ATLAS WIRELINE SERVICES

Western Atlas International

DUAL LATEROLOG
MICRO LATERALOG
Gamma Ray Caliper

FILE NO.

API NO.
30-015-26728

FIELD PRINT

COMPANY BIRD CREEK RESOURCES, INC.

WELL BURKHAM NO. 1

FIELD EAST LOVING DELAWARE

COUNTY EDDY STATE NEW MEXICO

LOCATION:
1650' FNL & 990' FWL
UNIT E, SW/NW/4

SEC 22 TWP 23-S RGE 28-E

OTHER SERVICES
ZDL/CN/GR
DEL2

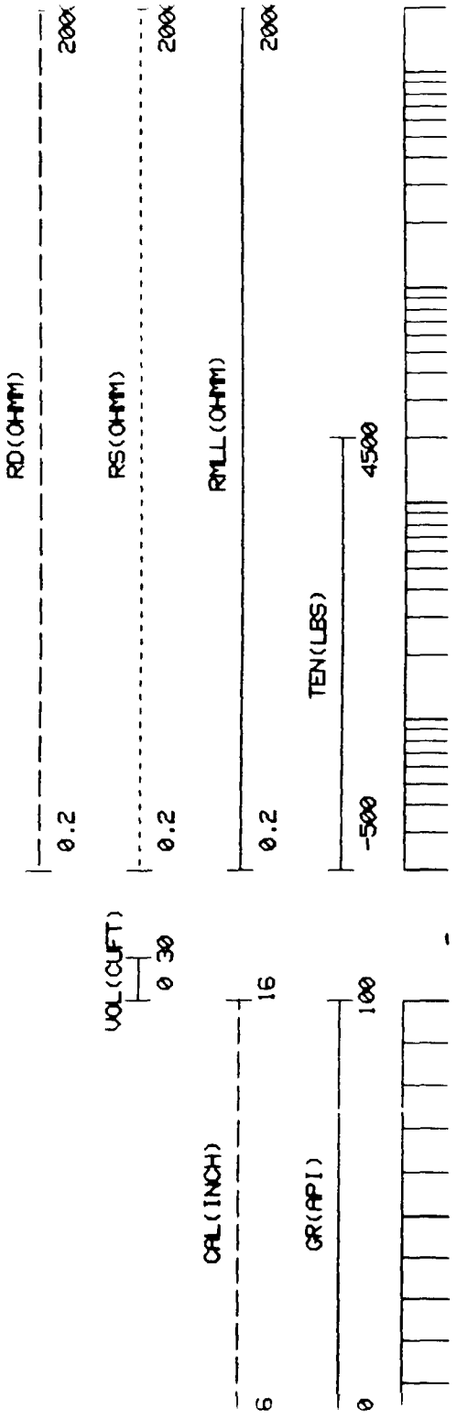
PERMANENT DATUM GROUND LEVEL ELEVATION 3009.5 FT.
LOG MEASURED FROM KELLY BUSHING 14.5 FT. ABOVE PERMANENT DATUM
DRILL. MEAS. FROM KELLY BUSHING

ELEVATIONS
KB 3024.0'
DF 3023.0'
GL 3009.5'

DATE	11th JUNE 1991		
RUN	ONE		
SERVICE ORDER	69219		
DEPTH DRILLER	6345'		
DEPTH LOGGER	6345'		
BOTTOM LOGGED INTERVAL	6342'		
TOP LOGGED INTERVAL	2500'		
CASING - DRILLER	8 5/8" @ 407'	@	
CASING LOGGER	NOT LOGGED		
BIT SIZE	7 7/8"		
TYPE FLUID IN HOLE	STARCH		
DENSITY / VISCOSITY	10.4 PPG | 31.0		
PH / FLUID LOSS	10.0 | 10.0		
SOURCE OF SAMPLE	CIRCULATION TANK		
RM AT MEAS. TEMP.	0.041 @ 83 DEG.F	@	
RMF AT MEAS. TEMP.	0.041 @ 83 DEG.F	@	
RMC AT MEAS. TEMP.	- @ -	@	
SOURCE OF RMF / RMC	MEASURED | -		
RM AT BHT	0.033 @ 110 DEG.F	@	
TIME SINCE CIRCULATION	4 HRS.		
MAX. REC. TEMP. DEG. F	110 DEG.F		
EQUIP. NO. / LOCATION	HL 6364 | HOBBS, N.M		
RECORDED BY	K. VOKES / B. CERVANIA		
WITNESSED BY	PROD. SUPVS.		

