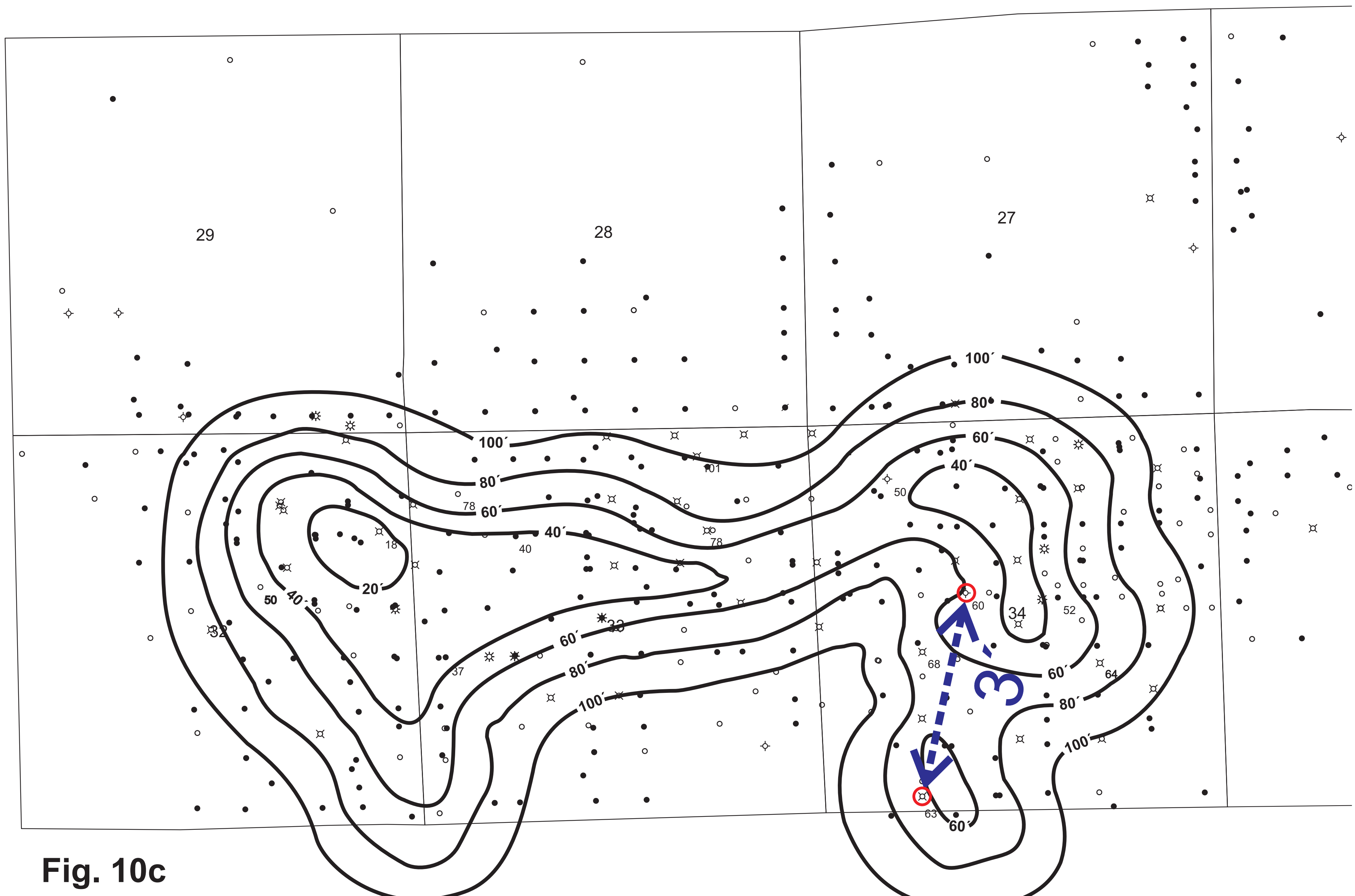


Fig. 10c

Simpson Isopach

Wildhorse Field Study
Osage County, OK

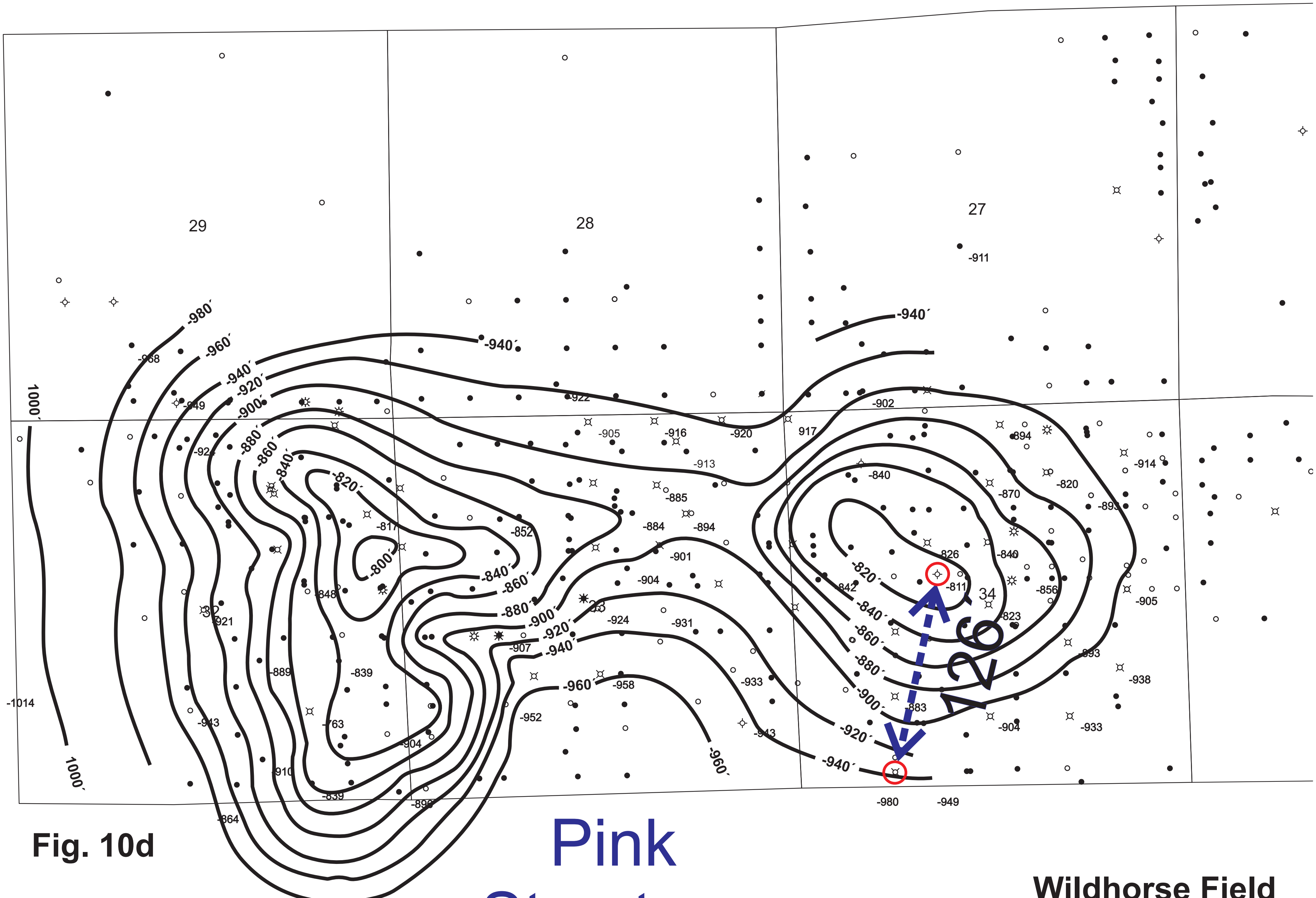


Fig. 10d

Pink Structure

Wildhorse Field
Osage County, OK

Fig. 10e

Pink-Simpson Structure

Wildhorse Field
Osage County, OK

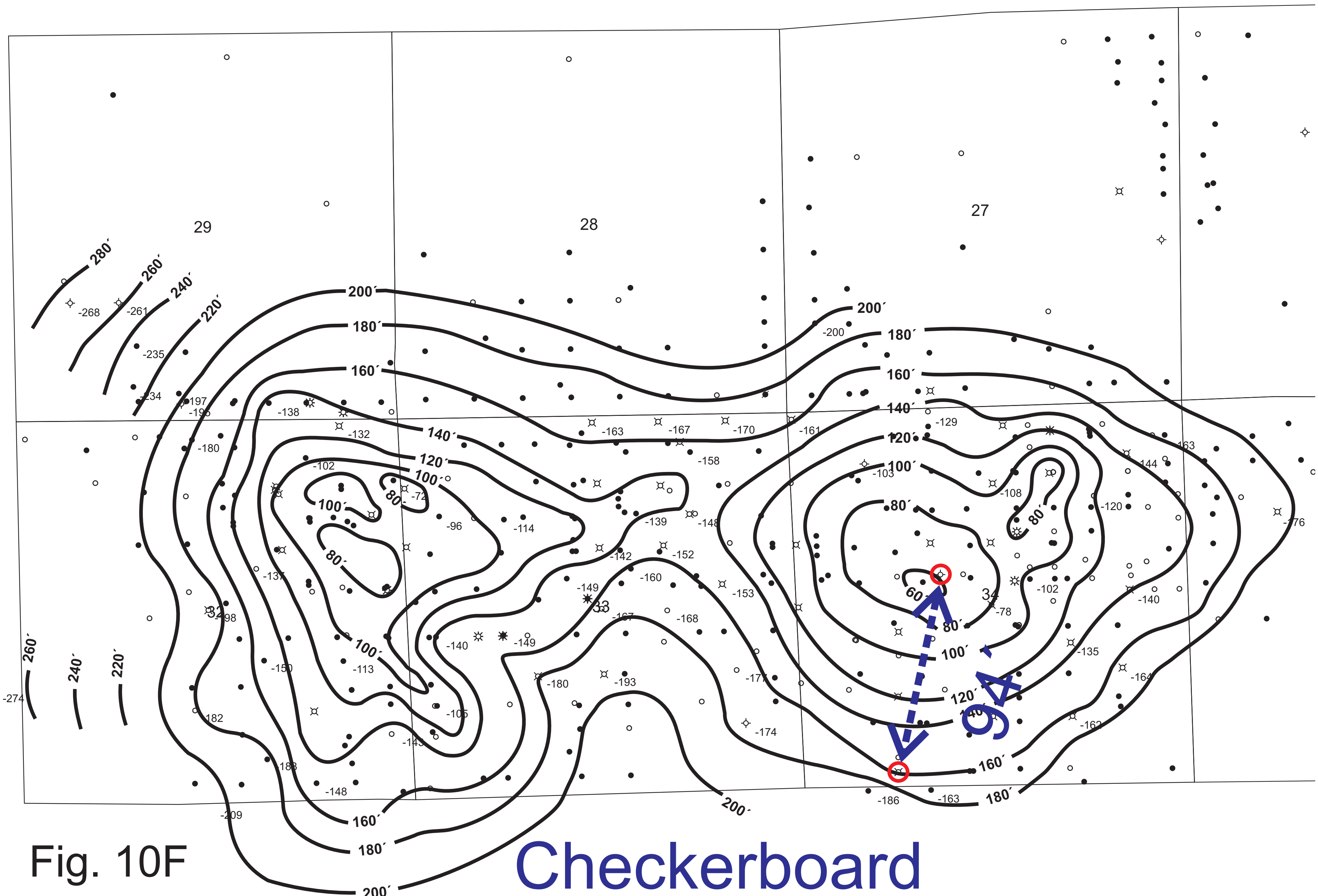


Fig. 10F

Checkerboard Structure

Wildhorse Field
Osage County, OK

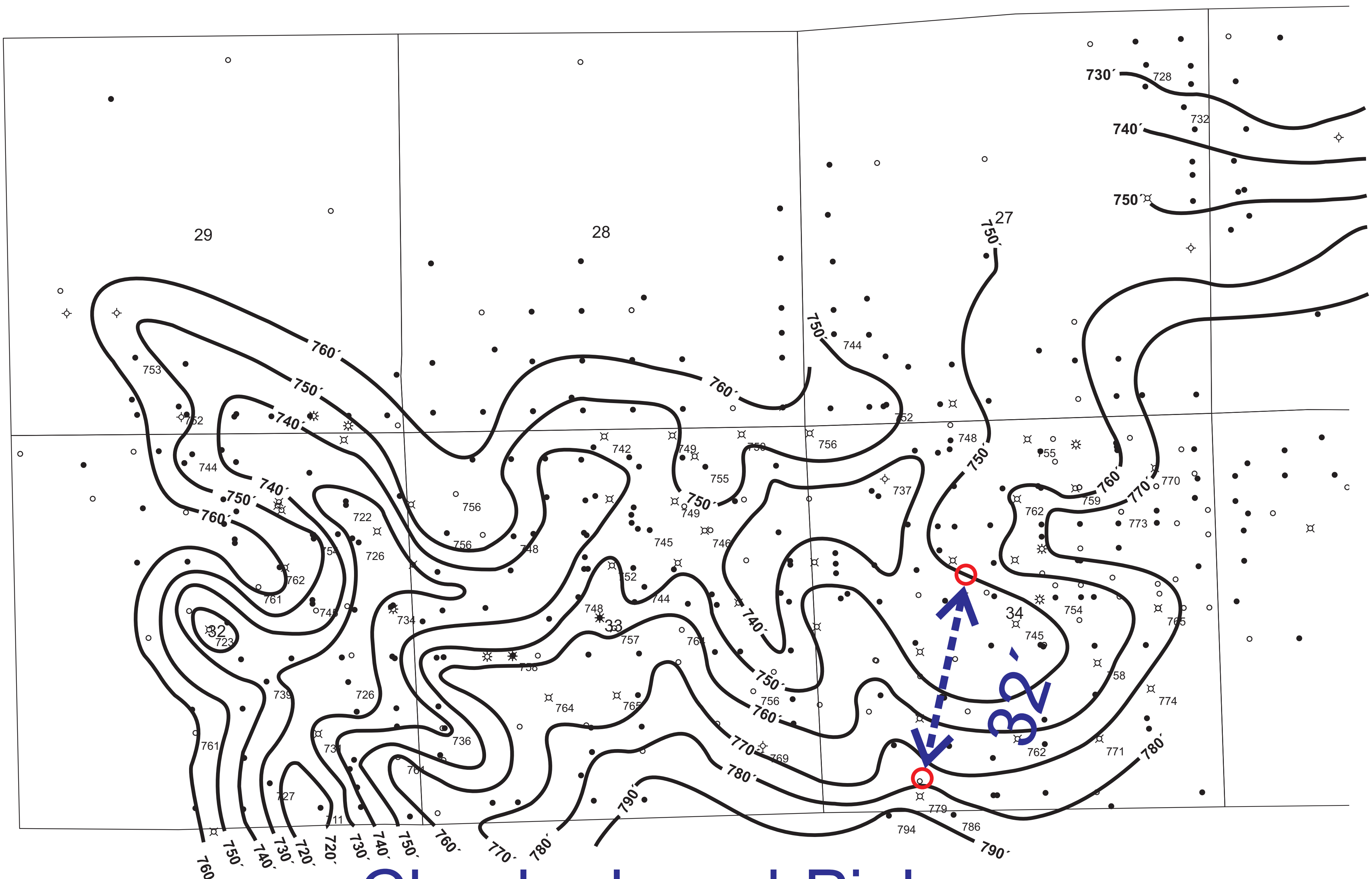


Fig. 10g

Checkerboard-Pink Isopach

Wildhorse Field
Osage County, OK

Assumptions

1. Tops of the Checkerboard and Pink Ls represent time stratigraphic units.
2. Checkerboard and Pink were deposited essentially parallel to sea level. Water depth was similar depth was similar depth for these zones.
3. Compaction was predominately responsible for isopach variation. Little or no structural uplift occurred.
4. Deposition remained consistent with subsidence.
5. Oil/gas production relationship suggest migration was pre-Woodford erosion. Oil/water contacts in the Penn suggest post Checkerboard oil migration.
6. Structural compaction was zero over Arbuckle "0's".
7. Arbuckle predominately uniform in composition with little lateral variation which influence compaction.

Fig 10 h

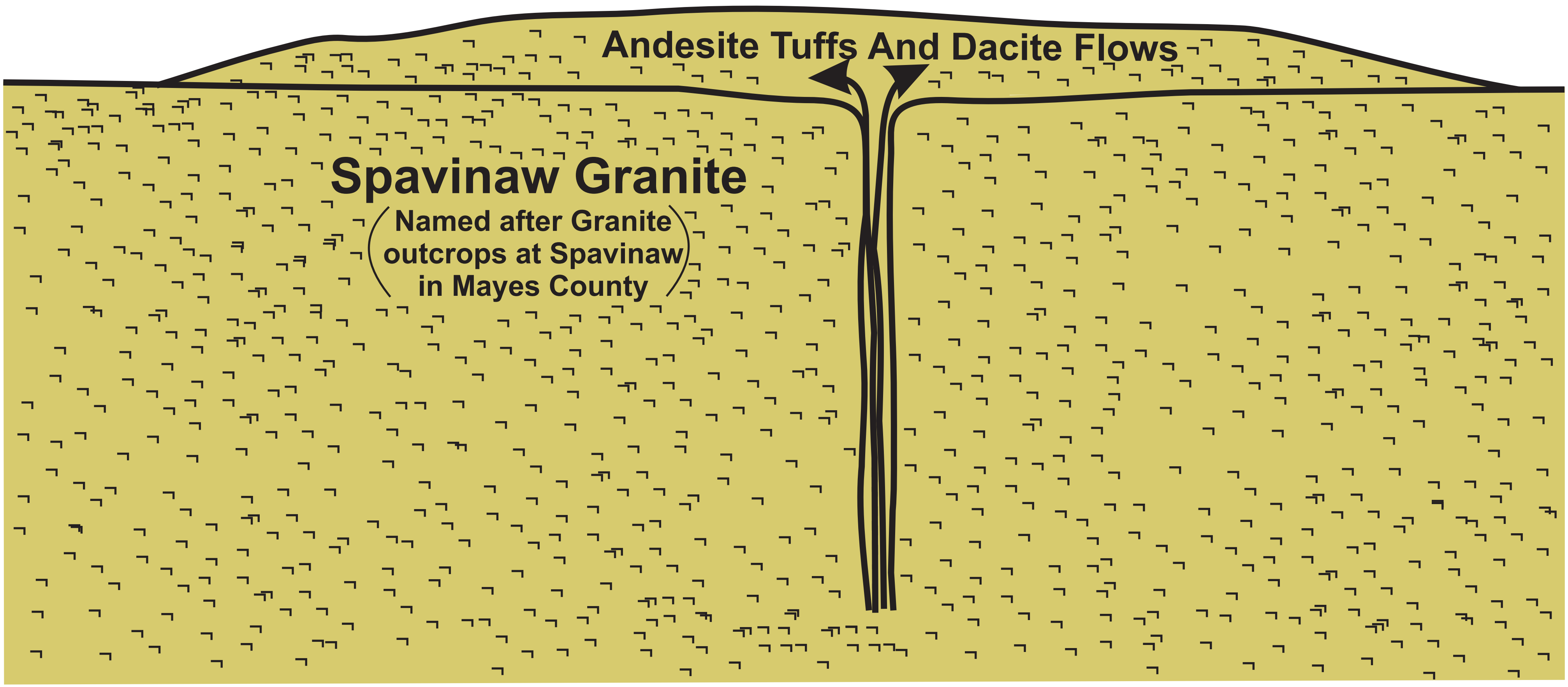


Fig. 12 Paleozoic formation

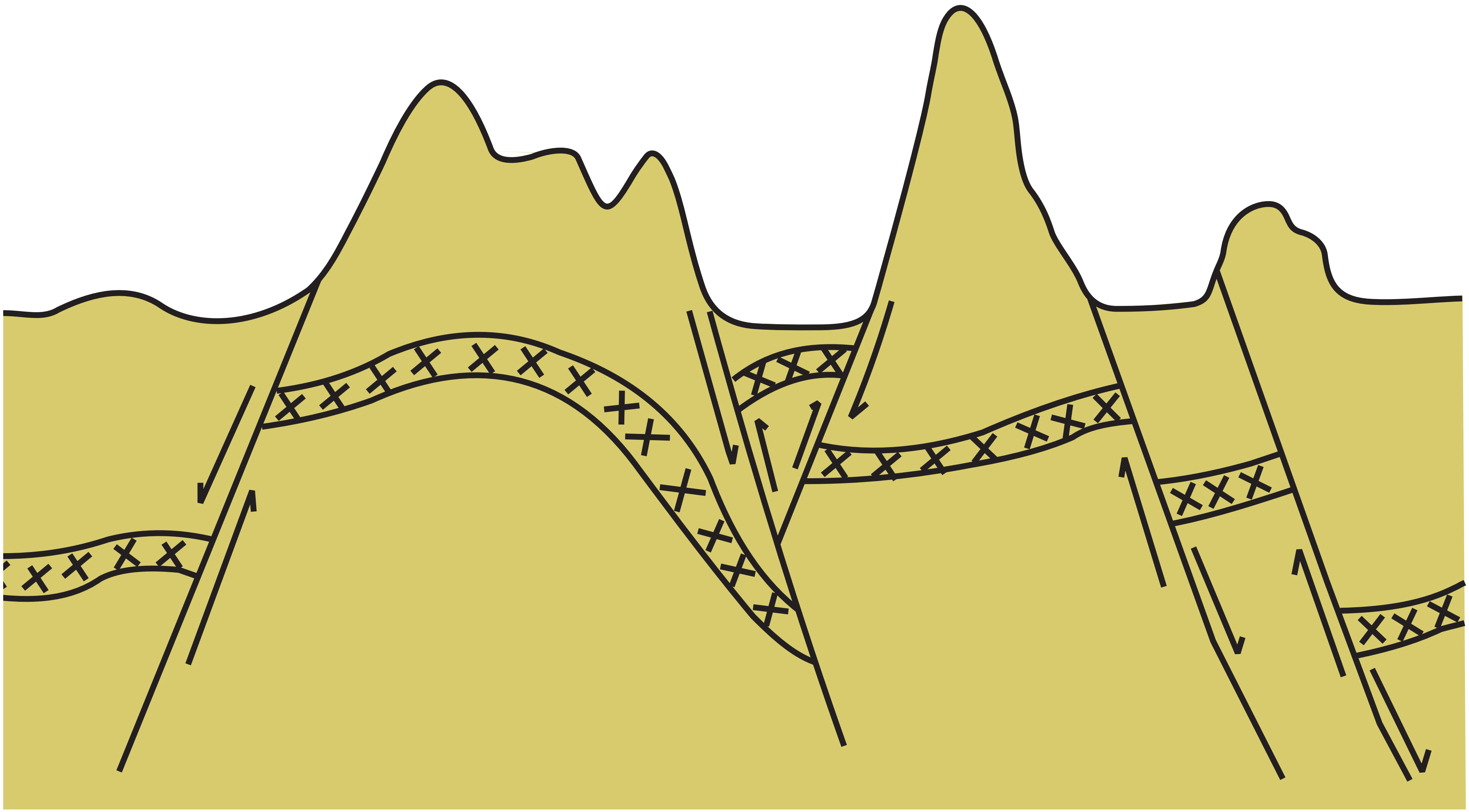
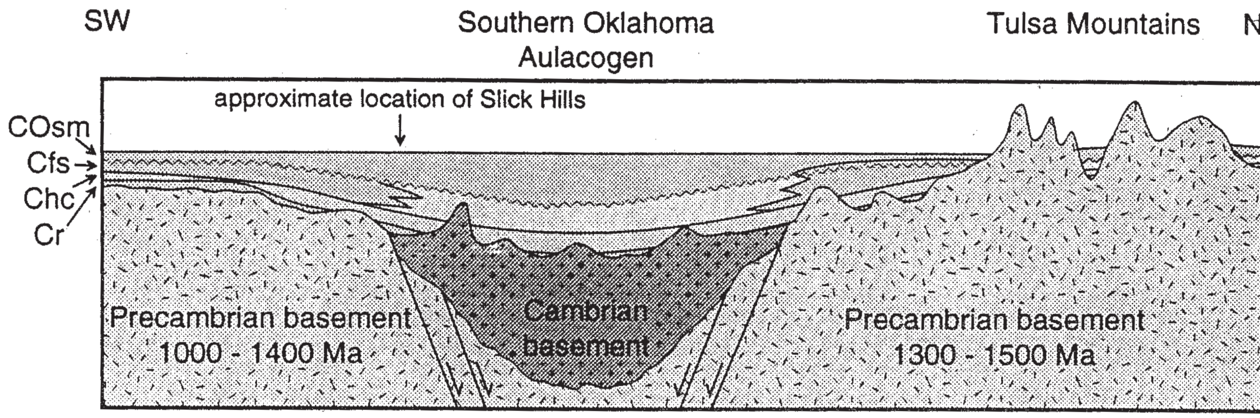
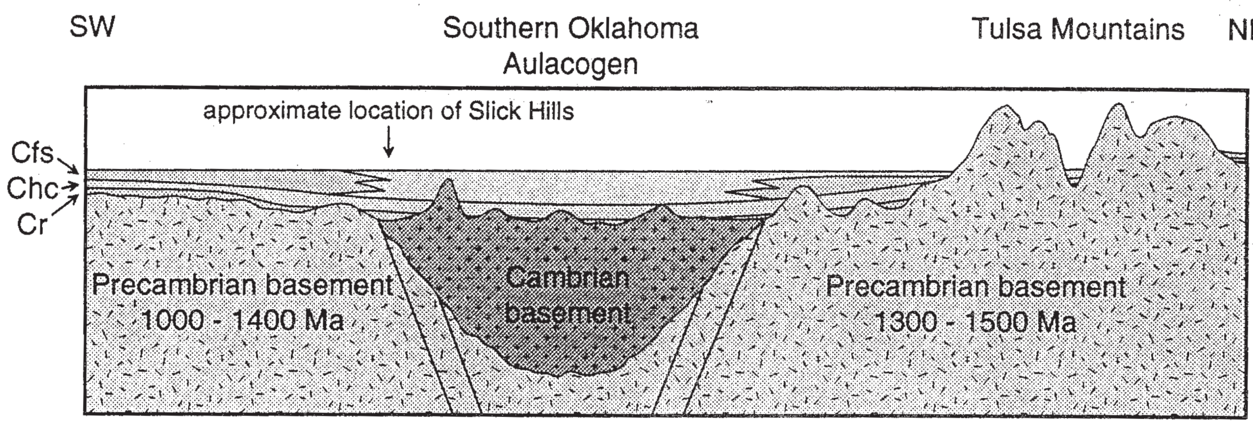


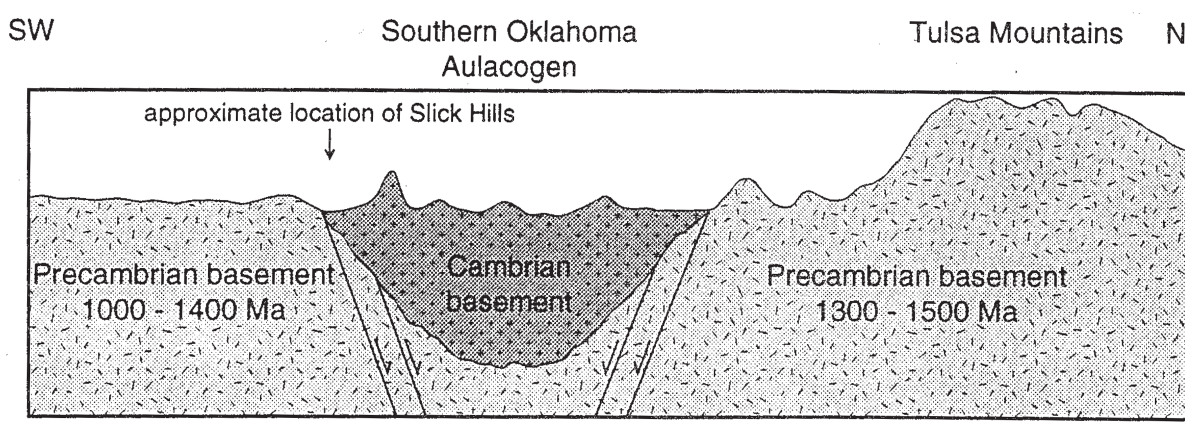
Fig 13 Faulting, folding and erosion of the Paleozoic



STAGE III - Reactivation of basin margin faults and deposition of Cambro-Ordovician Signal Mountain Formation in deeper waters? (Trempealeauan - Canadian)



STAGE II - Deposition of Cambrian Timbered Hills Group and Cambrian Fort Sill Formation. (Franconian)



STAGE I - Development of rift basin. (Middle Cambrian)

Fig. 14 **Arbuckle deposition**

Hosey and Donovan, 2000
Fig 13, Reprinted by
Permission of Oklahoma
Geological Society

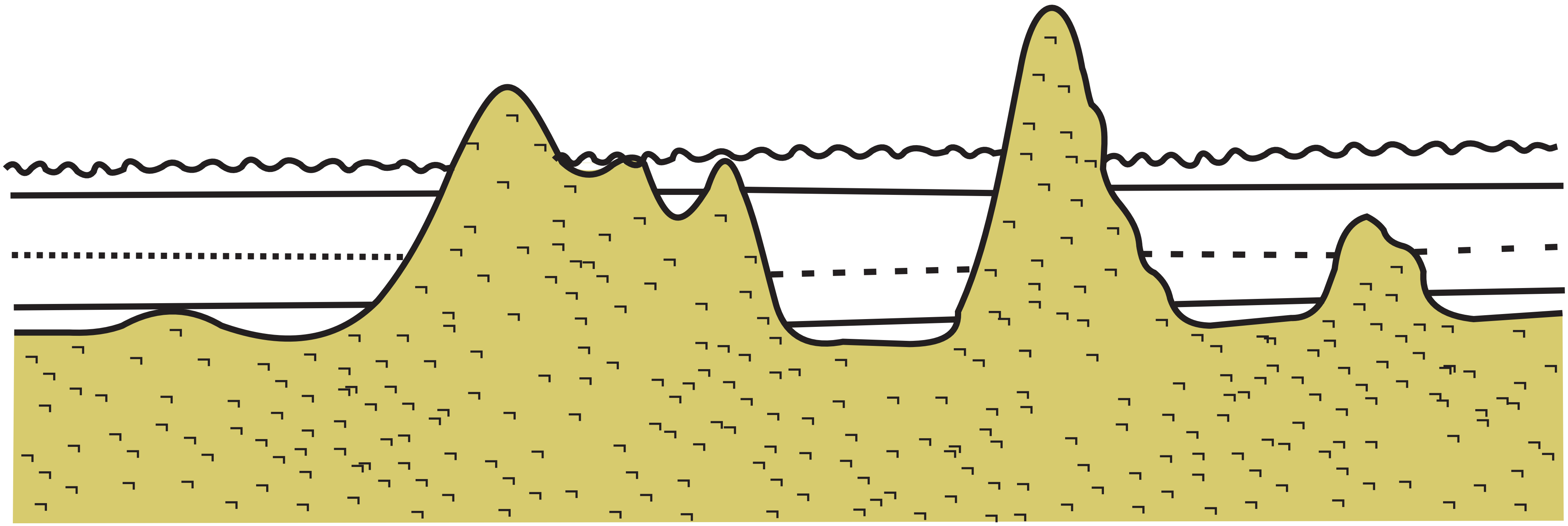


Fig 15 Deposition of the Arbuckle

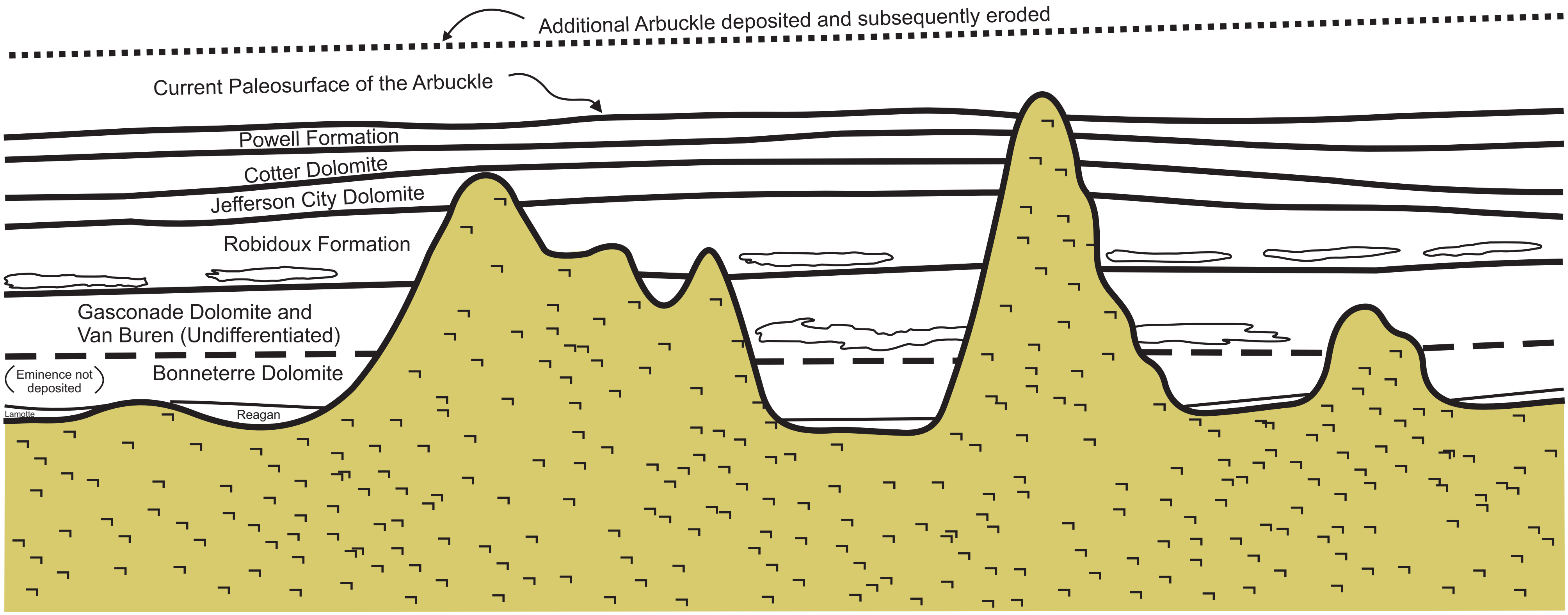


Fig 16 Continued deposition of the Arbuckle

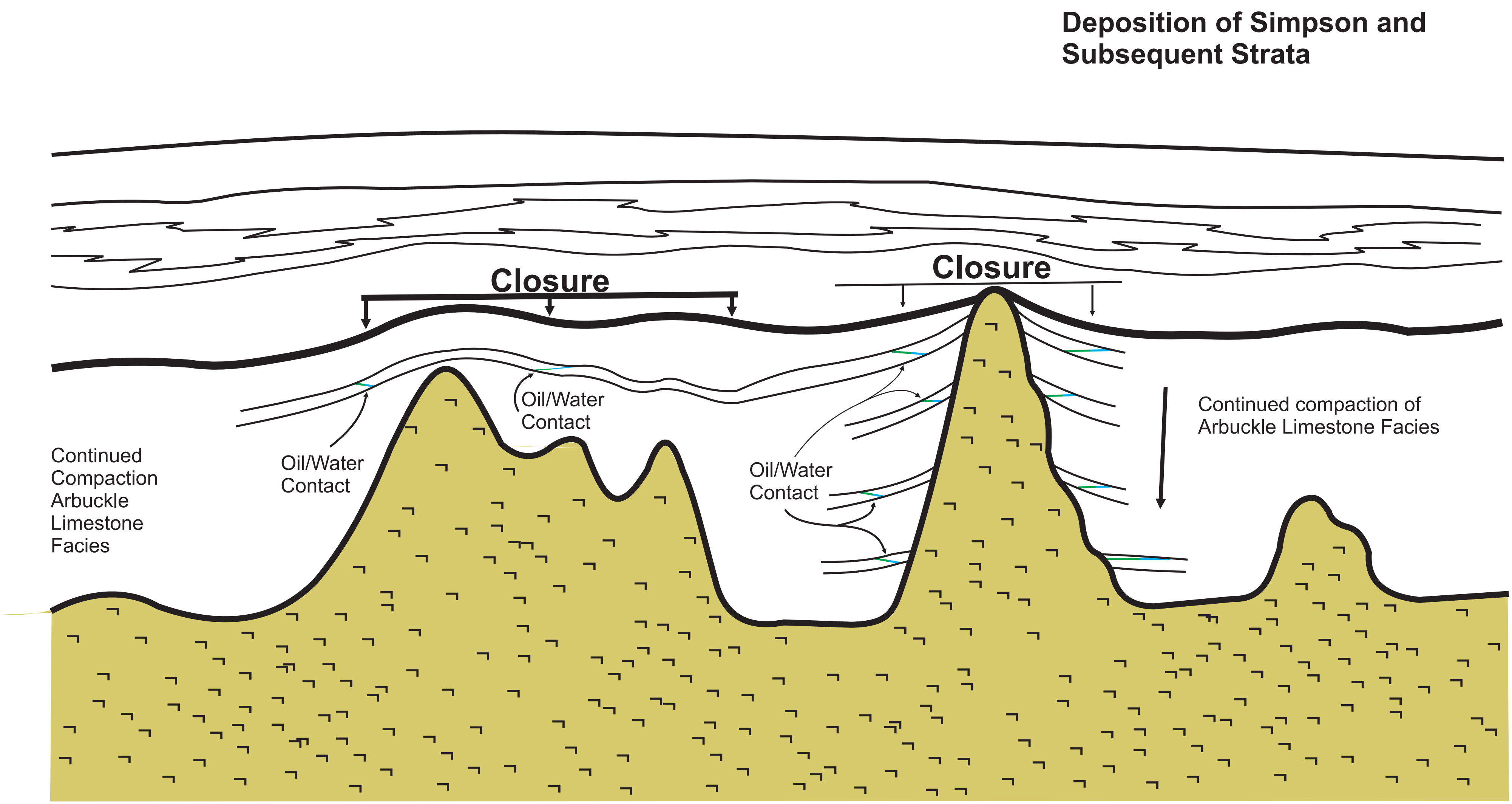


Fig 17 Compaction of Arbuckle sediments

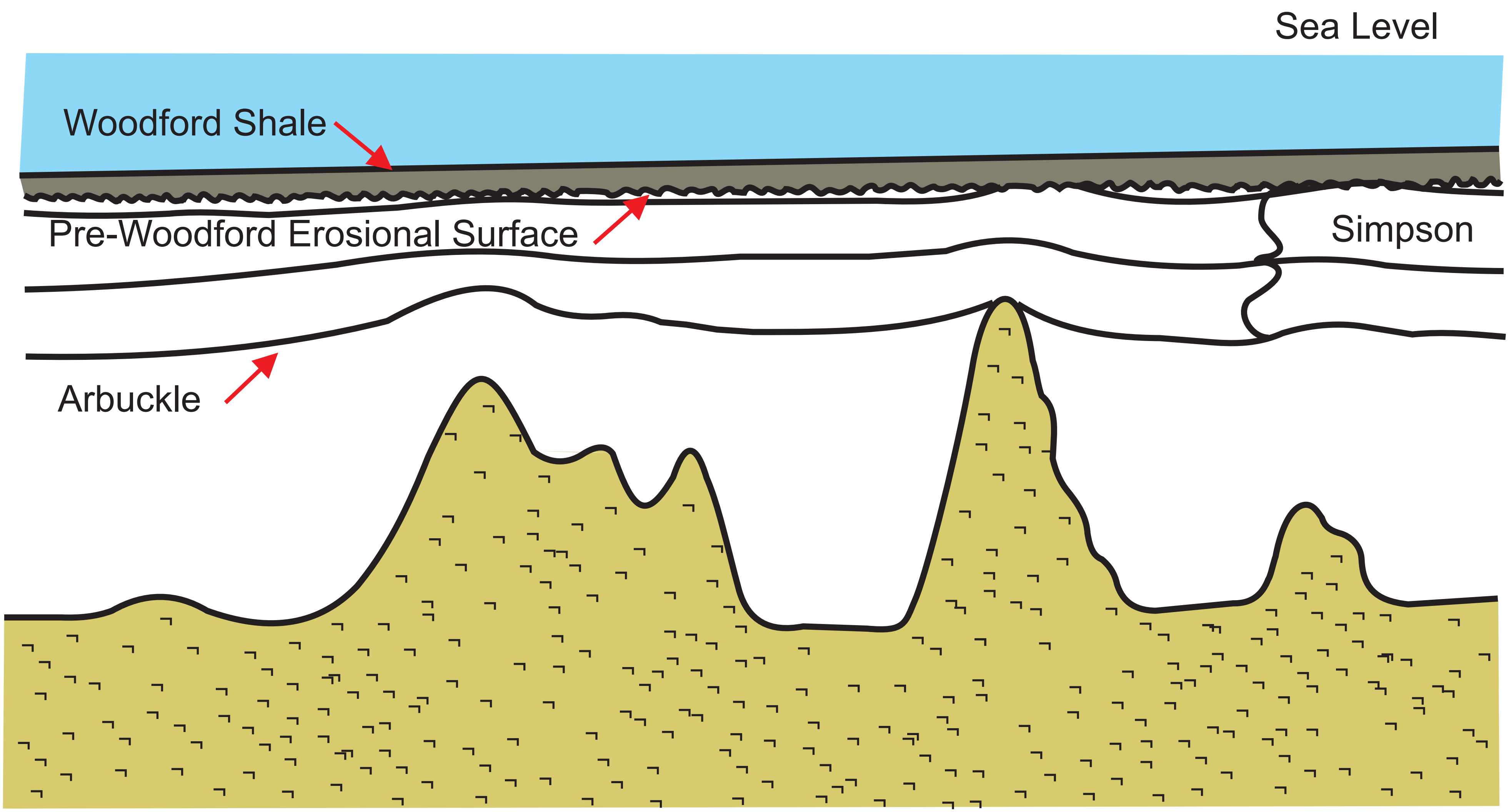

Sea Level
Woodford Shale
Pre-Woodford Erosional Surface
Simpson
Arbuckle

Fig 18

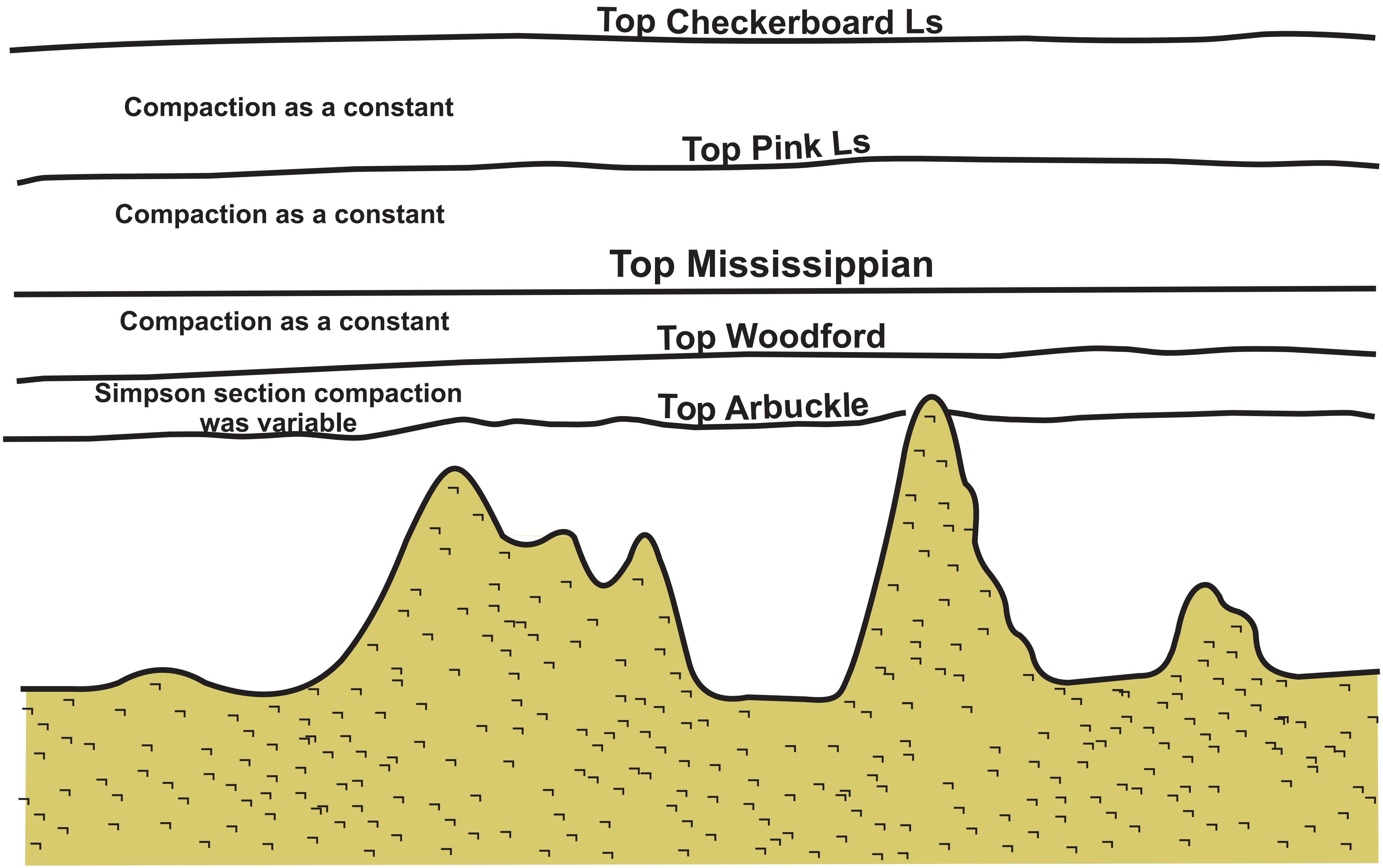


Fig 19 Deposition of Pink Ls and Checkerboard Ls

"The Dolomite Problem"

Dolomite is one of the commonest sedimentary materials. No geologic evidence that its formation was under unusual conditions of temperature or pressure. Efforts to prepare dolomite in the lab under simulated sedimentary conditions have failed. No dolomite is observed to be forming in nature in ordinary sedimentary environments.

Crystallography

Dolomite is a double carbonate of Mg and Ca which the anions are $CO_3^{=}$ and cations are REGULARLY alternation Ca^{++} and Mg^{++}.

This is a special, highly ordered crystal structure. When attempts are made to precipitate dolomite in the laboratory, the usual result is a mixture of calcite and hydro-magnesite. These are similar compounds found in shells or some marine organisms and are not dolomite but structure with random distribution of Ca and Mg, similar to what is found readily in the laboratory.

Dolomite is readily prepared artificially at temperatures somewhat over 100 degrees. Minerals formed at successively lower temperature result in crystal lattices that have increasingly disordered or random distribution of Ca and Mg in the lattice.

Geological

Not much evidence that dolomites, in older strata, were formed as primary precipitates, except possible evaporate deposits.