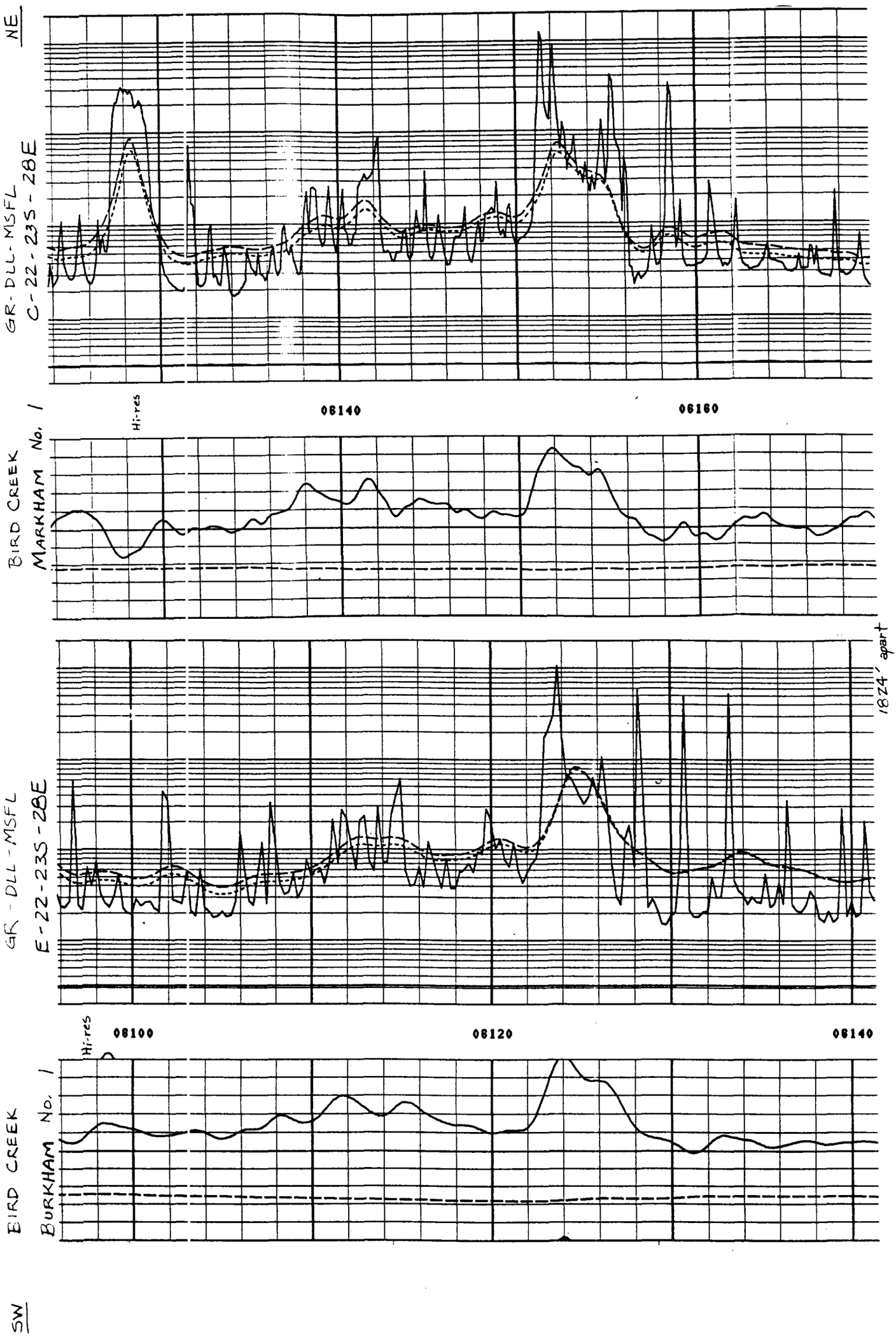
COMPANY: BIRD CREEK RESOURCES, INC.
WELL NAME: BURKHAM NO. 1
SERVICE: OGRMIE FILE: 1 DATE: 06/11/91 TIME: 22:45:17
REVISION: FSYS256 REV:G002 VER:2.1

RUN: 1
TRIP: 1
MODE: RECORD



BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 10226 Exhibit No. 4
Submitted by Bird Creek
Hearing Date 8-29-91


sand
sand
sand
sand
sand
2'
06080
06100
06120


NE
GR-DLL-MSFL
C-22-23S-28E
Hi-res
06140
06160
BIRD CREEK
MARKHAM No. 1
1824' apart
GR-DLL-MSFL
E-22-23S-28E
Hi-res
06100
06120
06140
BIRD CREEK
BURKHAM No. 1
SW