Characteristic poor preservation of fossils in dolomites, the coarseness of grains, commonly observed cavities and pore spaces suggest that dolomites formed subsequent to deposition.

Fig 19 a

Source: Introduction to Geochemistry by Konrad Krauskopf

SEPM Special Publication No. 28, p. 259–297, November 1980

BURIAL DOLOMITIZATION OF THE UPPER DEVONIAN MIETTE BUILDUP, JASPER NATIONAL PARK, ALBERTA[1]

BRET W. MATTES AND ERIC W. MOUNTJOY
McGill University, Montreal, Quebec H3A 2A7

ABSTRACT

The periphery of the well exposed Miette buildup in the Front Ranges of the Rocky Mountains is heavily dolomitized. Dolomitization is most abundant in a narrow zone less than 1 km wide and decreases rapidly into the buildup interior. Detailed mapping, petrographic analysis, and chemical studies facilitated the recognition of five types of dolomites in the following paragenetic sequence: (1) diffuse microcrystalline dolomite, an early phase of microcrystalline dolomite in lime mudstones and wackestones; (2) 'mosaic' dolomite which replaced large volumes of precursor limestone matrix and forms at least 70 percent of the dolomite in the buildup; (3) pressure solution related dolomite, coarse to fine crystalline, associated with pressure solution interfaces; (4) white sparry dolomite which forms irregular, coarsely crystalline pods in the massive dolomite facies at the buildup margin; and (5) late stage dolomite cements composed of coarse, clear, scalenohedral dolomite crystals forming isopachous crusts which line leached void spaces and fractures associated with brecciation at the buildup margin. Vuggy and intercrystalline porosity is associated with type 2 dolomites, but most reservoir porosity has been destroyed.

The Miette buildup was subaerially exposed only for brief periods and evaporites or evaporite-related features are absent. Petrographic observations supported by geochemical and isotope data indicate that pervasive dolomitization beginning with type 2 dolomites was a late diagenetic phenomenon postdating cementation and lithification of buildup interior deposits. Most of the dolomites in the buildup probably formed by a combination of three processes: (1) migration of brines from adjacent basin muds undergoing compaction, (2) pressure solution, and (3) mixing of near-surface fluids with deep burial brines along fracture controlled conduits. Most of the dolomitizing waters are believed to have been derived from the dewatering of basinal strata adjacent to the buildup and from strata underlying the buildup.

The deep burial regime has been underestimated as an environment conducive to massive dolomitization. Significant kinetic obstacles which hinder the formation of ordered dolomite at or near the surface may be largely overcome with increasing burial depths within a sedimentary basin.

Fig 19 b

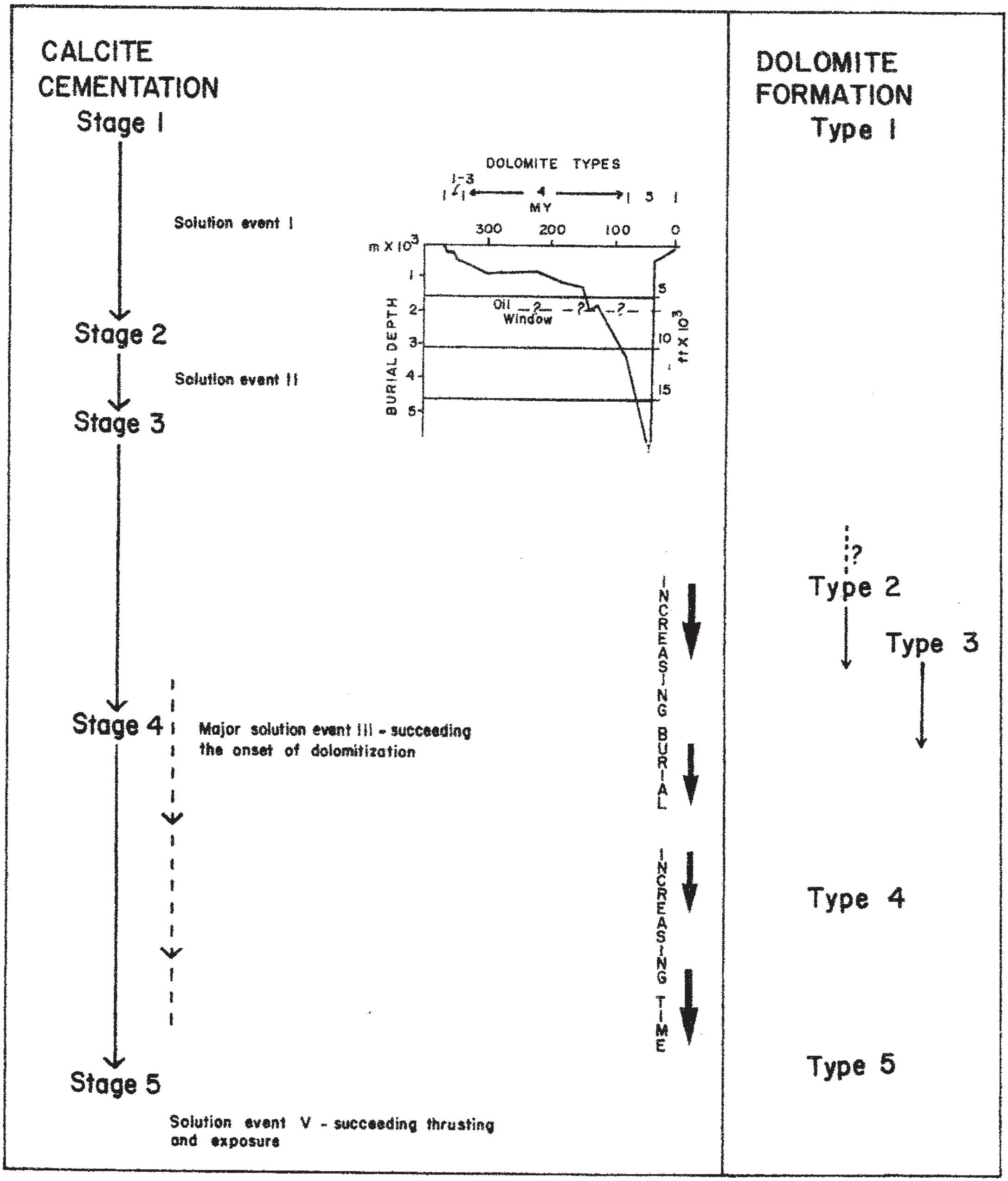
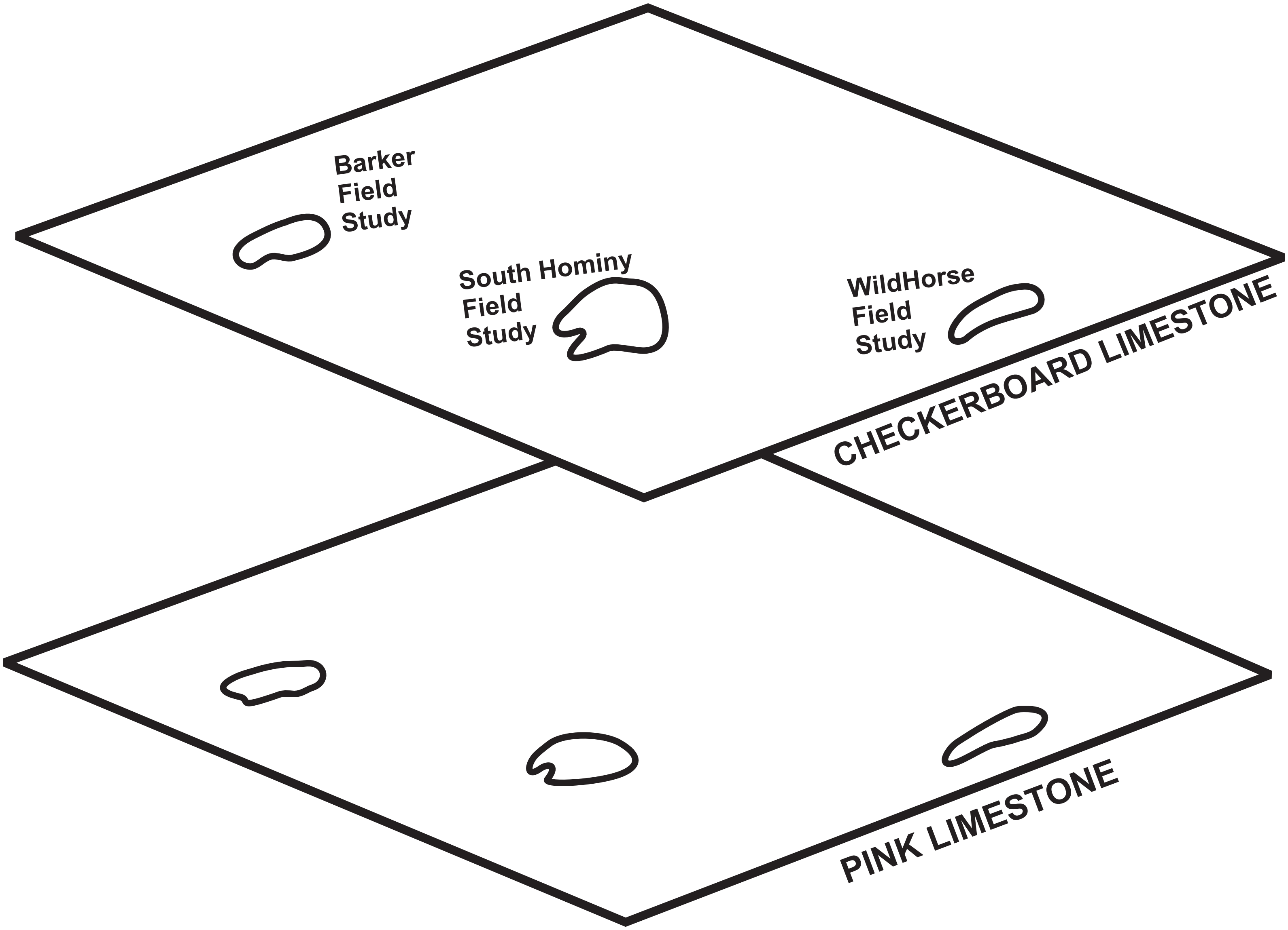

CALCITE CEMENTATION
Stage 1
Solution event I
Stage 2
Solution event II
Stage 3
Stage 4
Major solution event III - succeeding the onset of dolomitization
Stage 5
Solution event V - succeeding thrusting and exposure
DOLOMITE TYPES
1-3
4
5
MY
300
200
100
0
m X 10^3
BURIAL DEPTH
Oil Window
ft X 10^3
INCREASING BURIAL
INCREASING TIME
DOLOMITE FORMATION
Type 1
Type 2
Type 3
Type 4
Type 5

Fig 19 c



Pre-Structural Compaction

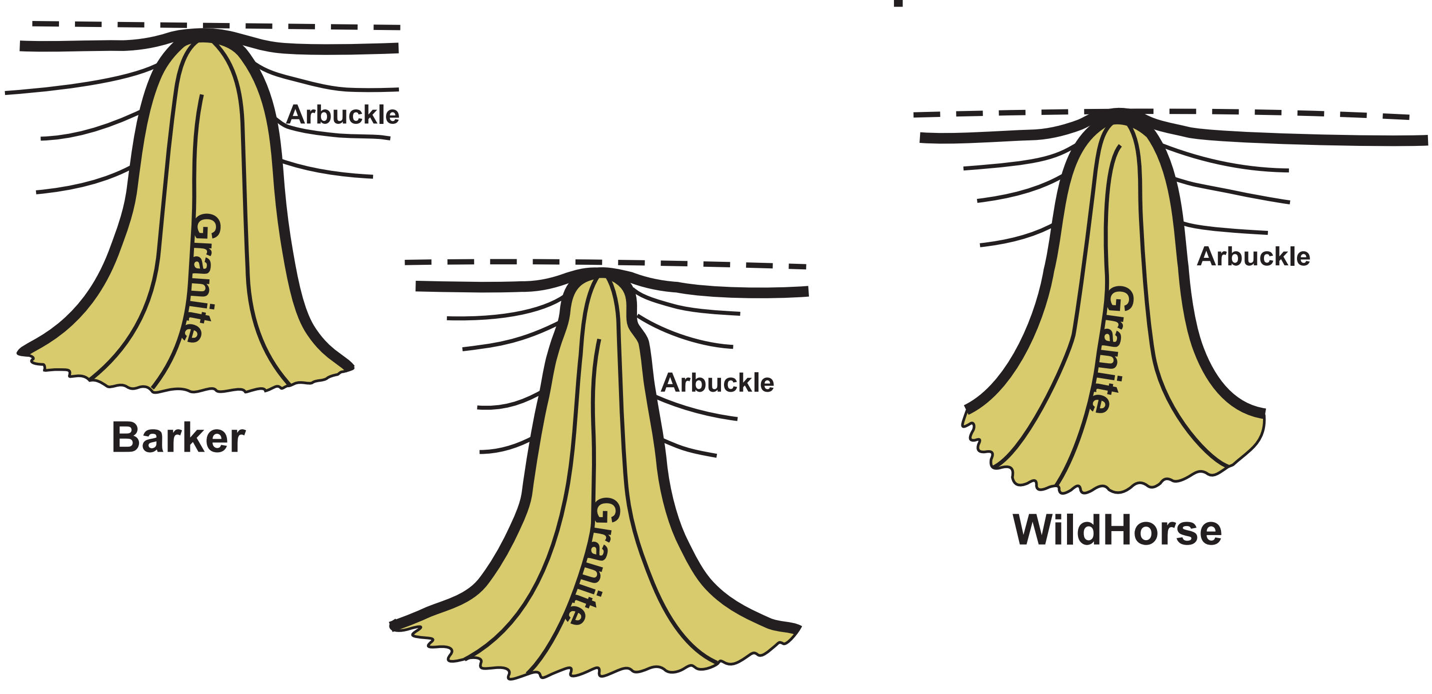


Fig 20

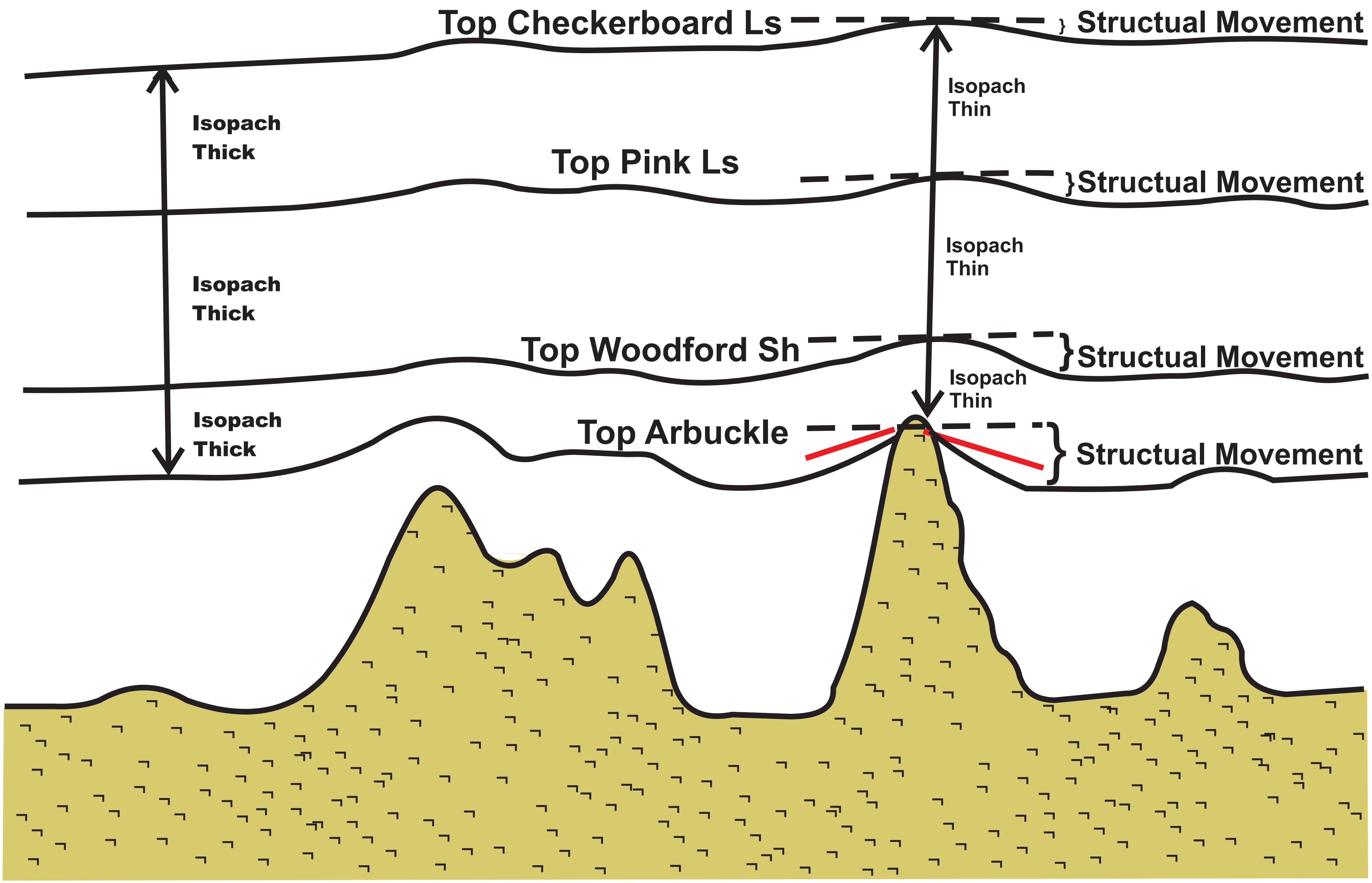

Top Checkerboard Ls
Structual Movement
Isopach Thick
Isopach Thin
Top Pink Ls
Structual Movement
Isopach Thick
Isopach Thin
Top Woodford Sh
Structual Movement
Isopach Thin
Isopach Thick
Top Arbuckle
Structual Movement

Fig 21

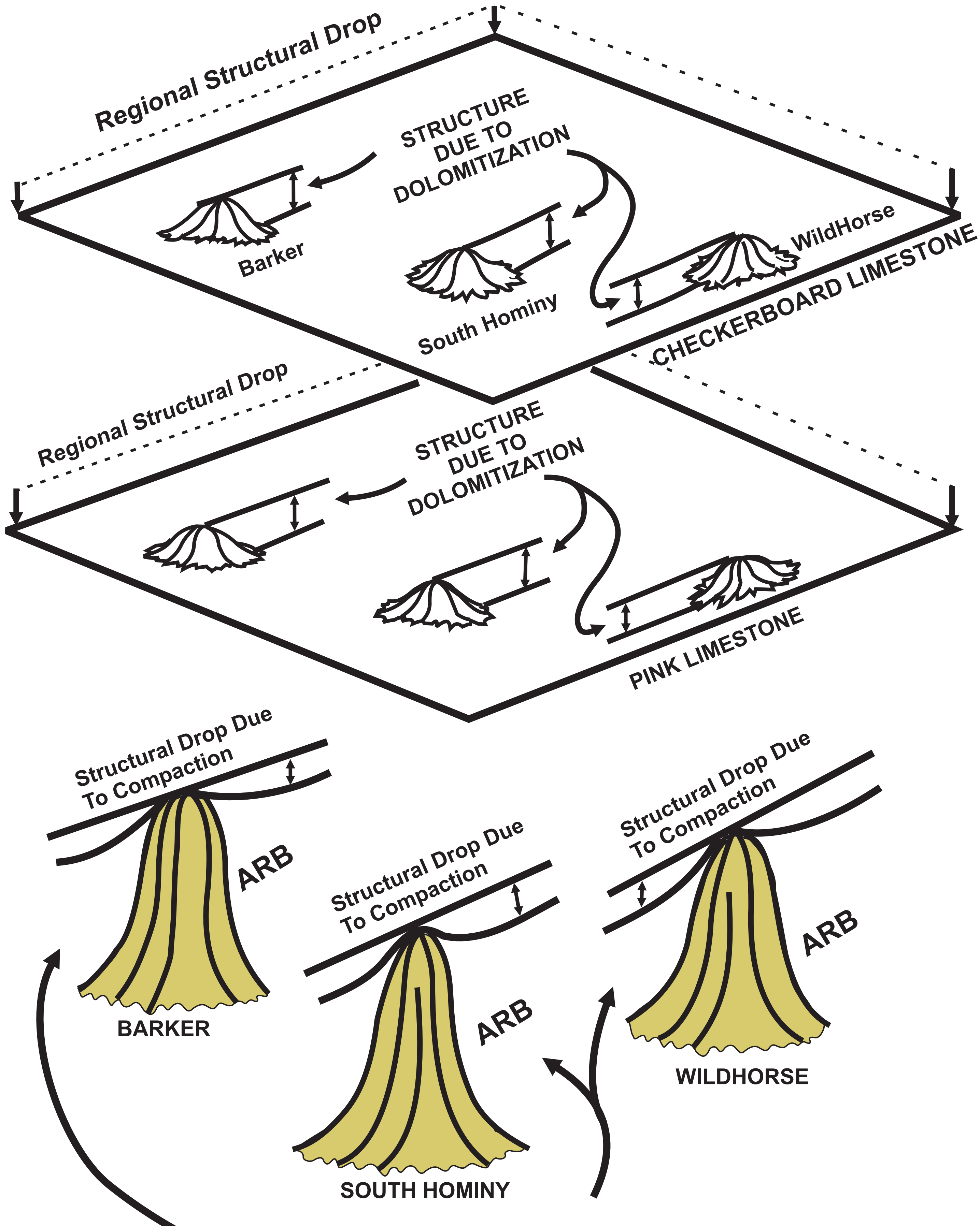


Fig 22

DIAGENETIC CHANGE

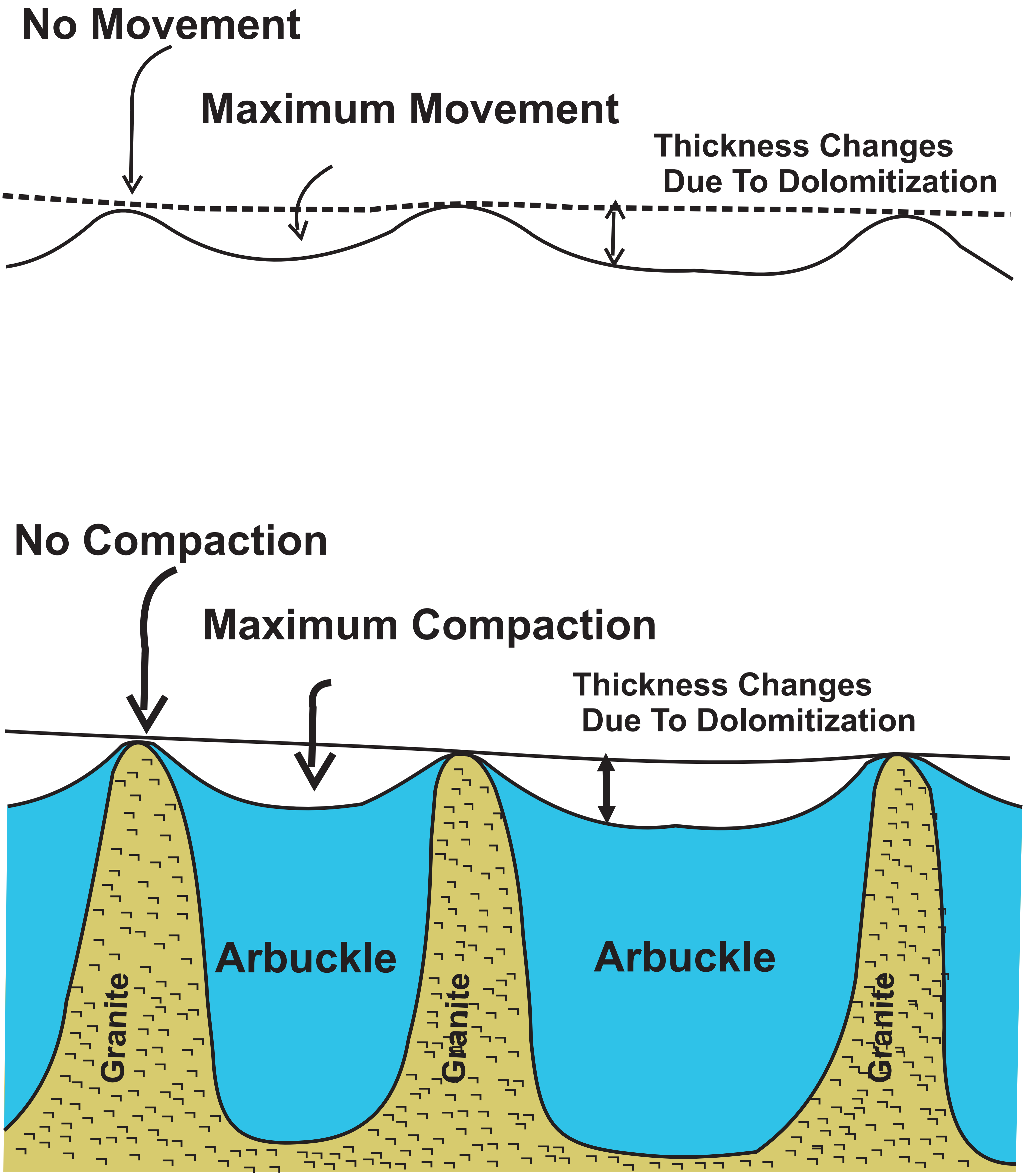
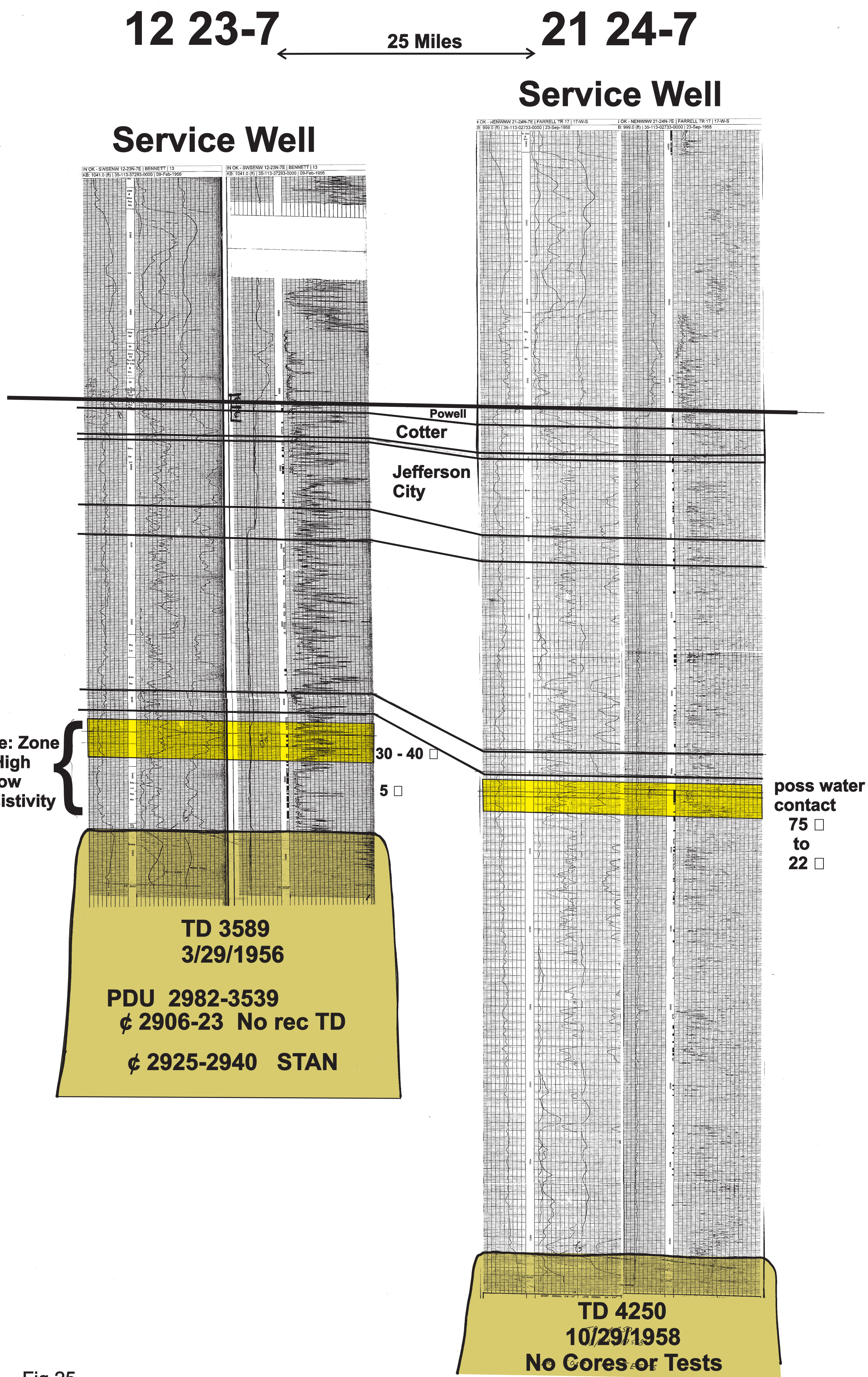
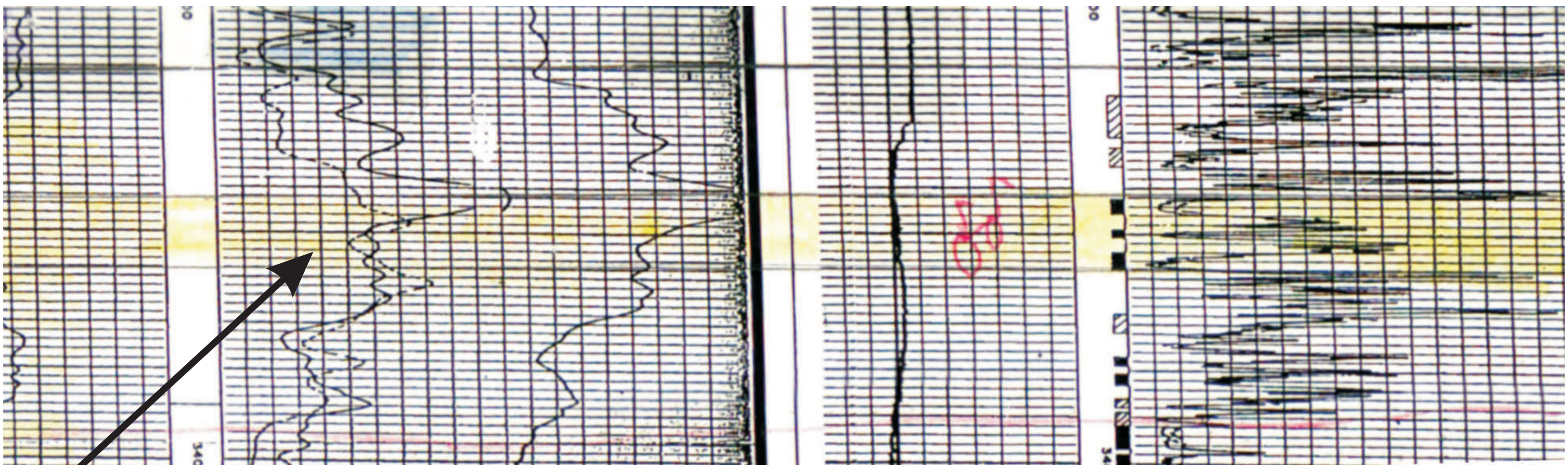

No Movement
Maximum Movement
Thickness Changes
Due To Dolomitization
No Compaction
Maximum Compaction
Thickness Changes
Due To Dolomitization
Arbuckle
Arbuckle
Granite
Granite
Granite

Fig 24



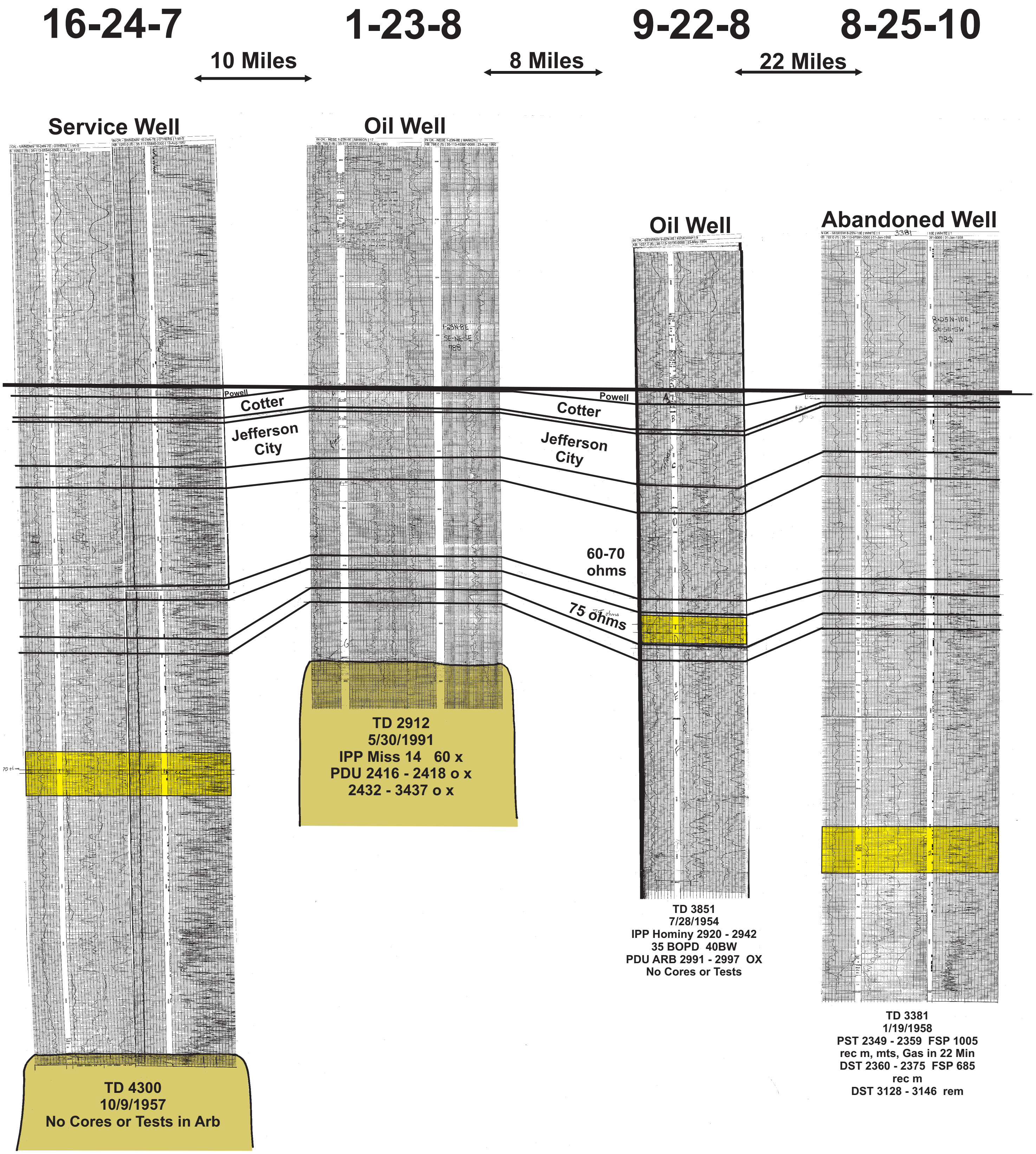
12 23-7
25 Miles
21 24-7
Service Well
Service Well
Powell
Cotter
Jefferson
City
Note: Zone
w/ High
& Low
Resistivity
30 - 40 □
5 □
poss water
contact
75 □
to
22 □
TD 3589
3/29/1956
PDU 2982-3539
¢ 2906-23 No rec TD
¢ 2925-2940 STAN
TD 4250
10/29/1958
No Cores or Tests

Fig 25



30-40 OHMS RESISTIVITY

Fig 26



16-24-7
1-23-8
9-22-8
8-25-10
10 Miles
8 Miles
22 Miles
Service Well
Oil Well
Oil Well
Abandoned Well
Powell
Cotter
Jefferson City
Powell
Cotter
Jefferson City
60-70 ohms
75 ohms
TD 4300
10/9/1957
No Cores or Tests in Arb
TD 2912
5/30/1991
IPP Miss 14 60 x
PDU 2416 - 2418 o x
2432 - 3437 o x
TD 3851
7/28/1954
IPP Hominy 2920 - 2942
35 BOPD 40BW
PDU ARB 2991 - 2997 OX
No Cores or Tests
TD 3381
1/19/1958
PST 2349 - 2359 FSP 1005
rec m, mts, Gas in 22 Min
DST 2360 - 2375 FSP 685
rec m
DST 3128 - 3146 rem

Fig 27

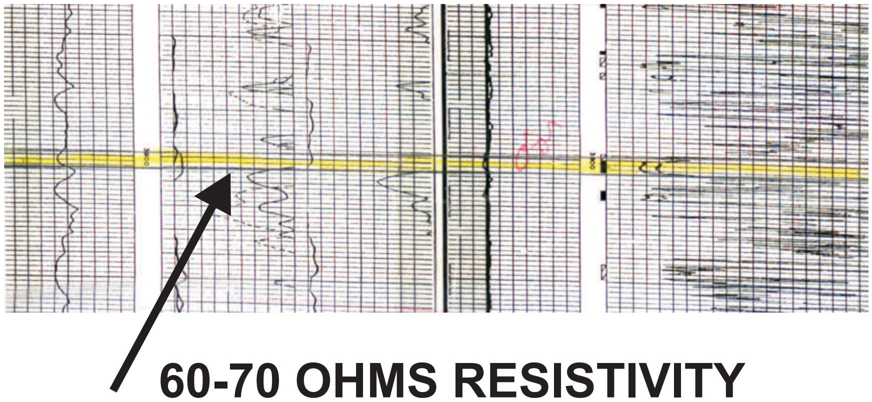


Fig 28a

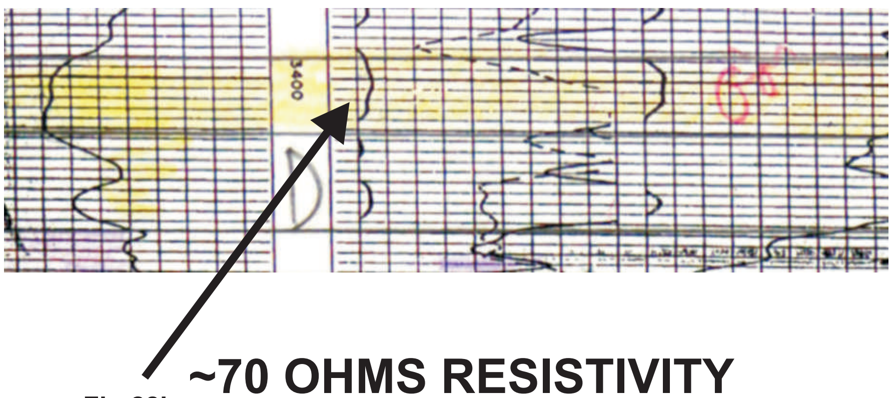


Fig 28b

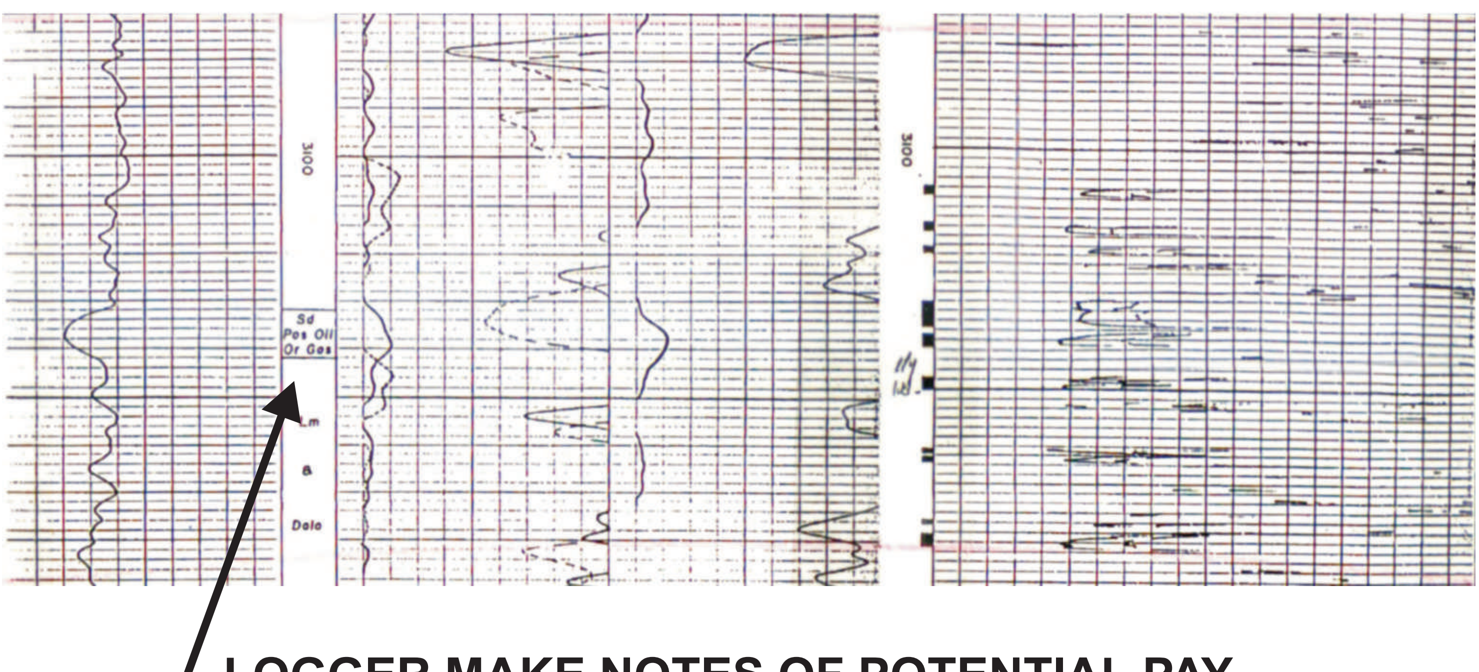


Fig 28d

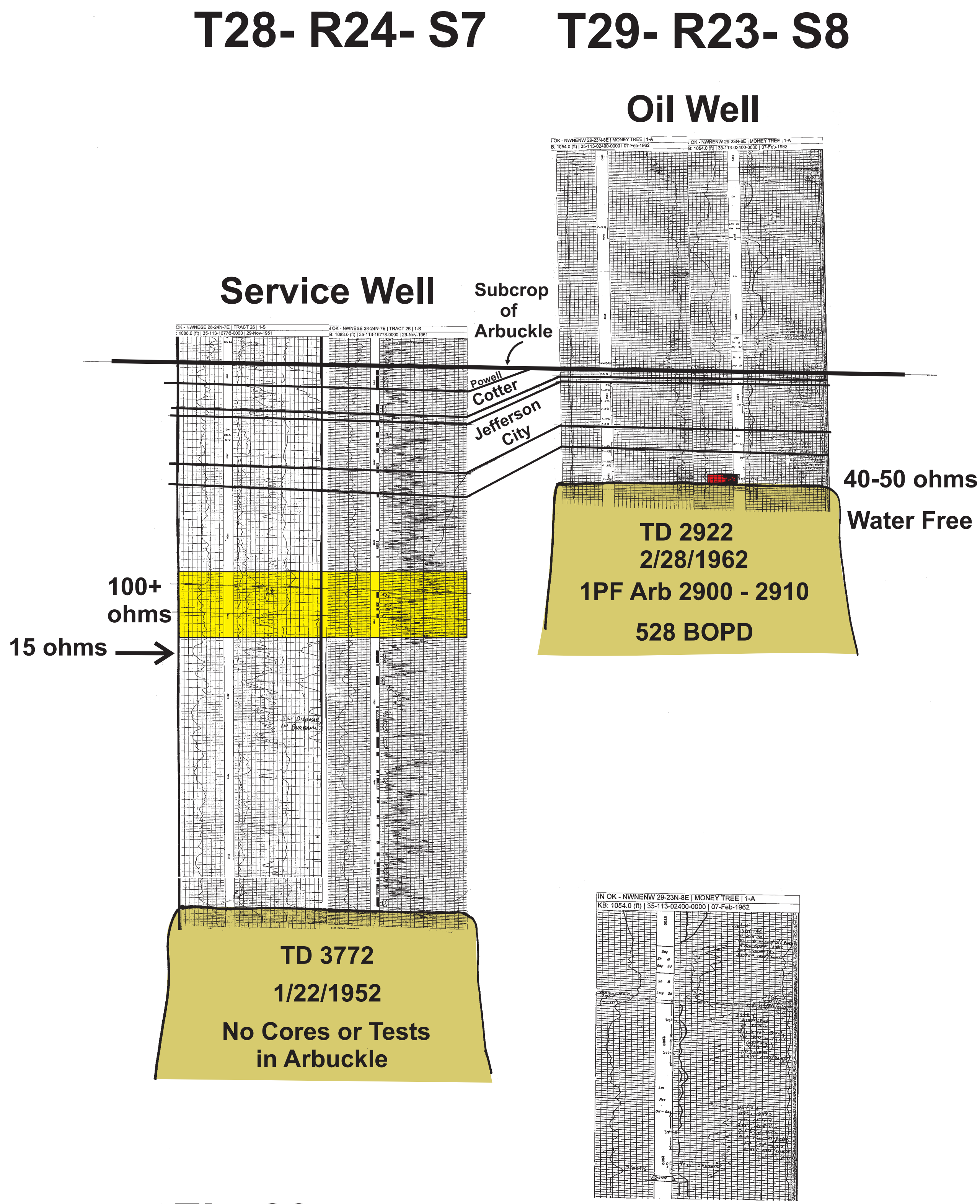
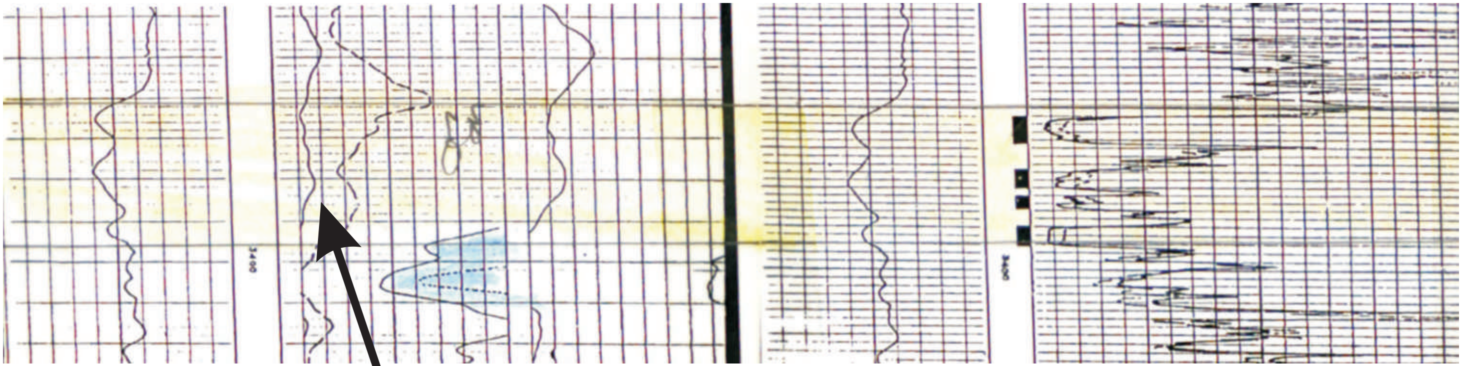