UN. N sw/sw/sw/4 Sec. 2 - 23S - 28E

CALIBRATED TO DIL

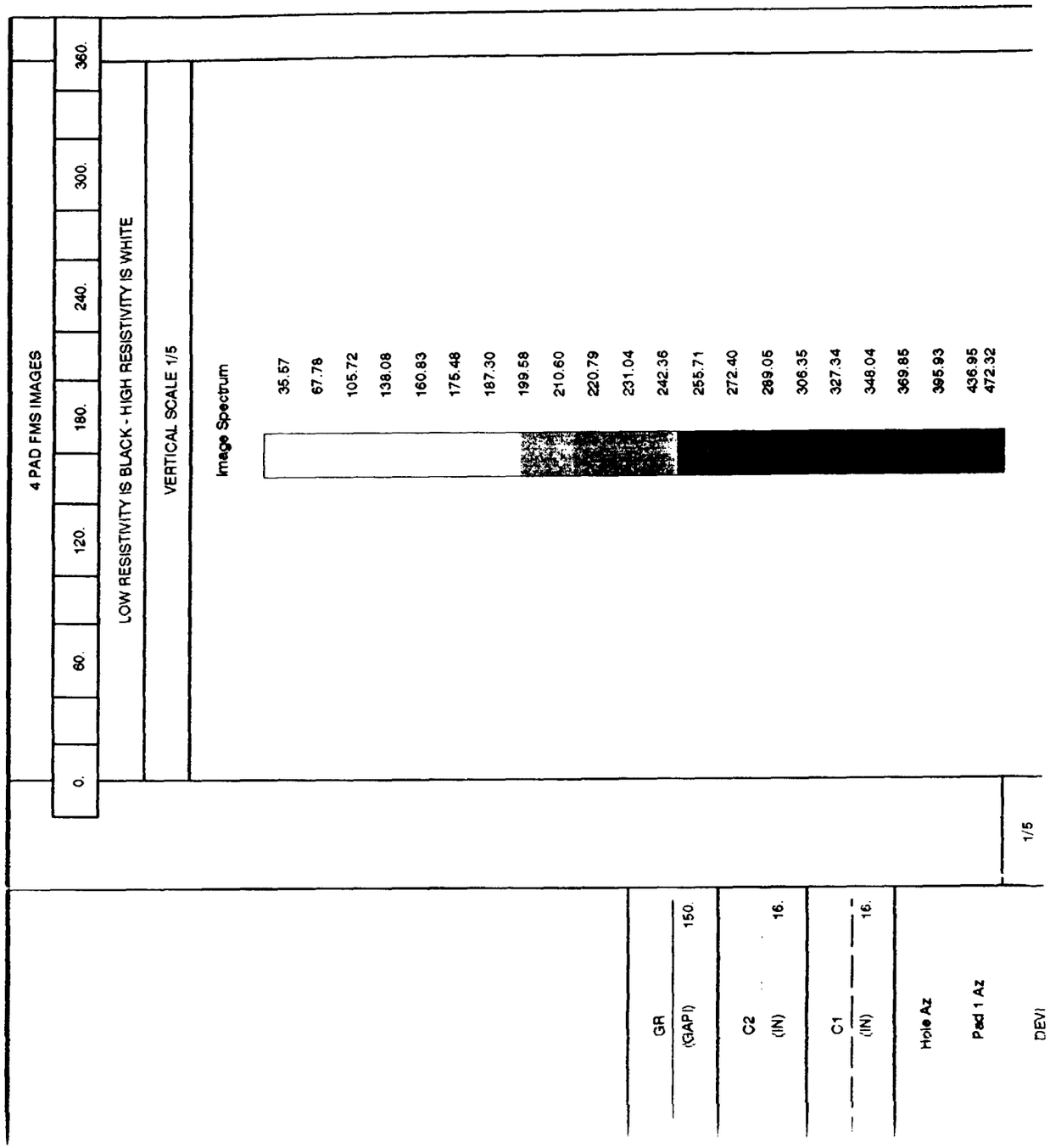
IMAGES

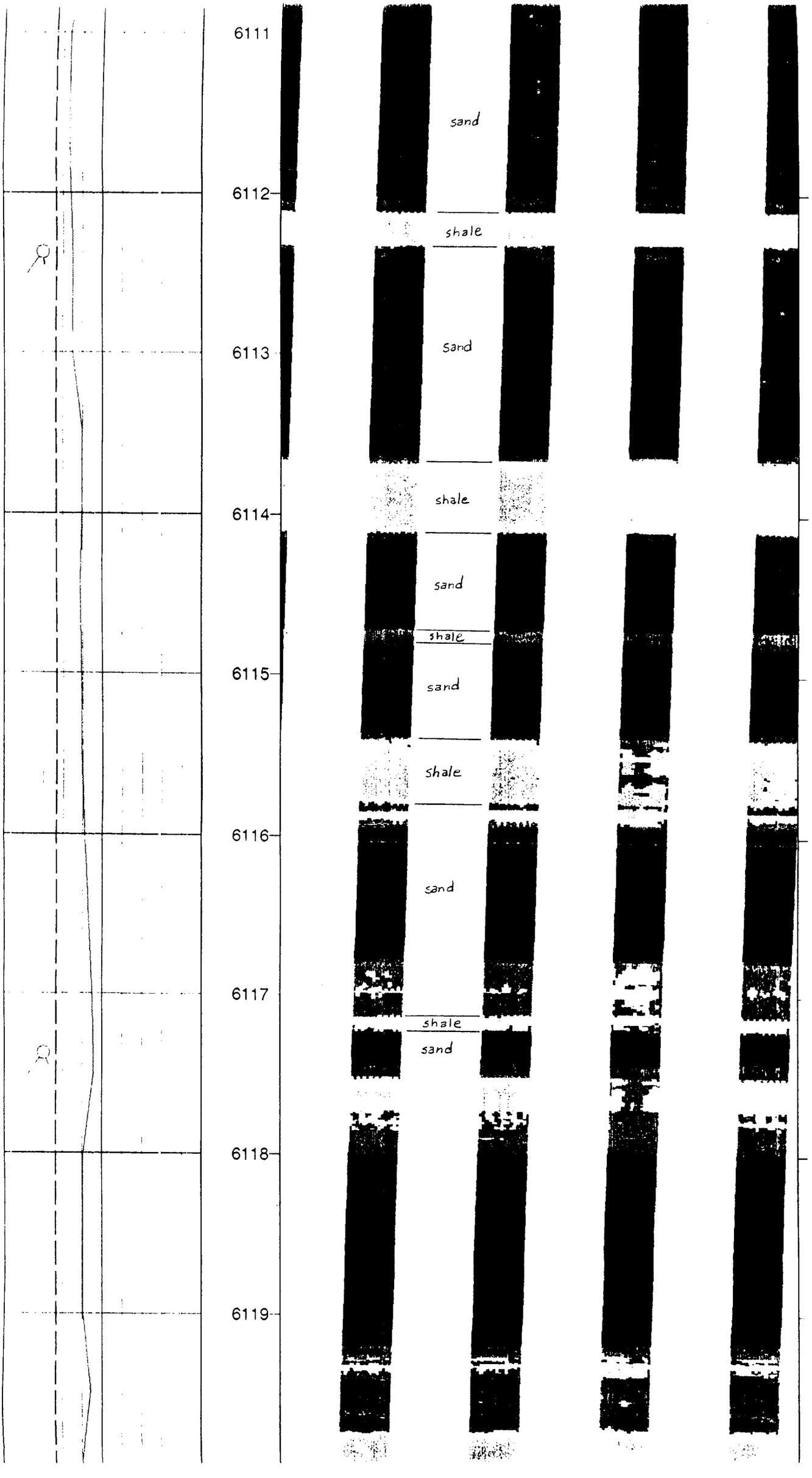
FMS

Formation MicroScanner*

*A Mark of Schlumberger

Logs Used:	FMS
Company:	BIRD CREEK RESOURCES
Well:	PARDUE MARTIN #1
Field:	EAST LOVING DELAWARE
County:	EDDY
State:	NEW MEXICO
Run Number:	ONE
Files Used:	FILES 4,5
Intervals:	6190-6070 5870-5774 FT.
Date Logged:	01-AUG-1991 Date Processed: 06-AUG-1991
Location:	330 FSL & 330 FWL SEC.2 TWN.23S RGE.28E




6111
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Delaware Sandstone

The Delaware Sandstone play, in addition to being the westernmost oil play in Texas, is depositionally unusual. The play is centered in the northern part of the Delaware Basin, a Permian depositional element of southeastern New Mexico and southwestern Texas (fig. 412). Production occurs in the upper part of the Delaware Mountain Group (Bell Canyon Sandstone), the forereef basinal equivalent of the Capitan Limestone of the Guadalupian Series (fig. 413).