T28- R24- S7
T29- R23- S8
Oil Well
Service Well
Subcrop of Arbuckle
Powell
Cotter
Jefferson City
40-50 ohms
Water Free
TD 2922
2/28/1962
1PF Arb 2900 - 2910
528 BOPD
100+ ohms
15 ohms
TD 3772
1/22/1952
No Cores or Tests in Arbuckle

Fig 29



50-75 OHMS RESISTIVITY

Fig 30

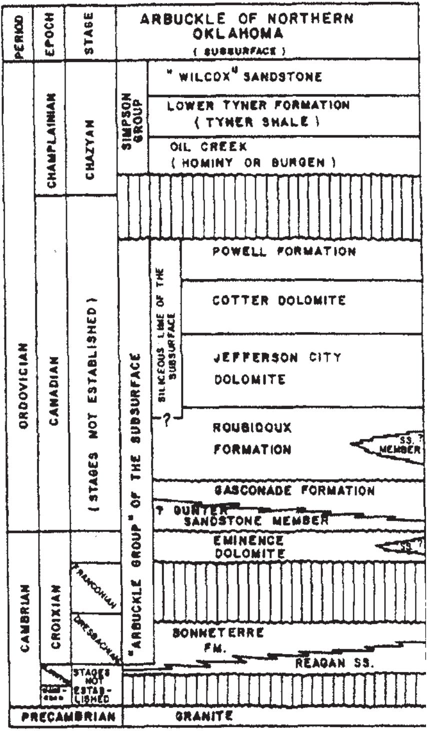


Fig. 31

Chenowith,P A, 1968
Fig 4, Reprinted by
Permission of American
Association of Petroleum
Geologists

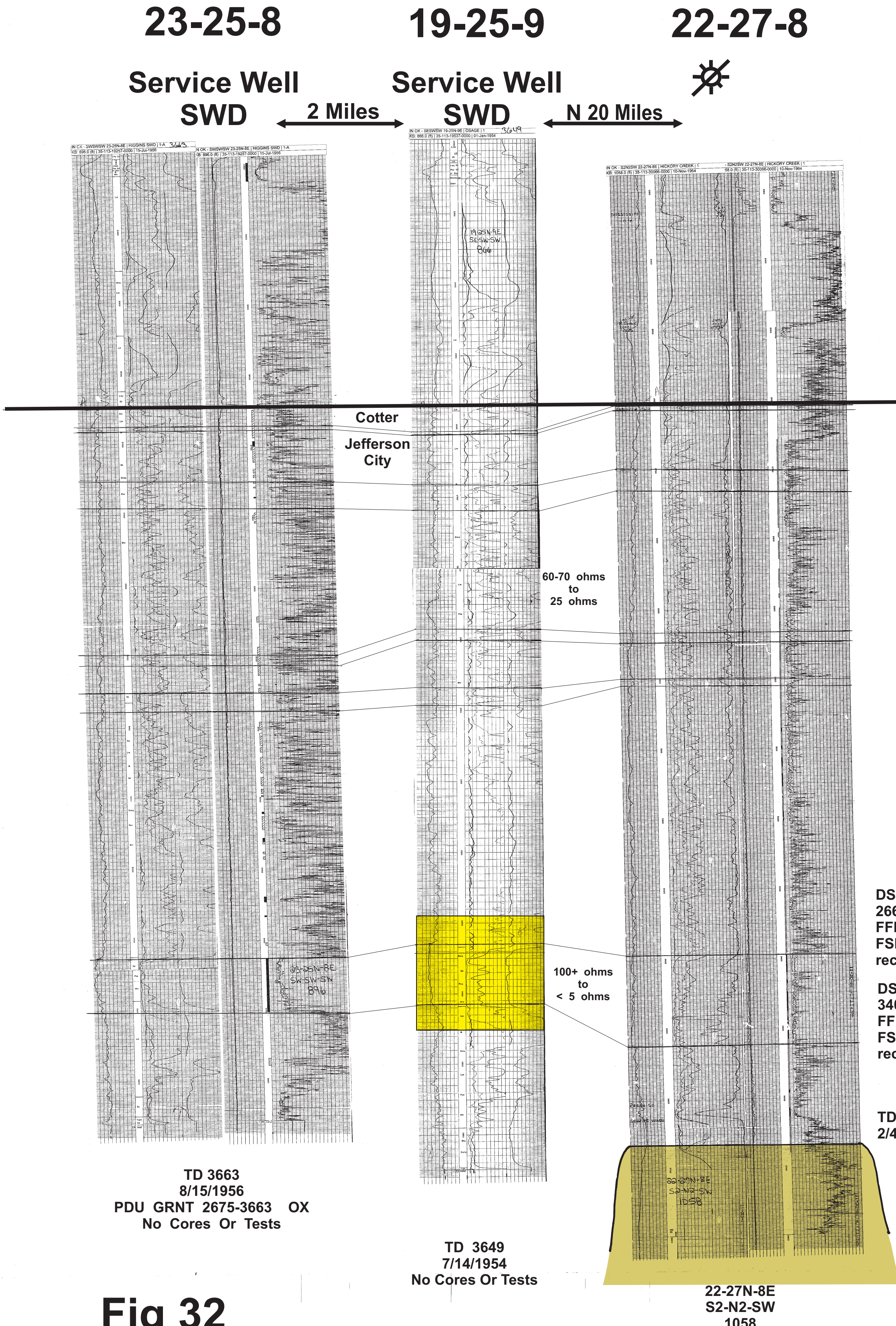

23-25-8
19-25-9
22-27-8
Service Well
SWD
2 Miles
Service Well
SWD
N 20 Miles
Cotter
Jefferson
City
60-70 ohms
to
25 ohms
100+ ohms
to
< 5 ohms
DST #1
2668-2684
FFP 17
FSP 1027
rec xm
DST #2
3404-34
FFP 1197
FSP 1265
rec zw
TD 3798
2/4/1965
TD 3663
8/15/1956
PDU GRNT 2675-3663 OX
No Cores Or Tests
TD 3649
7/14/1954
No Cores Or Tests
22-27N-8E
S2-N2-SW
1058

Fig 32

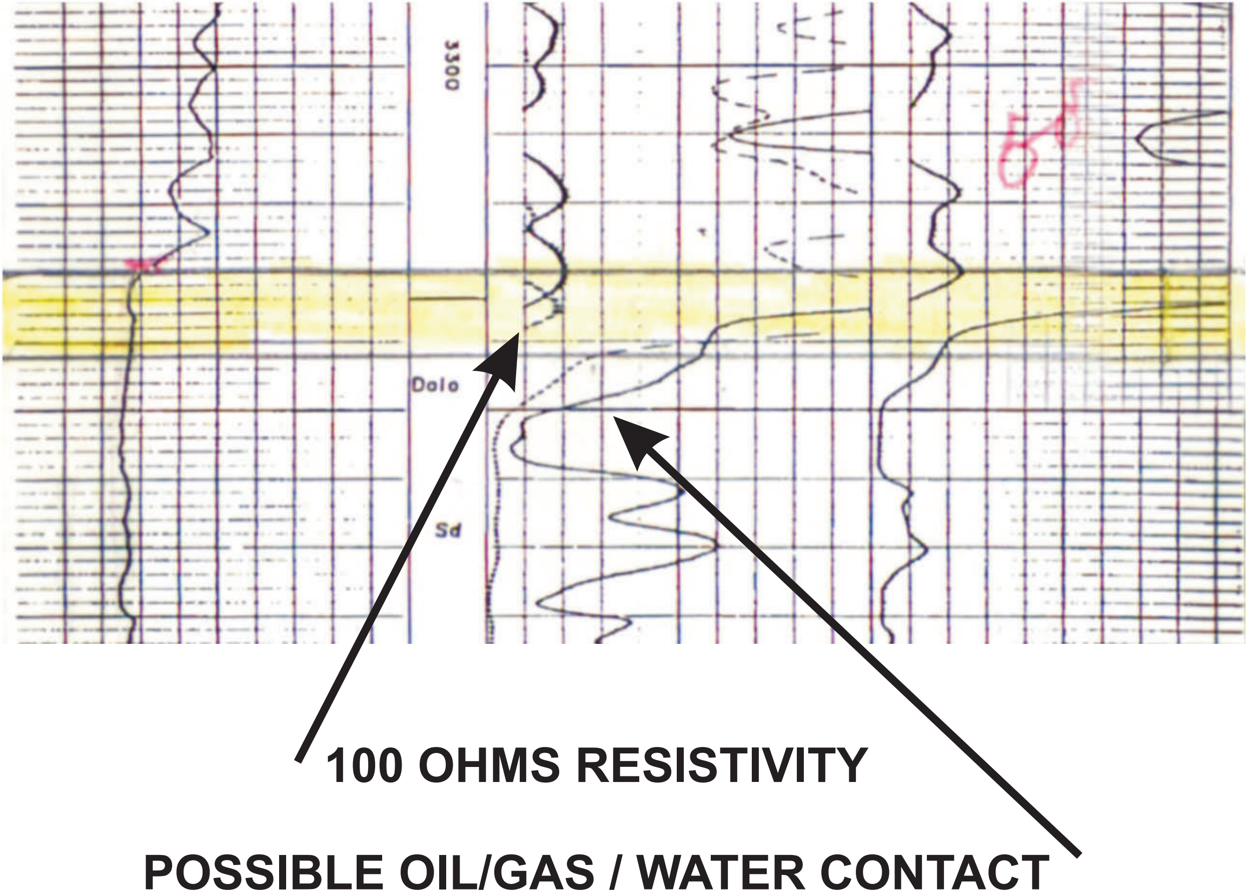
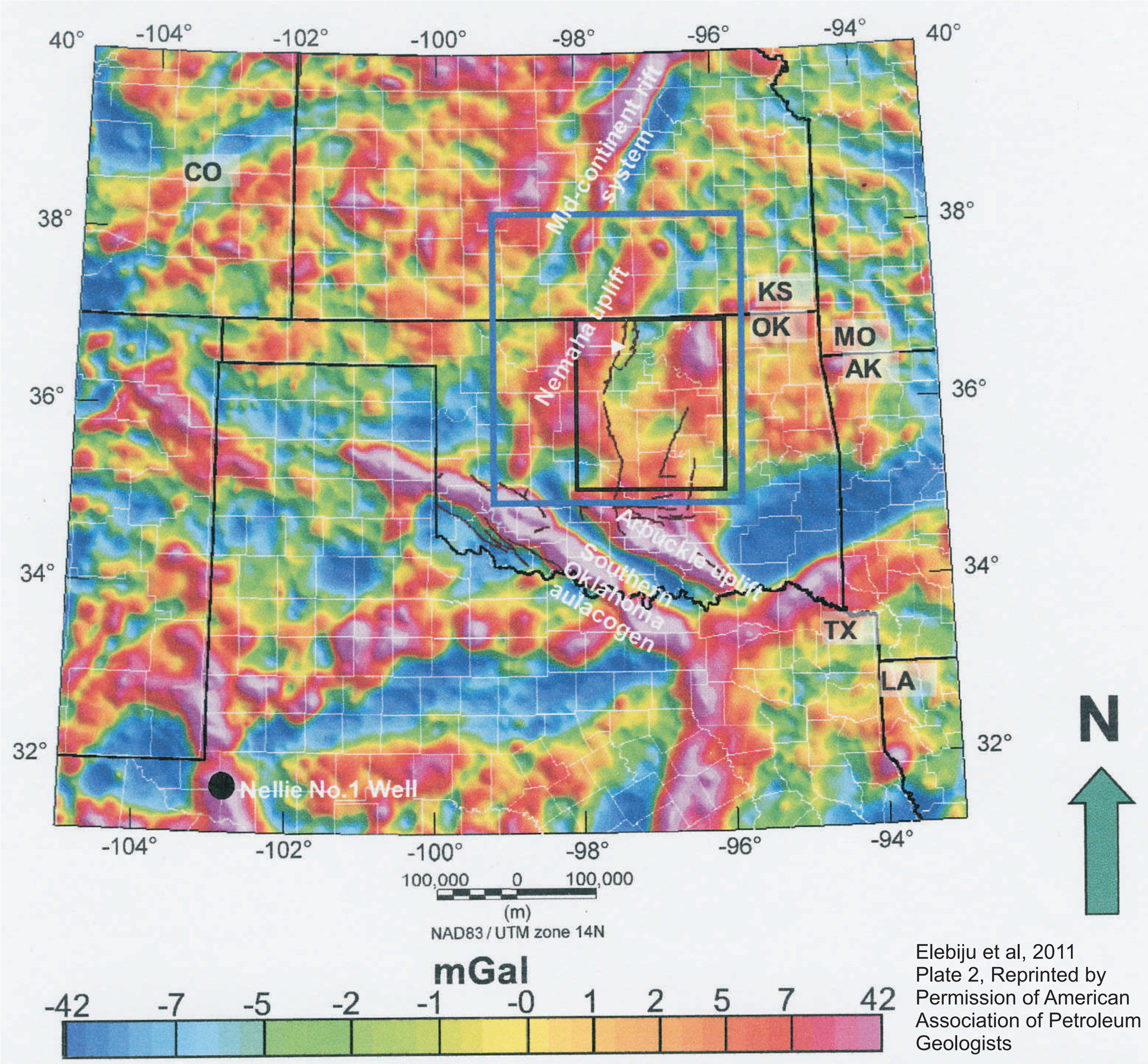

3300
Dolo
Sd
100 OHMS RESISTIVITY
POSSIBLE OIL/GAS / WATER CONTACT

Fig 33



40°
-104°
-102°
-100°
-98°
-96°
-94°
40°
CO
Mid-continent rift system
38°
38°
KS
OK
MO
AK
Nemaha uplift
36°
36°
Arbuckle uplift
Southern Oklahoma aulacogen
34°
34°
TX
LA
32°
32°
Nellie No.1 Well
-104°
-102°
-100°
-98°
-96°
-94°
100,000
0
100,000
(m)
NAD83 / UTM zone 14N
N
mGal
-42
-7
-5
-2
-1
-0
1
2
5
7
42
Elebiju et al, 2011
Plate 2, Reprinted by
Permission of American
Association of Petroleum
Geologists

Fig 34

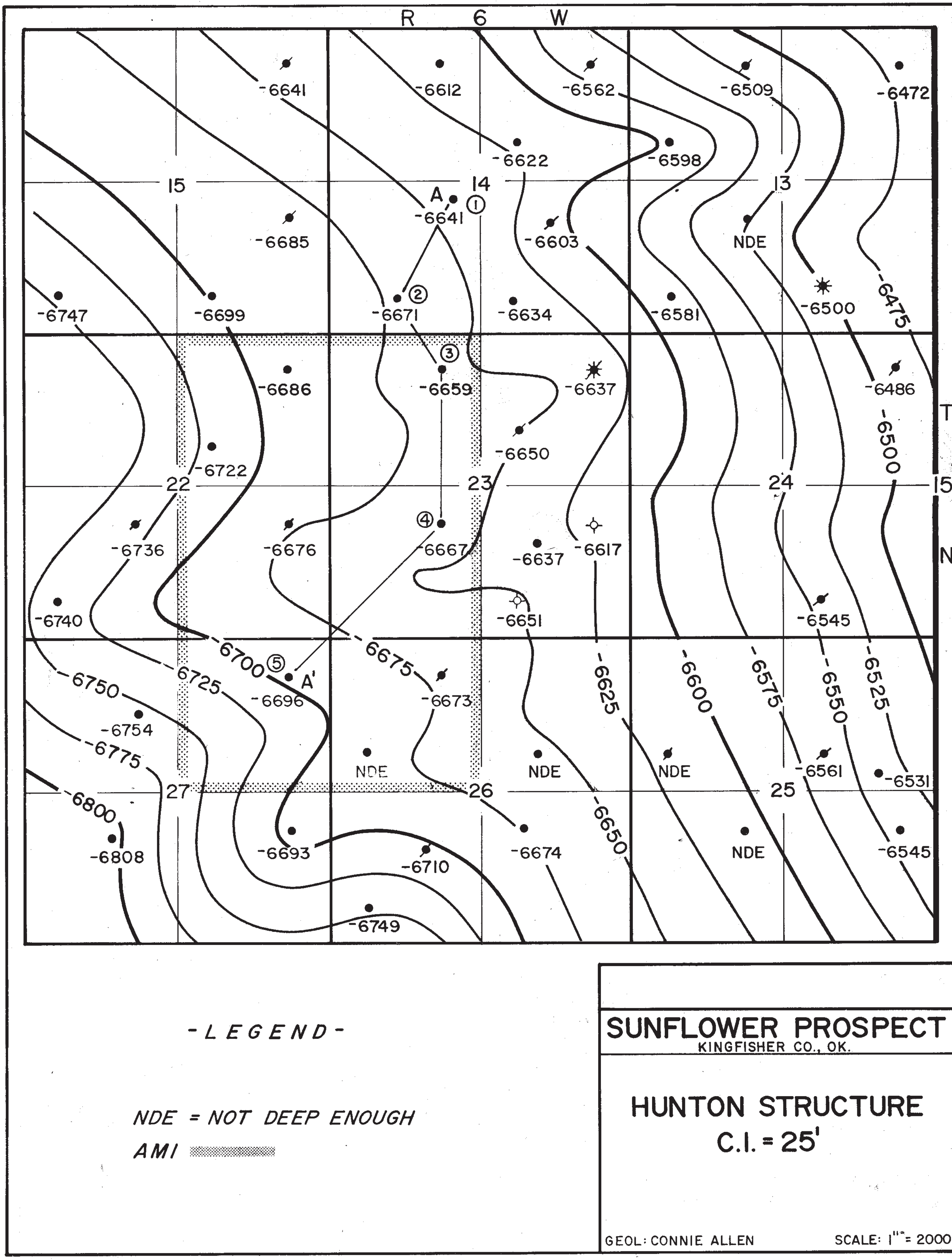
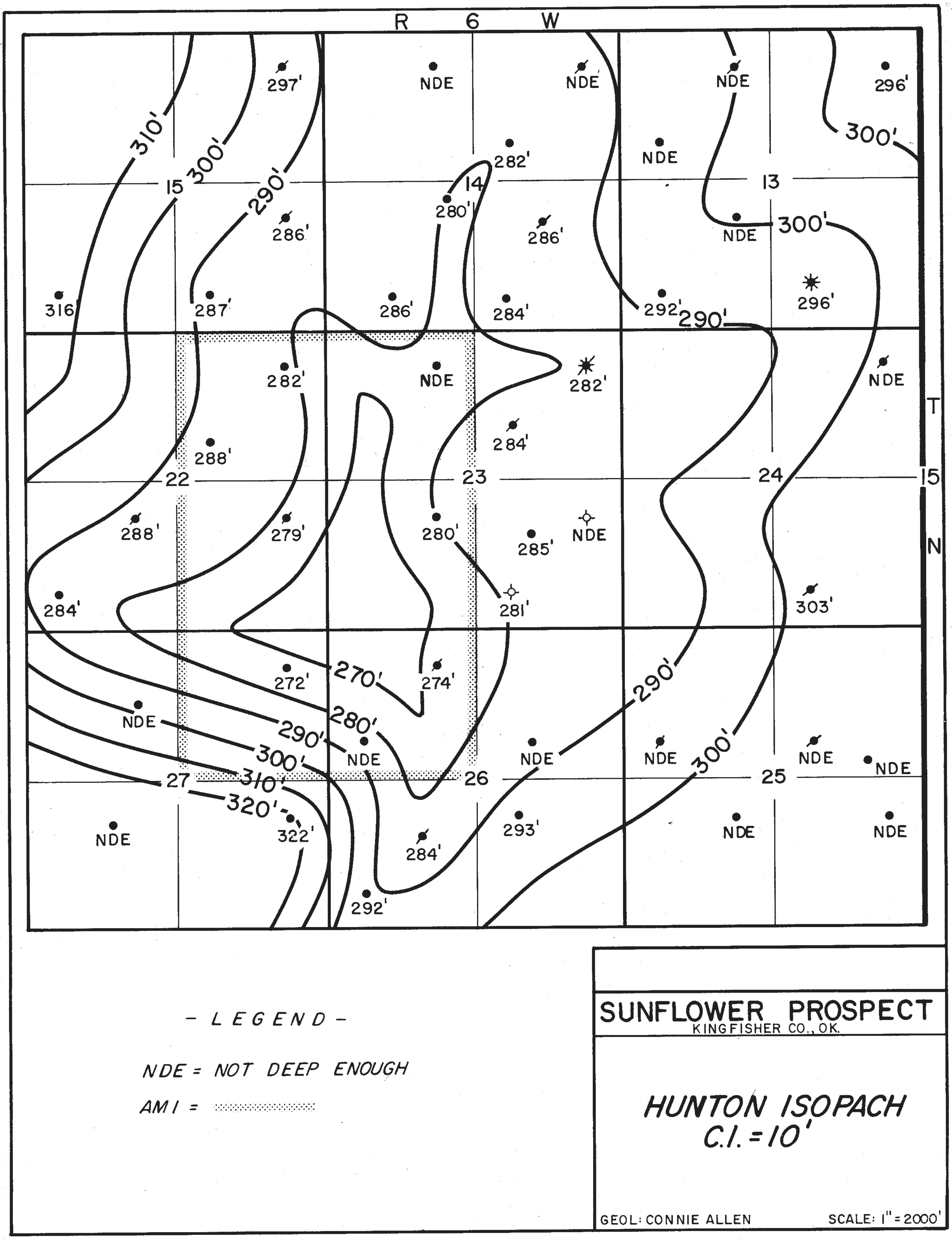

R 6 W
T 15 N
15
14
13
22
23
24
27
26
25
A
A'
-6641
-6612
-6562
-6509
-6472
-6622
-6598
-6641
-6685
-6603
NDE
-6747
-6699
-6671
-6634
-6581
-6500
-6686
-6659
-6637
-6486
-6722
-6650
-6736
-6676
-6667
-6637
-6617
-6740
-6651
-6545
-6696
-6673
-6754
NDE
NDE
NDE
-6561
-6531
-6808
-6693
-6710
-6674
NDE
-6545
-6749
-6475
-6500
-6700
-6675
-6750
-6725
-6775
-6800
-6625
-6600
-6575
-6550
-6525
-6650
- LEGEND -
NDE = NOT DEEP ENOUGH
AMI
SUNFLOWER PROSPECT
KINGFISHER CO., OK.
HUNTON STRUCTURE
C.I. = 25'
GEOL: CONNIE ALLEN
SCALE: 1" = 2000'

Fig 35



R 6 W
T 15 N
15
14
13
22
23
24
27
26
25
310'
300'
290'
280'
270'
320'
297'
NDE
296'
282'
280'
286'
316'
287'
284'
292'
296'
282'
288'
284'
279'
285'
281'
303'
272'
274'
322'
284'
293'
292'
- LEGEND -
NDE = NOT DEEP ENOUGH
AMI =
SUNFLOWER PROSPECT
KINGFISHER CO., OK.
HUNTON ISOPACH
C.I. = 10'
GEOL: CONNIE ALLEN
SCALE: 1" = 2000'

Fig 36

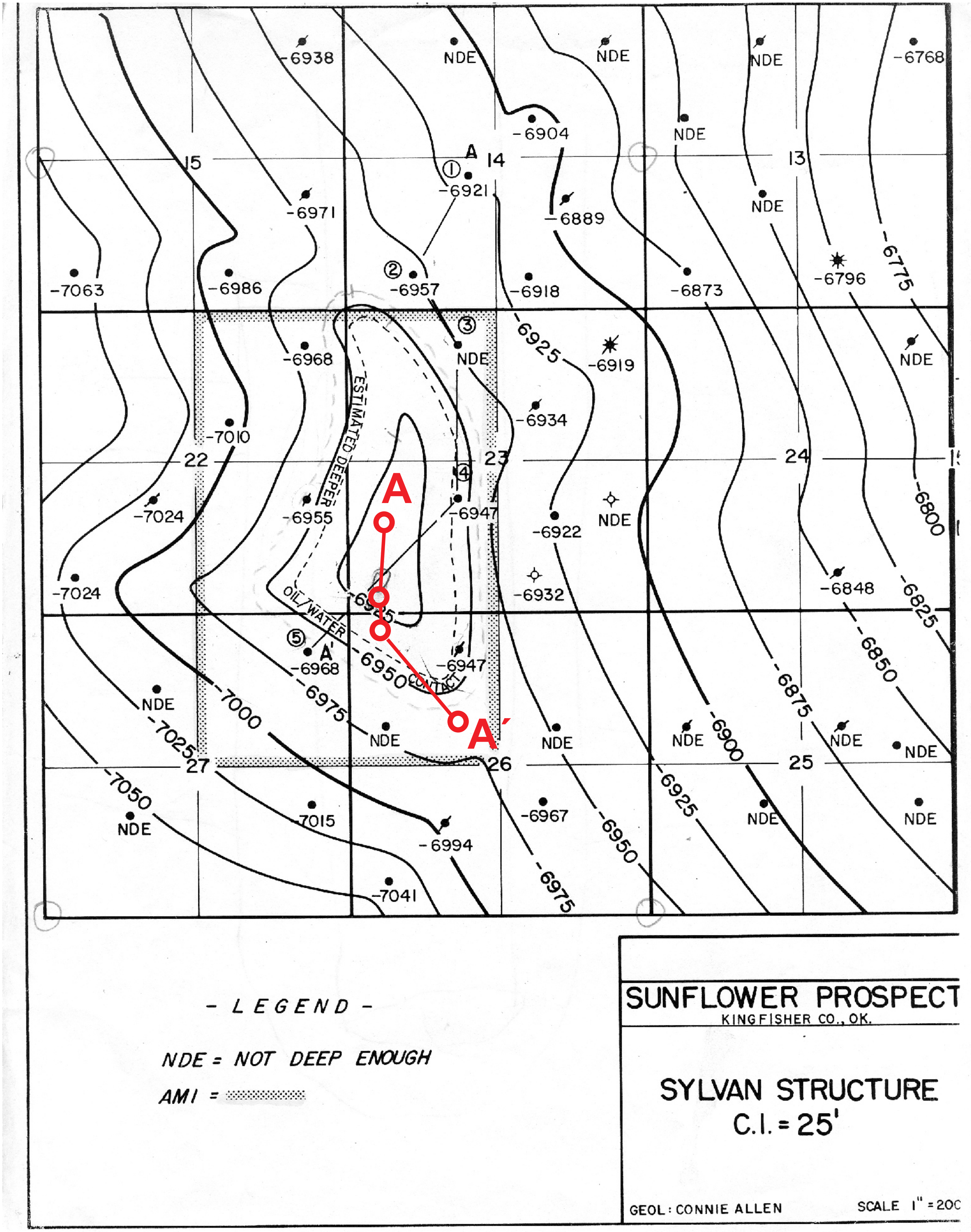

A
A´
ESTIMATED DEEPER
OIL/WATER CONTACT
- LEGEND -
NDE = NOT DEEP ENOUGH
AMI =
SUNFLOWER PROSPECT
KINGFISHER CO., OK.
SYLVAN STRUCTURE
C.I. = 25'
GEOL: CONNIE ALLEN
SCALE 1" = 200

Fig 37

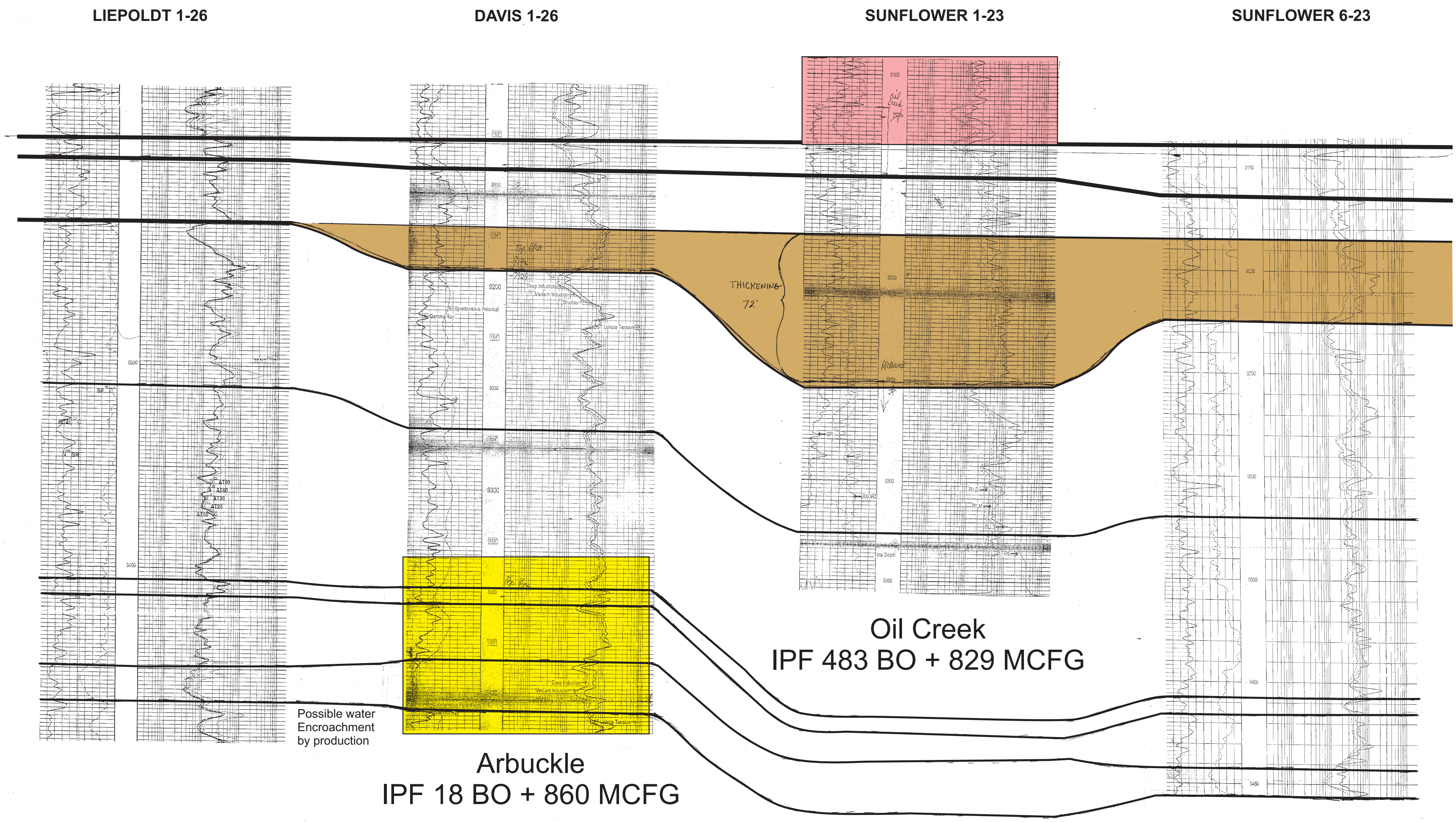

LIEPOLDT 1-26
DAVIS 1-26
SUNFLOWER 1-23
SUNFLOWER 6-23
THICKENING
72'
Oil Creek
IPF 483 BO + 829 MCFG
Possible water
Encroachment
by production
Arbuckle
IPF 18 BO + 860 MCFG

Fig. 38

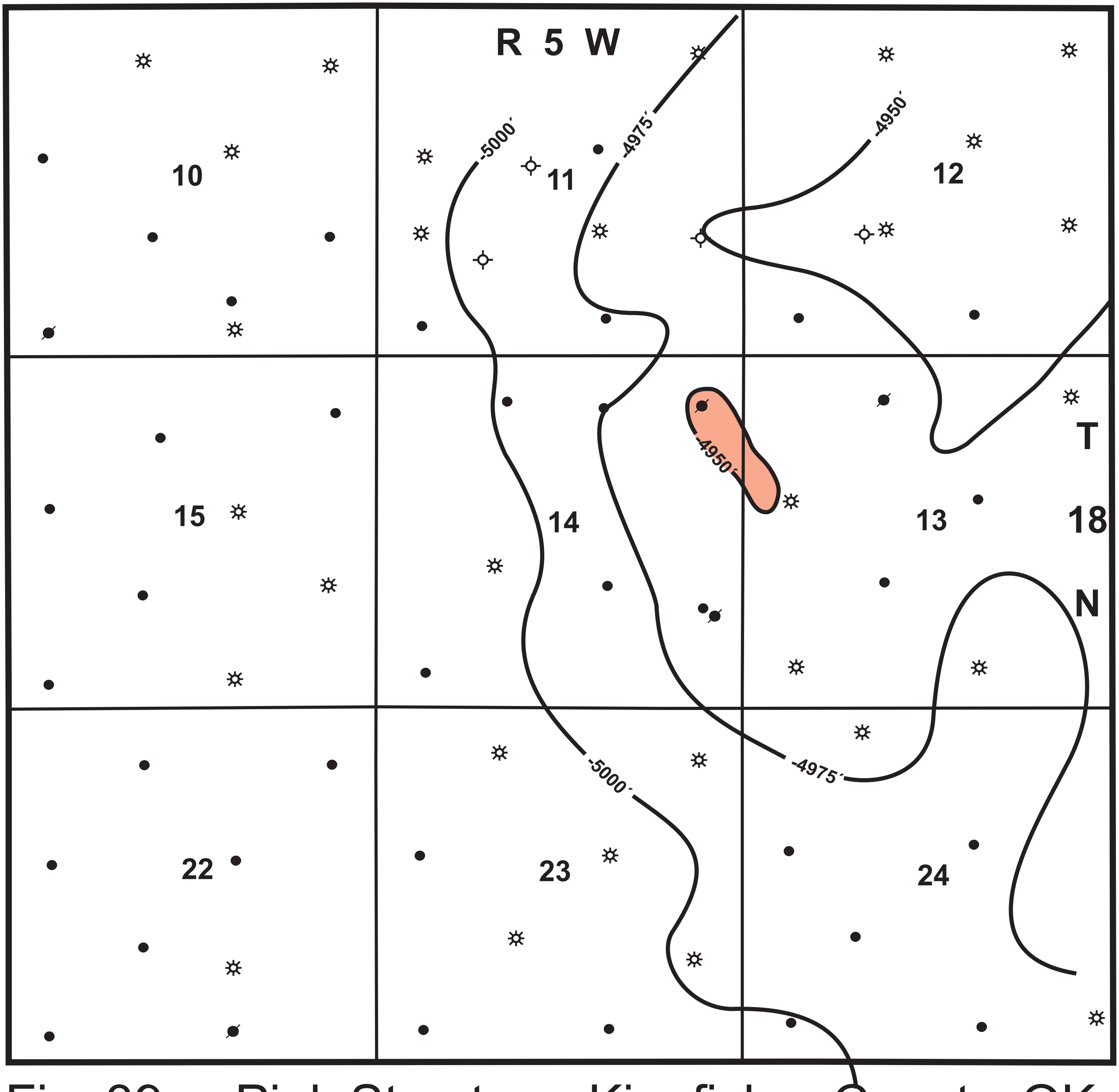


Fig. 39 Pink Structure, Kingfisher County, OK

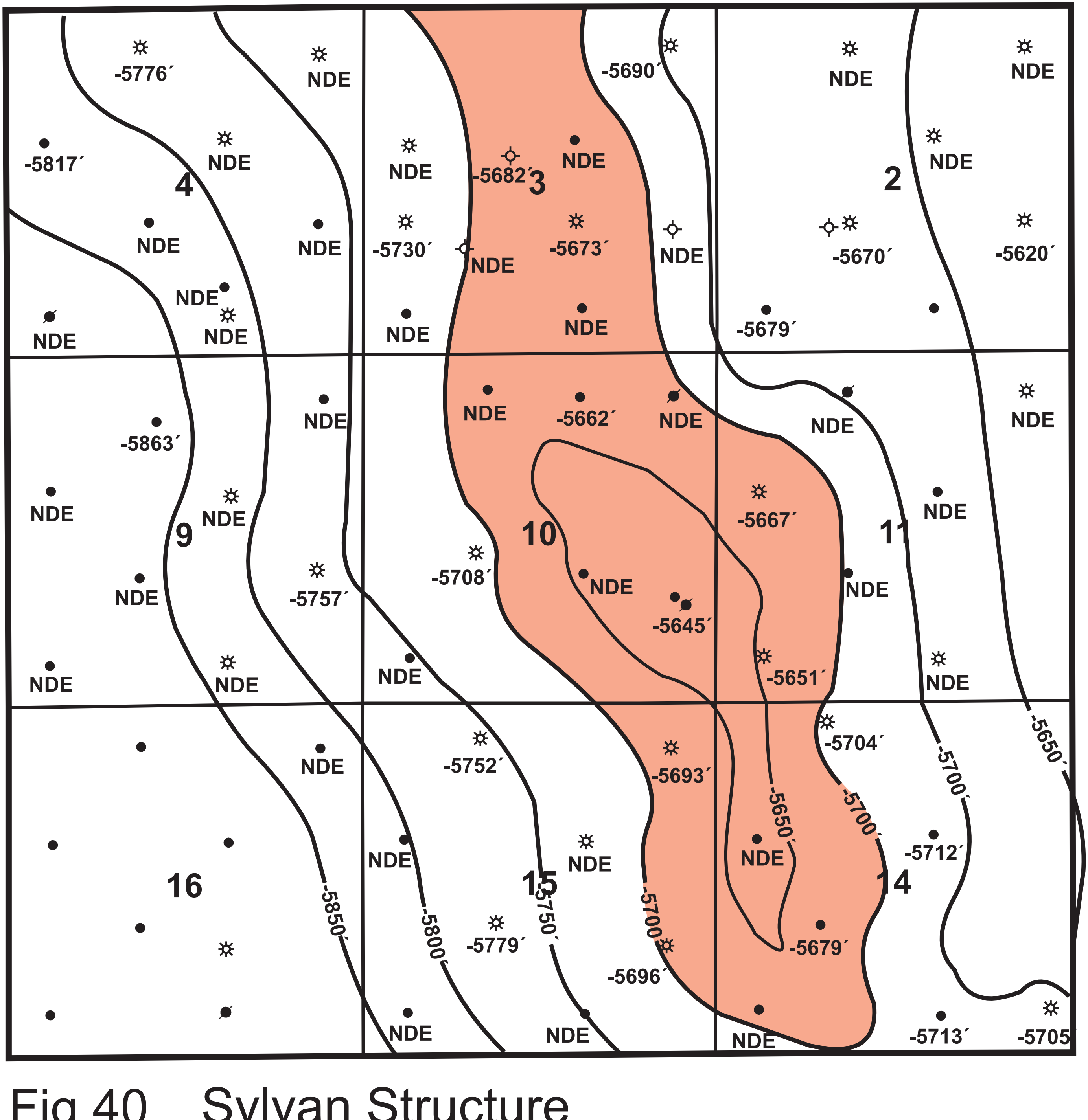


Fig 40 Sylvan Structure

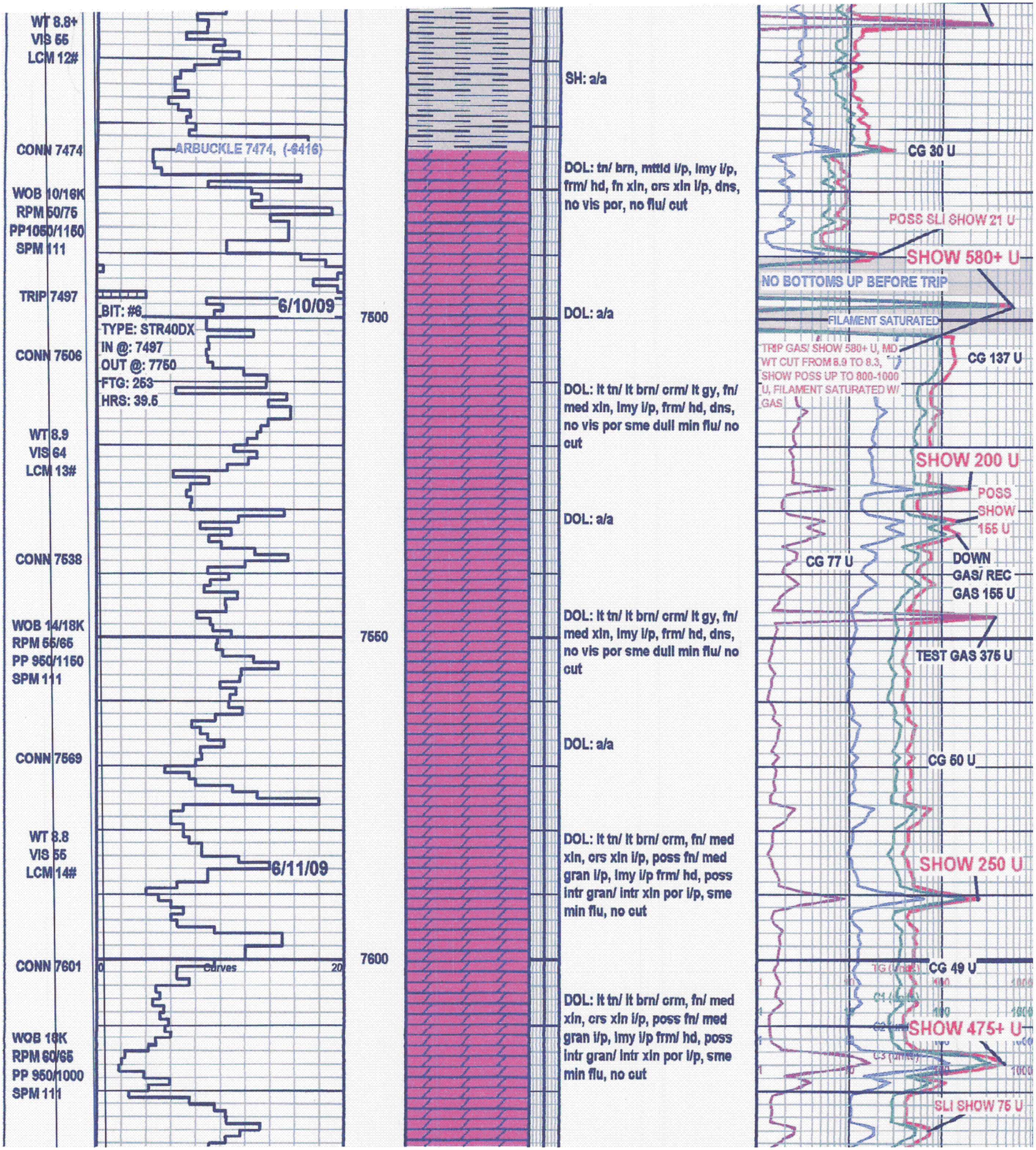
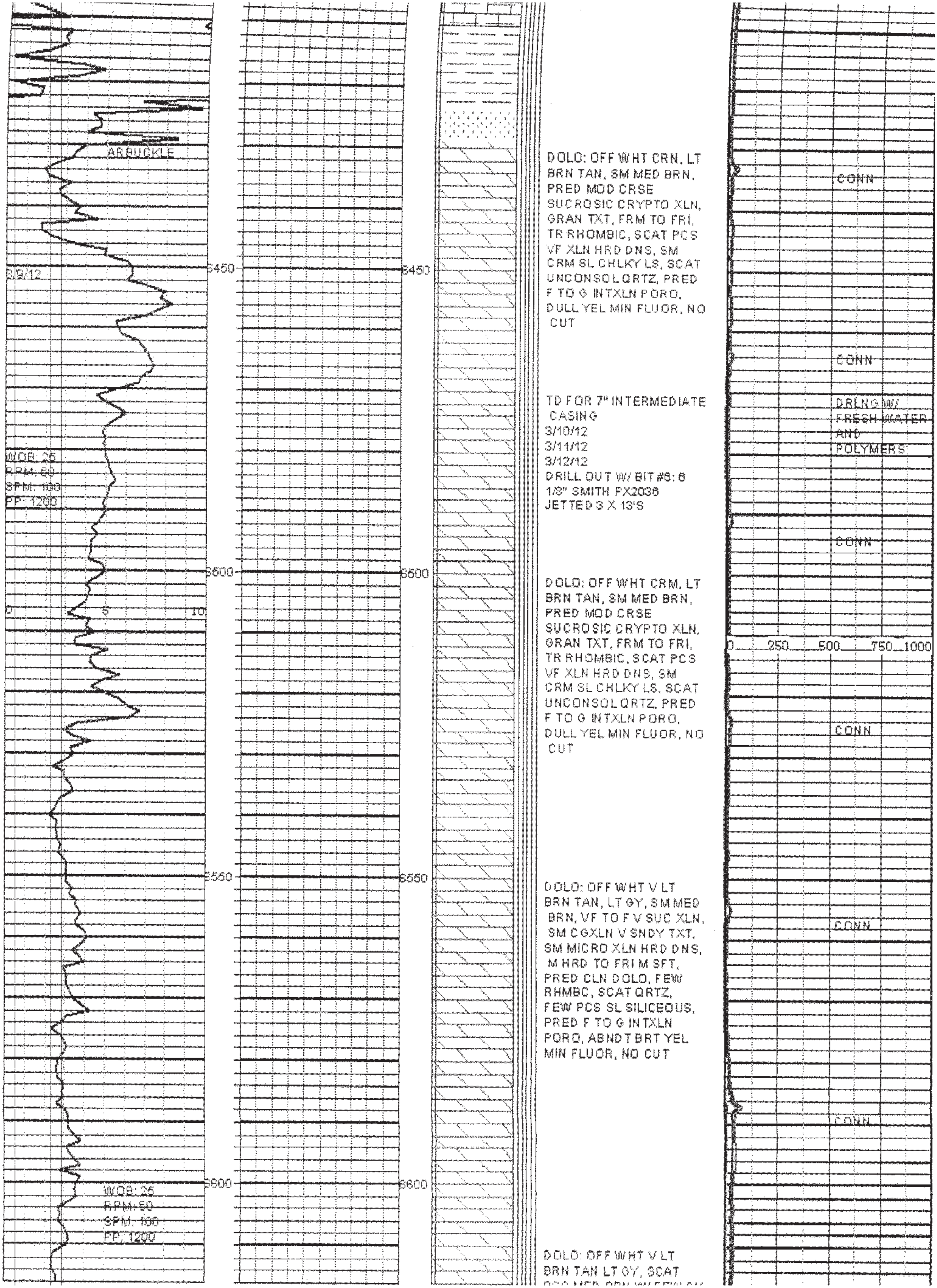
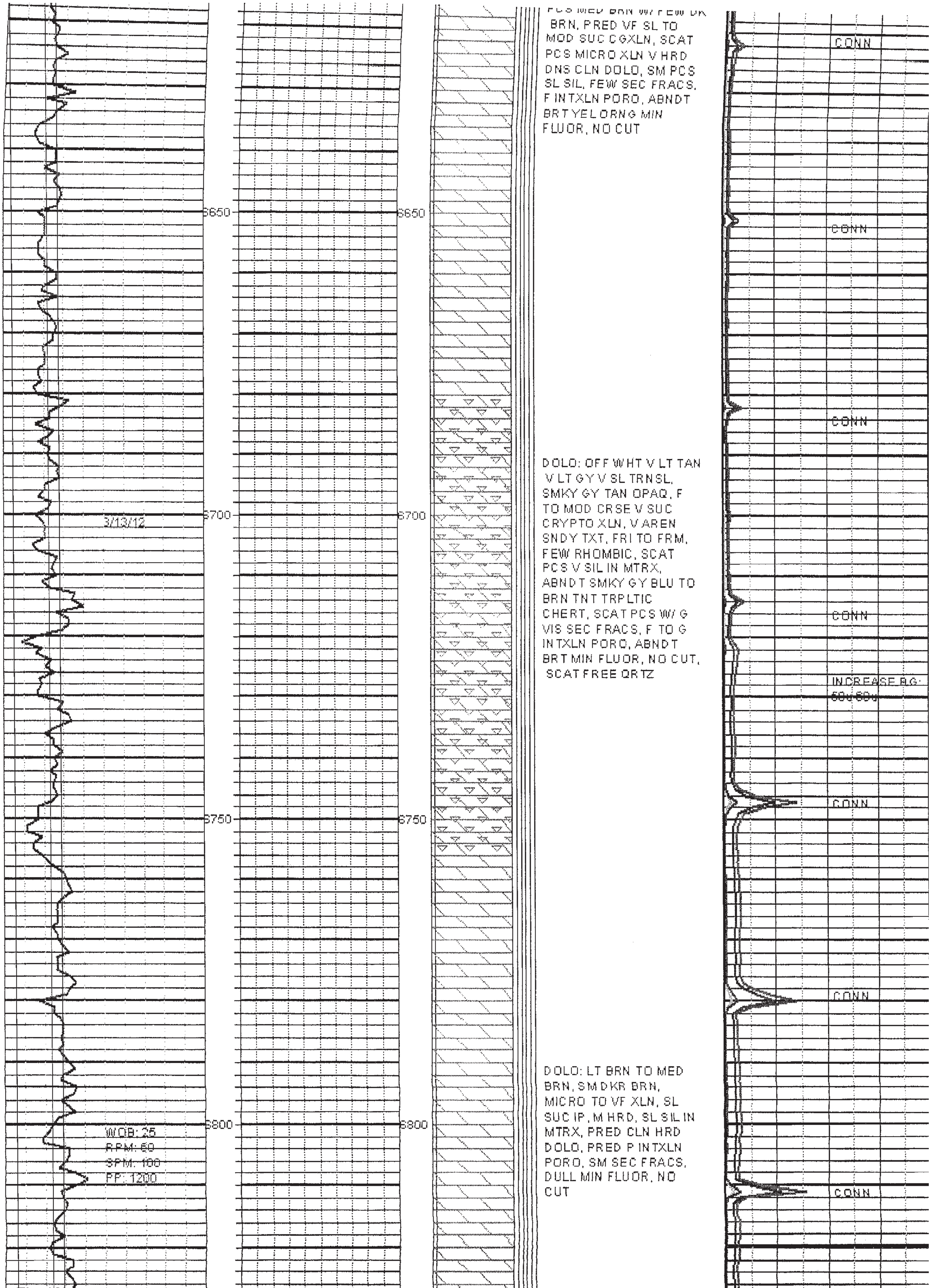

WT 8.8+
VIS 55
LCM 12#
CONN 7474
ARBUCKLE 7474, (-6416)
WOB 10/16K
RPM 50/75
PP1050/1150
SPM 111
TRIP 7497
6/10/09
BIT: #6
TYPE: STR40DX
IN @: 7497
OUT @: 7750
FTG: 253
HRS: 39.5
CONN 7506
WT 8.9
VIS 64
LCM 13#
CONN 7538
WOB 14/18K
RPM 55/65
PP 950/1150
SPM 111
CONN 7569
WT 8.8
VIS 55
LCM 14#
6/11/09
CONN 7601
WOB 16K
RPM 60/65
PP 950/1000
SPM 111
Curves
7500
7550
7600
SH: a/a
DOL: tn/ brn, mttld i/p, lmy i/p, frm/ hd, fn xln, crs xln i/p, dns, no vis por, no flu/ cut
DOL: a/a
DOL: lt tn/ lt brn/ crm/ lt gy, fn/ med xln, lmy i/p, frm/ hd, dns, no vis por sme dull min flu/ no cut
DOL: a/a
DOL: lt tn/ lt brn/ crm/ lt gy, fn/ med xln, lmy i/p, frm/ hd, dns, no vis por sme dull min flu/ no cut
DOL: a/a
DOL: lt tn/ lt brn/ crm, fn/ med xln, crs xln i/p, poss fn/ med gran i/p, lmy i/p frm/ hd, poss intr gran/ intr xln por i/p, sme min flu, no cut
DOL: lt tn/ lt brn/ crm, fn/ med xln, crs xln i/p, poss fn/ med gran i/p, lmy i/p frm/ hd, poss intr gran/ intr xln por i/p, sme min flu, no cut
CG 30 U
POSS SLI SHOW 21 U
SHOW 580+ U
NO BOTTOMS UP BEFORE TRIP
FILAMENT SATURATED
TRIP GAS/ SHOW 580+ U, MD WT CUT FROM 8.9 TO 8.3, SHOW POSS UP TO 800-1000 U, FILAMENT SATURATED W/ GAS
CG 137 U
SHOW 200 U
POSS SHOW 155 U
CG 77 U
DOWN GAS/ REC GAS 155 U
TEST GAS 375 U
CG 50 U
SHOW 250 U
CG 49 U
SHOW 475+ U
SLI SHOW 75 U

Fig 41



ARBUCKLE
3/9/12
6450
6500
6550
6600
0
5
10
WOB: 25
RPM: 50
SPM: 100
PP: 1200
DOLO: OFF WHT CRN, LT BRN TAN, SM MED BRN, PRED MOD CRSE SUCROSIC CRYPTO XLN, GRAN TXT, FRM TO FRI, TR RHOMBIC, SCAT PCS VF XLN HRD DNS, SM CRM SL CHLKY LS, SCAT UNCONSOL QRTZ, PRED F TO G INTXLN PORO, DULL YEL MIN FLUOR, NO CUT
TD FOR 7" INTERMEDIATE CASING
3/10/12
3/11/12
3/12/12
DRILL OUT W/ BIT #6: 6 1/8" SMITH PX2036 JETTED 3 X 13'S
DOLO: OFF WHT CRM, LT BRN TAN, SM MED BRN, PRED MOD CRSE SUCROSIC CRYPTO XLN, GRAN TXT, FRM TO FRI, TR RHOMBIC, SCAT PCS VF XLN HRD DNS, SM CRM SL CHLKY LS, SCAT UNCONSOL QRTZ, PRED F TO G INTXLN PORO, DULL YEL MIN FLUOR, NO CUT
DOLO: OFF WHT V LT BRN TAN, LT GY, SM MED BRN, VF TO F V SUC XLN, SM CGXLN V SNDY TXT, SM MICRO XLN HRD DNS, M HRD TO FRI M SFT, PRED CLN DOLO, FEW RHMBC, SCAT QRTZ, FEW PCS SL SILICEOUS, PRED F TO G INTXLN PORO, ABNDT BRT YEL MIN FLUOR, NO CUT
DOLO: OFF WHT V LT BRN TAN LT GY, SCAT
CONN
CONN
DRLNG W/ FRESH WATER AND POLYMERS
CONN
0
250
500
750
1000
CONN
CONN
CONN

Fig 42a


BRN, PRED VF SL TO MOD SUC CGXLN, SCAT PCS MICRO XLN V HRD DNS CLN DOLO, SM PCS SL SIL, FEW SEC FRACS, F INTXLN PORO, ABNDT BRT YEL ORNG MIN FLUOR, NO CUT
6650
6650
CONN
CONN
DOLO: OFF WHT V LT TAN V LT GY V SL TRNSL, SMKY GY TAN OPAQ, F TO MOD CRSE V SUC CRYPTO XLN, V AREN SNDY TXT, FRI TO FRM, FEW RHOMBIC, SCAT PCS V SIL IN MTRX, ABNDT SMKY GY BLU TO BRN TNT TRPLTIC CHERT, SCAT PCS W/ G VIS SEC FRACS, F TO G INTXLN PORO, ABNDT BRT MIN FLUOR, NO CUT, SCAT FREE QRTZ
3/13/12
6700
6700
CONN
INCREASE BG:
CONN
6750
6750
CONN
DOLO: LT BRN TO MED BRN, SM DKR BRN, MICRO TO VF XLN, SL SUC IP, M HRD, SL SIL IN MTRX, PRED CLN HRD DOLO, PRED P INTXLN PORO, SM SEC FRACS, DULL MIN FLUOR, NO CUT
6800
6800
WOB: 25
RPM: 60
SPM: 100
PP: 1200
CONN
Fig 42b

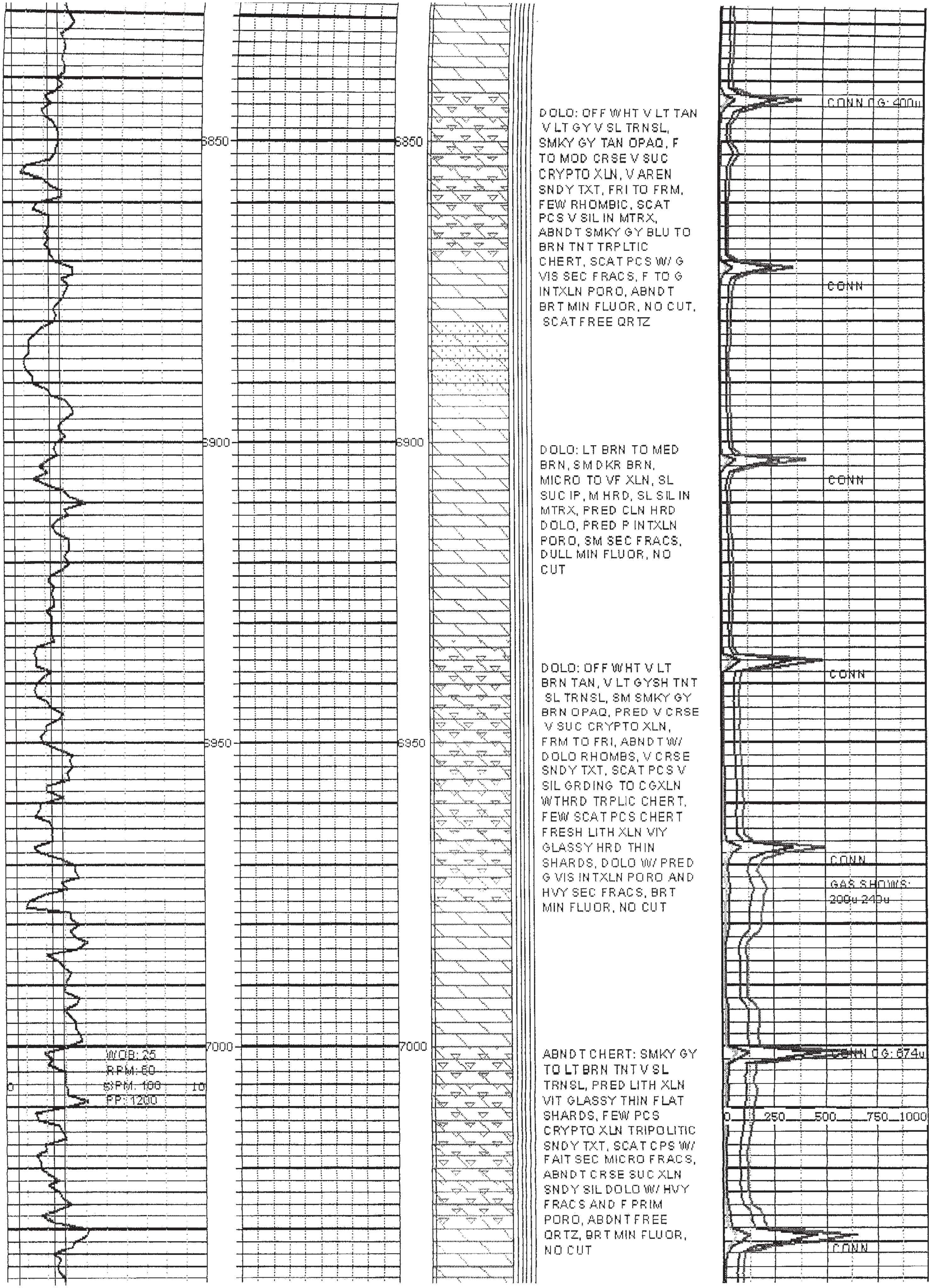
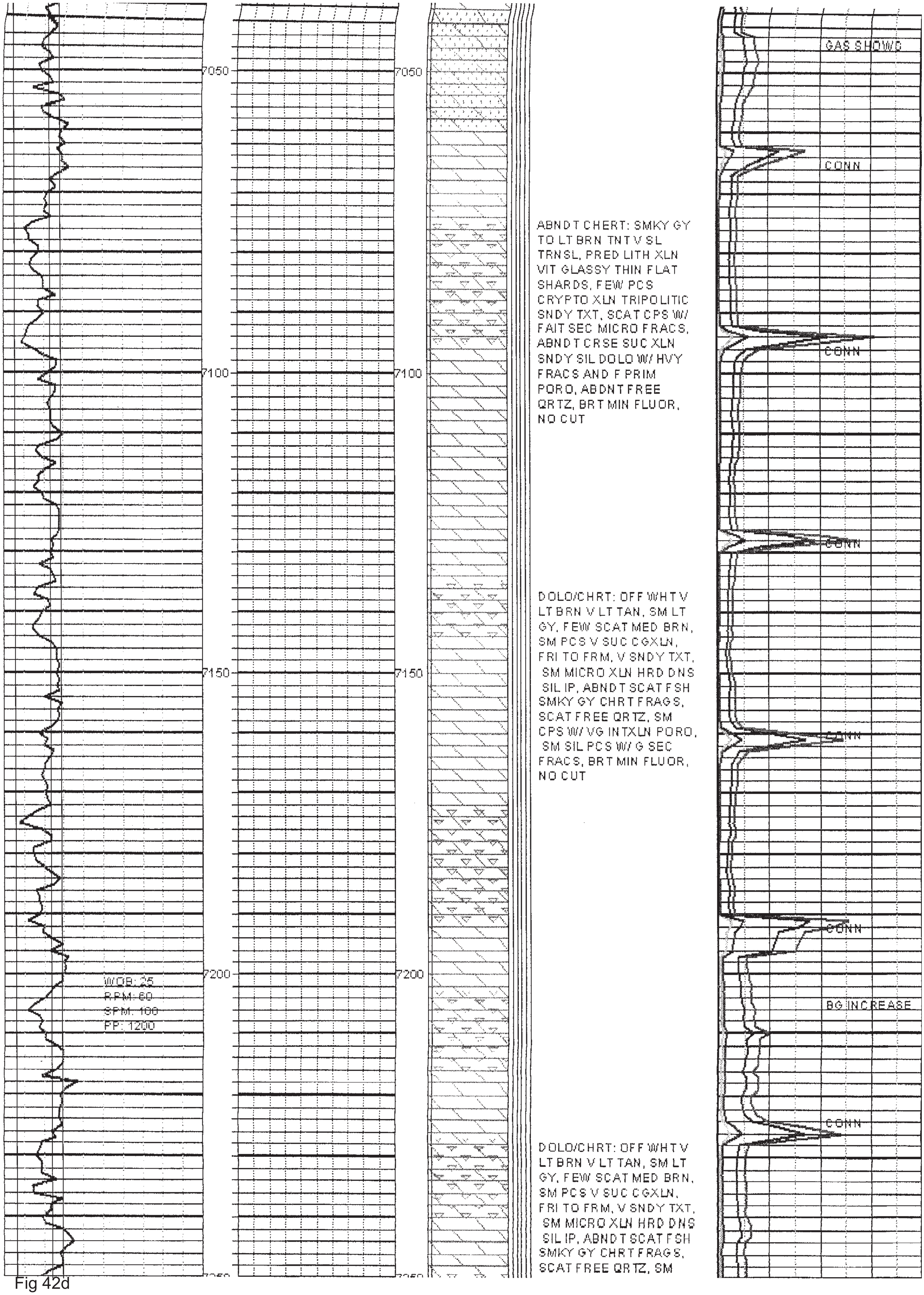

6850
6900
6950
7000
DOLO: OFF WHT V LT TAN V LT GY V SL TRNSL, SMKY GY TAN OPAQ, F TO MOD CRSE V SUC CRYPTO XLN, V AREN SNDY TXT, FRI TO FRM, FEW RHOMBIC, SCAT PCS V SIL IN MTRX, ABNDT SMKY GY BLU TO BRN TNT TRPLTIC CHERT, SCAT PCS W/ G VIS SEC FRACS, F TO G INTXLN PORO, ABNDT BRT MIN FLUOR, NO CUT, SCAT FREE QRTZ
DOLO: LT BRN TO MED BRN, SM DKR BRN, MICRO TO VF XLN, SL SUC IP, M HRD, SL SIL IN MTRX, PRED CLN HRD DOLO, PRED P INTXLN PORO, SM SEC FRACS, DULL MIN FLUOR, NO CUT
DOLO: OFF WHT V LT BRN TAN, V LT GYSH TNT SL TRNSL, SM SMKY GY BRN OPAQ, PRED V CRSE V SUC CRYPTO XLN, FRM TO FRI, ABNDT W/ DOLO RHOMBS, V CRSE SNDY TXT, SCAT PCS V SIL GRDING TO CGXLN WTHRD TRPLIC CHERT, FEW SCAT PCS CHERT FRESH LITH XLN VIY GLASSY HRD THIN SHARDS, DOLO W/ PRED G VIS INTXLN PORO AND HVY SEC FRACS, BRT MIN FLUOR, NO CUT
ABNDT CHERT: SMKY GY TO LT BRN TNT V SL TRNSL, PRED LITH XLN VIT GLASSY THIN FLAT SHARDS, FEW PCS CRYPTO XLN TRIPOLITIC SNDY TXT, SCAT CPS W/ FAIT SEC MICRO FRACS, ABNDT CRSE SUC XLN SNDY SIL DOLO W/ HVY FRACS AND F PRIM PORO, ABDNT FREE QRTZ, BRT MIN FLUOR, NO CUT
WOB: 25
RPM: 60
SPM: 100
PP: 1200
0
10
CONN CG: 400u
CONN
CONN
CONN
CONN
GAS SHOWS: 200u 240u
CONN CG: 674u
0 250 500 750 1000
CONN

Fig 42c


GAS SHOWS
7050
7050
CONN
ABNDT CHERT: SMKY GY TO LT BRN TNT V SL TRNSL, PRED LITH XLN VIT GLASSY THIN FLAT SHARDS, FEW PCS CRYPTO XLN TRIPOLITIC SNDY TXT, SCAT CPS W/ FAIT SEC MICRO FRACS, ABNDT CRSE SUC XLN SNDY SIL DOLO W/ HVY FRACS AND F PRIM PORO, ABDNT FREE QRTZ, BRT MIN FLUOR, NO CUT
CONN
7100
7100
CONN
DOLO/CHRT: OFF WHT V LT BRN V LT TAN, SM LT GY, FEW SCAT MED BRN, SM PCS V SUC CGXLN, FRI TO FRM, V SNDY TXT, SM MICRO XLN HRD DNS SIL IP, ABNDT SCAT FSH SMKY GY CHRT FRAGS, SCAT FREE QRTZ, SM CPS W/ VG INTXLN PORO, SM SIL PCS W/ G SEC FRACS, BRT MIN FLUOR, NO CUT
7150
7150
CONN
CONN
7200
7200
WOB: 25
RPM: 60
SPM: 100
PP: 1200
BG INCREASE
CONN
DOLO/CHRT: OFF WHT V LT BRN V LT TAN, SM LT GY, FEW SCAT MED BRN, SM PCS V SUC CGXLN, FRI TO FRM, V SNDY TXT, SM MICRO XLN HRD DNS SIL IP, ABNDT SCAT FSH SMKY GY CHRT FRAGS, SCAT FREE QRTZ, SM
Fig 42d

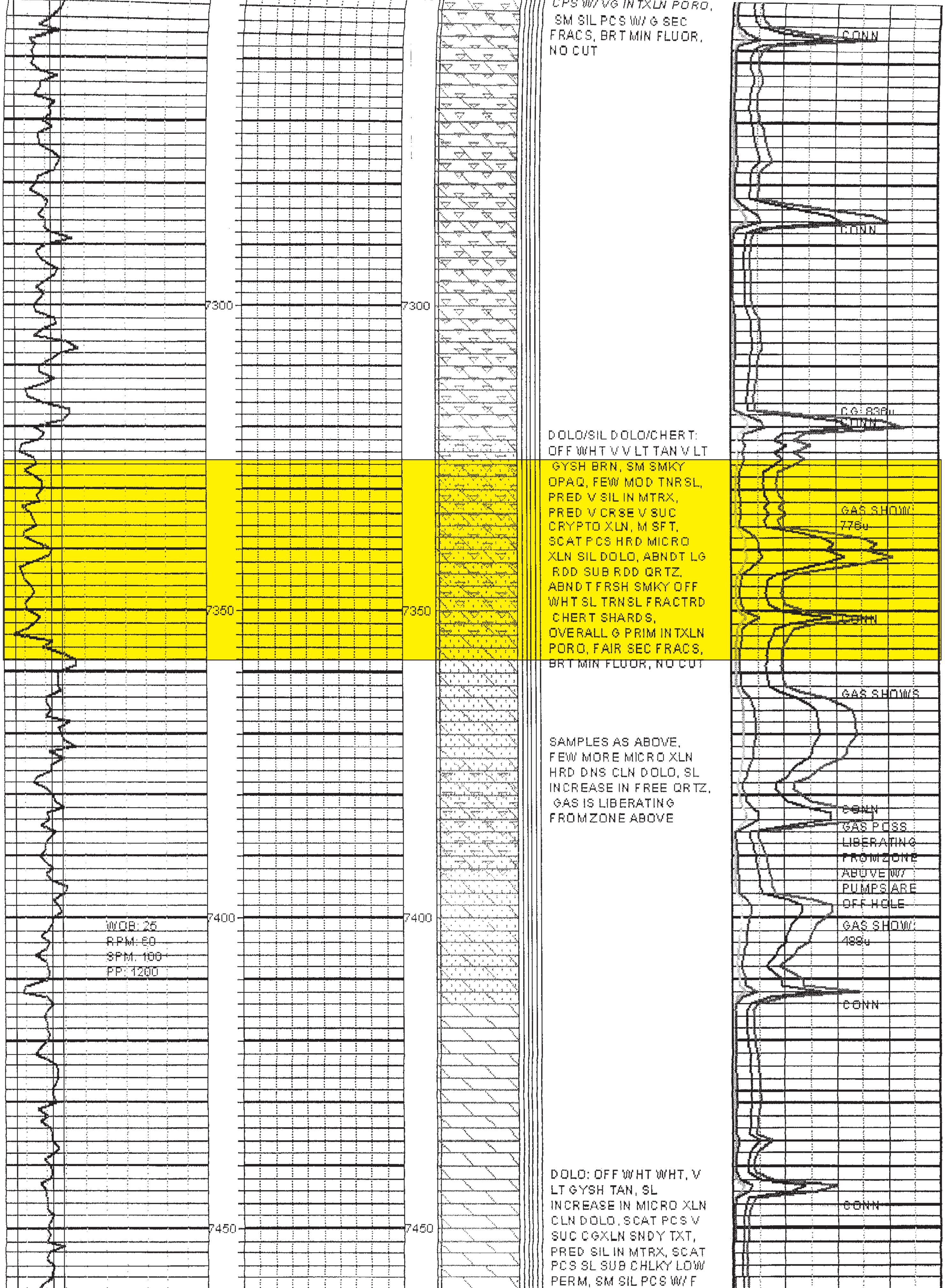
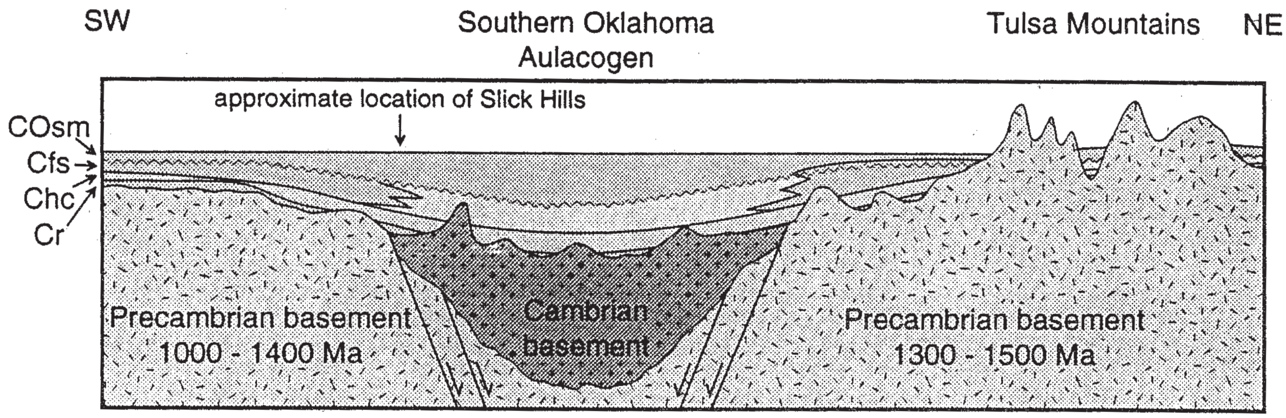
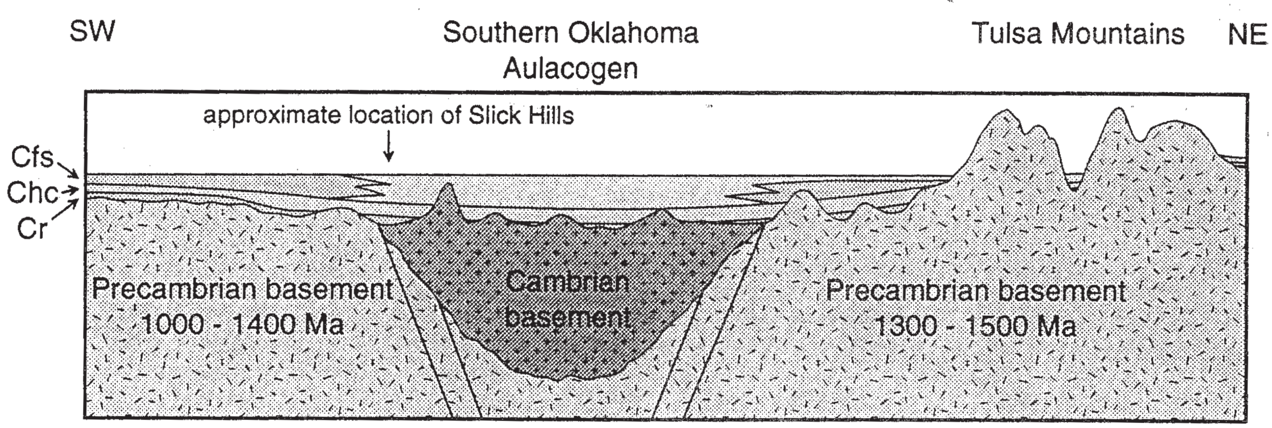


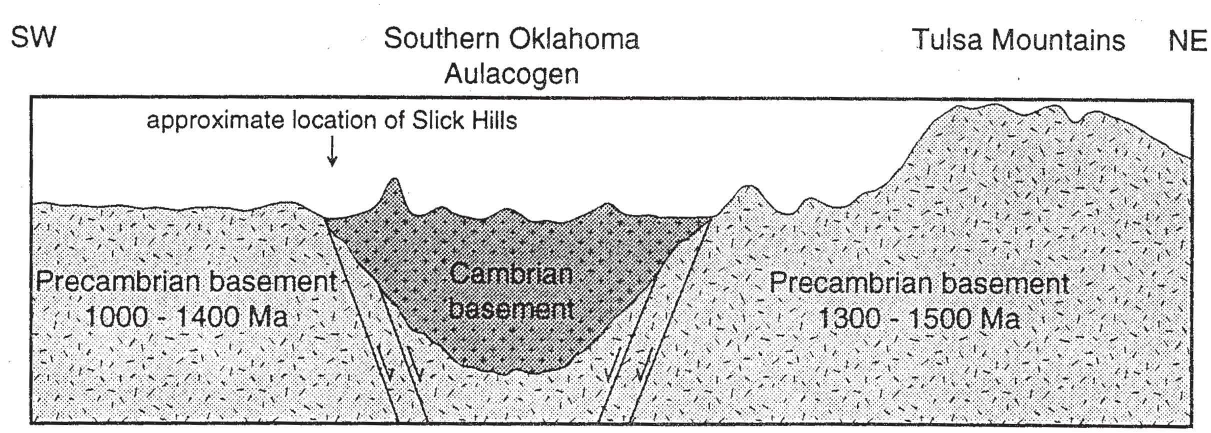
Fig 42e Excellent Gas Show base of Arbuckle



STAGE III - Reactivation of basin margin faults and deposition of Cambro-Ordovician Signal Mountain Formation in deeper waters? (Trempealeauan - Canadian)



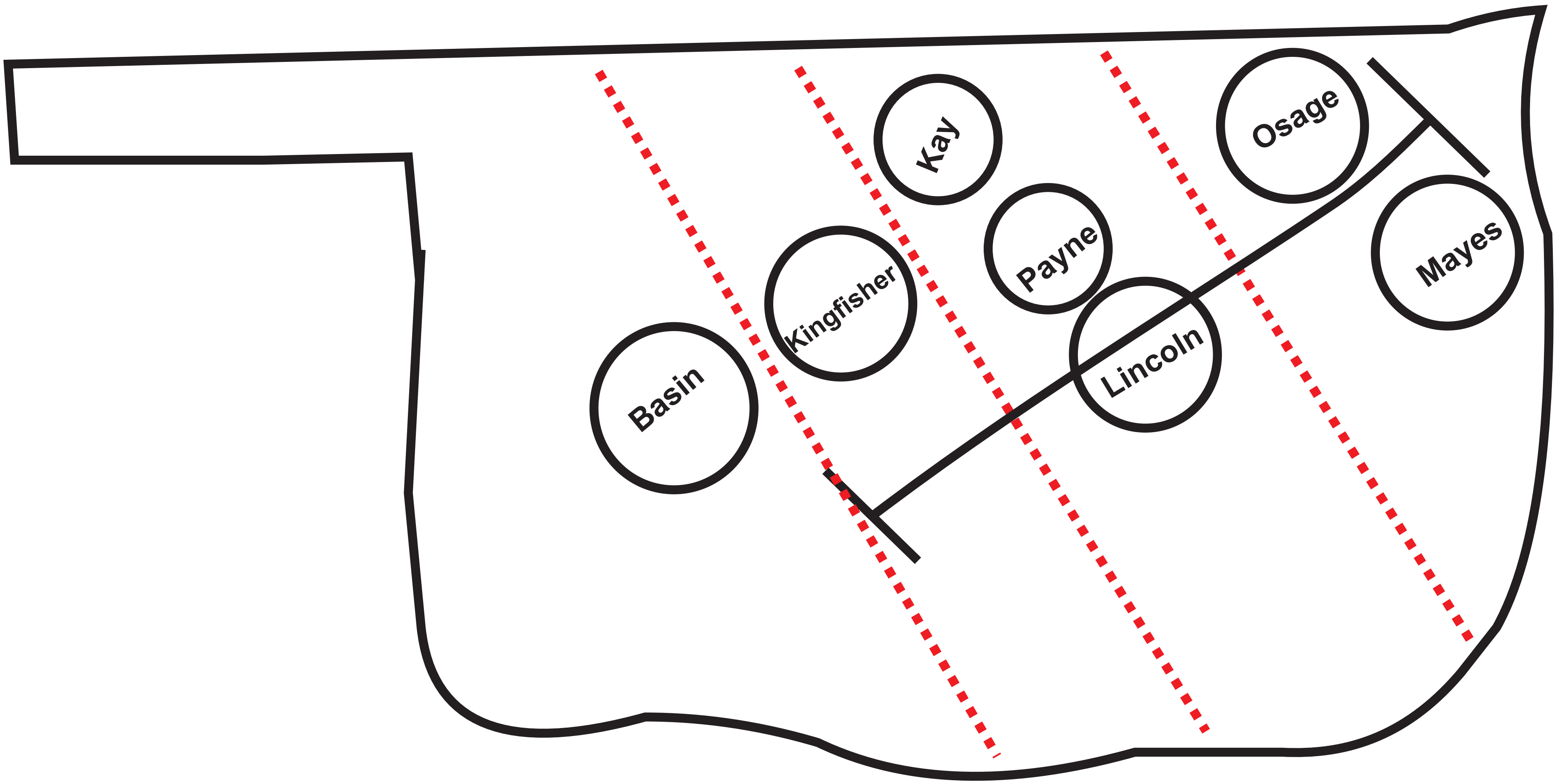
STAGE II - Deposition of Cambrian Timbered Hills Group and Cambrian Fort Sill Formation. (Franconian)



STAGE I - Development of rift basin. (Middle Cambrian)

Hosey and Donovan, 2000
Fig 13, Reprinted by
Permission of Oklahoma
Geological Society

Fig 43



AREAS EXIBITING ARBUCKLE THICKS AND THINS

Fig 44

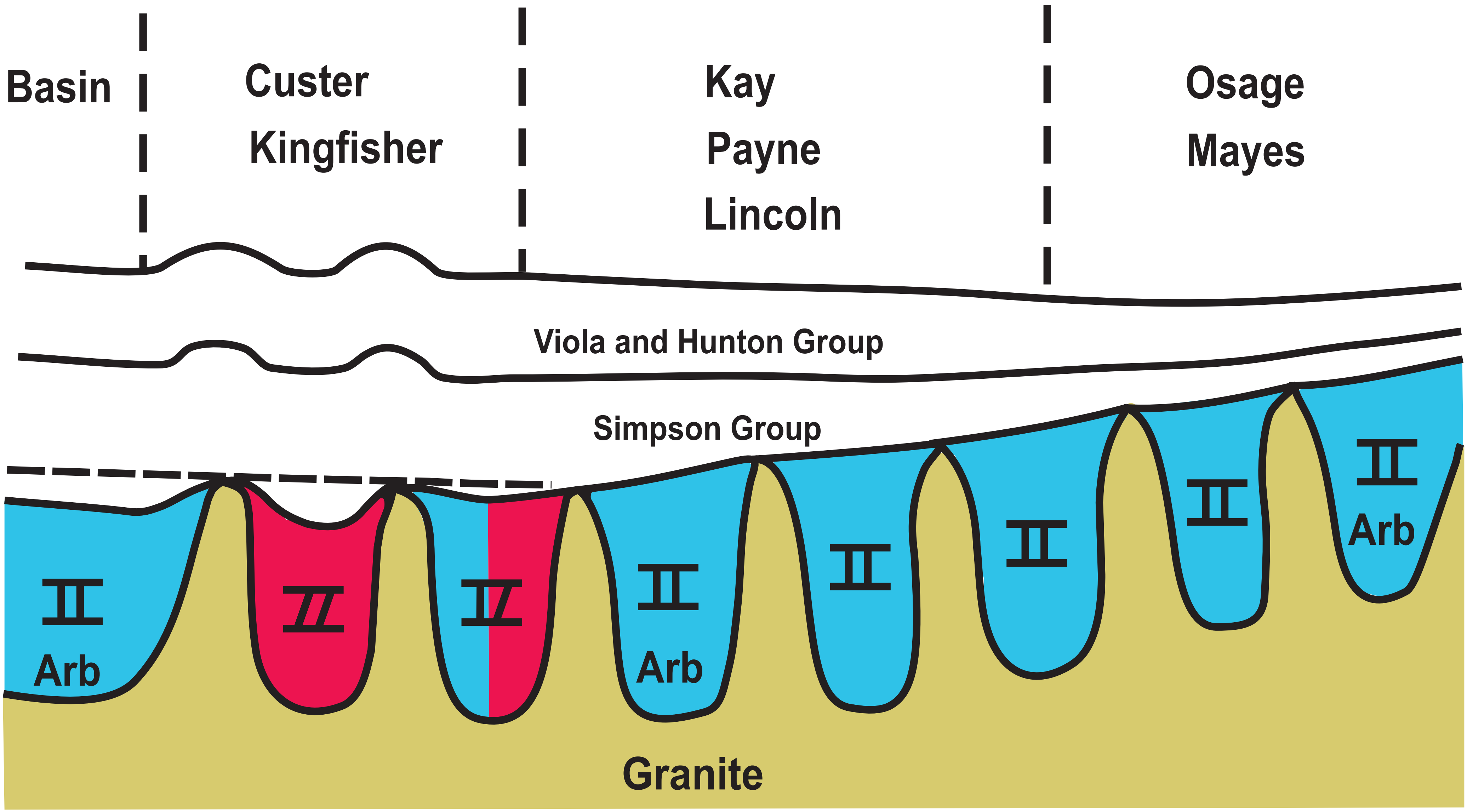
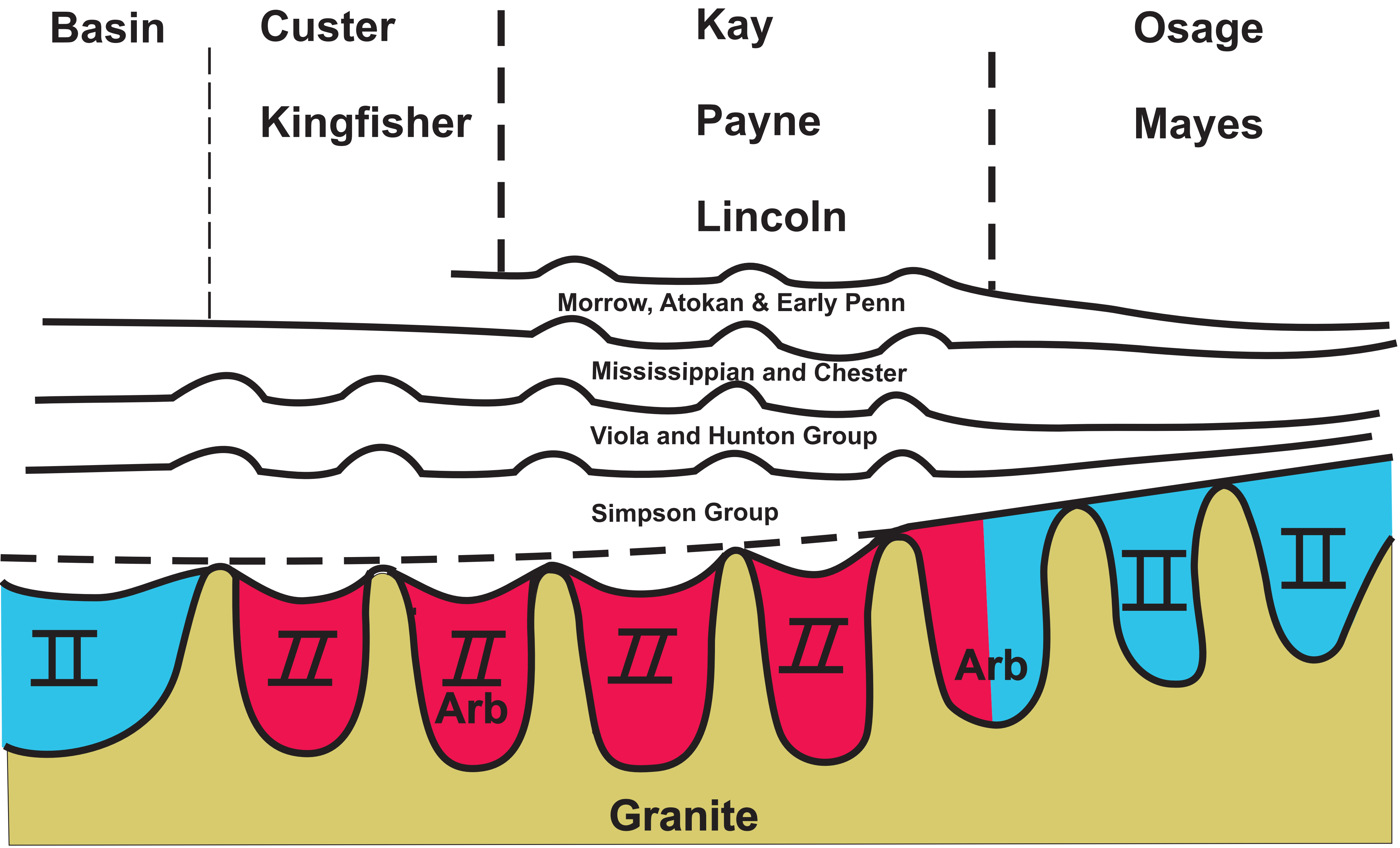
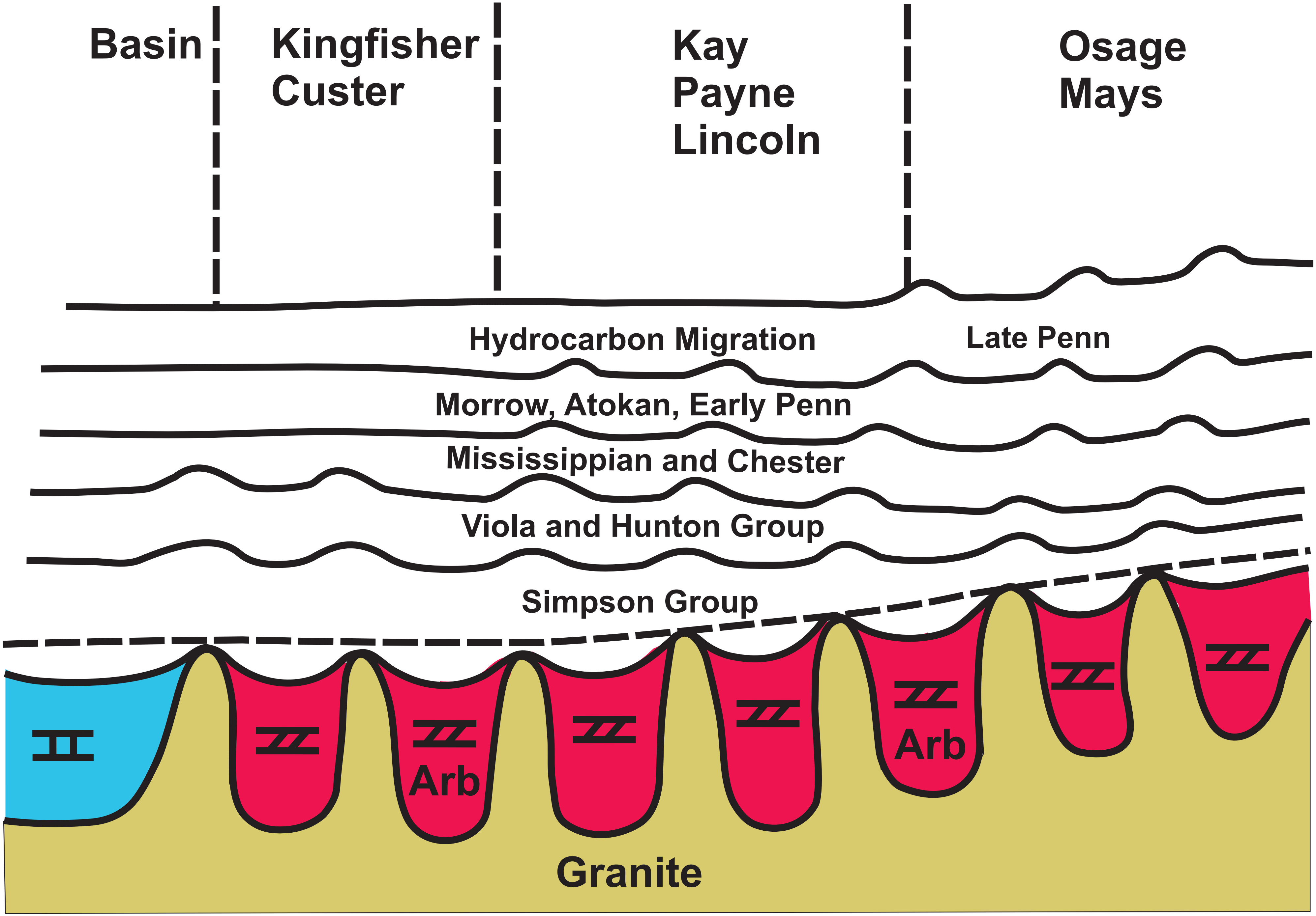

Basin
Custer
Kingfisher
Kay
Payne
Lincoln
Osage
Mayes
Viola and Hunton Group
Simpson Group
II
Arb
Granite

Fig 45



Basin
Custer
Kingfisher
Kay
Payne
Lincoln
Osage
Mayes
Morrow, Atokan & Early Penn
Mississippian and Chester
Viola and Hunton Group
Simpson Group
II
II
II
Arb
II
II
Arb
II
II
Granite

Fig 46



Basin
Kingfisher
Custer
Kay
Payne
Lincoln
Osage
Mays
Hydrocarbon Migration
Late Penn
Morrow, Atokan, Early Penn
Mississippian and Chester
Viola and Hunton Group
Simpson Group
Arb
Arb
Granite

Fig 47

References

Chenowith, P. A., 1968, Early Paleozoic (Arbuckle) overlap, southern Mid-continent, United States: Am. Assoc. Petroleum Geologists Bull., v. 52, p. 1670-1688

Elebiju, O. O., Matson, S., Keller, R., and Marfurt, K. J., 2011, Integrated geophysical studies of the basement structures, the Mississippian chert, and the Arbuckle Group of Osage county region, Oklahoma: Am. Assoc. Petroleum Geologists Bull. v. 95, p371-393

Fath, A. E., 1920, The origin of faults, anticlines, and buried granite ridge of northern part of Mid-Continent oil and gas fields: U.S. Geol. Survey Prof. paper 128C.

Mattes, B. W., and Mountjoy, D. W., 1980, Burial Dolomitization of the upper Devonian Miette buildup, Jasper National Park, Alberta: Soc. Econ. Paleontologists and Mineralogists, Concepts and Models of Dolomitization, edited by Zenger, Dunham, and Ethington, sp. pub. no. 28., p. 259-297.

Merritt, J. W., and McDonald, O. G., 1926, Oil and gas in Oklahoma, Creek County: Oklahoma Geological Survey Bull. 40-C, p. 1-43.

Reeder, L. R.,1974, The Control of potential Arbuckle hydrocarbon traps in northeastern Oklahoma by Precambrian topography: Shale Shaker, v. 24, p. 84-93

Rountree, J. H., 1991, Petroleum geology of the Arbuckle Group, southern Osage and eastern Pawnee Counties, Oklahoma: Shale Shaker, v.XL-XLIV, p.207-230

Walters, R. F., 1946, Buried Precambrian hills in northeasterh Barton county, central Kansas: Am. Assoc. Petroleum Geologists Bull. v. 42, p. 2133-2173