Reservoirs are well-sorted, very fine grained sandstone interbedded with laminated and burrowed siltstone, organic-rich shale, and some limestone. The reservoir sandstone bodies were deposited by broad, anastomosing, and internally braided channels along the lower slope and floor of the intermittently stagnant, density-stratified, deep Delaware Basin (Williamson, 1979; Bozanich, 1979). Sandstones show abundant evidence of transport by saline density currents derived from the northern marginal shelf, which was a restricted evaporite platform (fig. 414). Lack of turbid density-current flow because of the clean, well-sorted texture of entrained (eolian?) sediment makes the deposits of this slope/basin system quite different from facies of conventional submarine fans.

The productive channel facies occurs as southwest-trending, broadly lenticular belts. The Ramsey zone (fig. 415, A and B) is typical. Oil is trapped by lateral updip pinch-out of individual channel-fill belts (fig. 416, A and B). Structure has little or no importance in trap formation. Sealing facies are silty and moderately permeable. The transmissive nature of the basin fill, combined with the observed regional eastward-dipping potentiometric surface in the Delaware Sandstone, suggests to many authors that entrapment is hydrodynamically augmented (Williamson, 1979). Reserves are found in the uppermost sandstones within a few hundred feet of the base of the massive Castile evaporites, which record the final desiccation of the basin.

The selected reservoirs are a part of a large family of more than 40 Delaware Sandstone fields centered in Loving County. Reserves occur at moderate to shallow depths of less than 5,000 ft. Porosity values average 20 to 25 percent, but the fine texture of the reservoirs results in high water saturation and moderate to low permeability. Further, zones of equivalent petrophysical properties are highly lenticular and stratified within sandstone bodies (fig. 417), reflecting the bedded nature of the submarine channel-fill sandstone facies. Reservoirs are small to moderate; the largest is estimated to contain less than 160 million barrels of oil in place. Many are unitized, and low primary recoveries necessitate the widespread application of secondary recovery processes, principally waterflood. However, carbon dioxide injection has also been successfully applied and shows promise of significantly improving the low recovery efficiencies (averaging 19 percent) typical of the play (Kumar and others, 1980).

References

Bozanich, R. G., 1979, The Bell Canyon and Cherry Canyon Formations, Eastern Delaware Basin, Texas: lithology, environments and mechanisms of deposition, *in* Upper Guadalupian facies, Permian reef complex, Guadalupe Mountains, New Mexico and West Texas: Society of Economic Paleontologists and Mineralogists, Permian Basin Section, Publication 79-18, p. 121-141.

Kumar, R. M., Watson, J. A., and Goodrich, J. H., 1980, CO_2 field injection project conducted by HNG Fuels Company, Twofreds field, West Texas, *in* Fossil Energy: U.S. Department of Energy, p. 120-136.

Williamson, C. R., 1979, Deep-sea sedimentation and stratigraphic traps, Bell Canyon Formation (Guadalupian), Delaware Basin, Texas - New Mexico, *in* Upper Guadalupian facies, Permian reef complex, Guadalupe Mountains, New Mexico and West Texas: Society of Economic Paleontologists and Mineralogists, Permian Basin Section, Publication 79-18, p. 39-74.

RRC DIST	FIELD AND RESERVOIR	DISC DATE	LITH-OLOGY	TRAP	DRIVE	DEPTH (FT)	OIL COL (FT)	POR (%) AVG	PERMEABILITY (MD) LOG RANGE	H2O SAT	API GRAV	INIT GOR	INIT PRES.	TEMP (F)	PRODUCTION TECHNOLOGY	UNIT DATE	WELL SPACING (ACRES)	ROS (%)	OIP (MMBBL)	CUM PROD (MMBBL)	ULT RECOV (MMBBL)	REC EFF. (%)
8	EL MAR DELAWARE	59	SS	UPP	SG	4500		22	14 1 2	45	41	575	2151		WF	69	20	21	70	16 7	18 4	26
8	GERALDINE-FORD	57	SS	UPP	SG	2600	400	22	49 1 2	45	41	466	1421	100	WF,M	68	20	15	111	19 1	28.6	26
8	TUNSTILL	47	SS	UPP	SG	3300	215	25	30 1 2	38	40	1327	1720	88	WF		20		160	10 1	11.0	7
8	TWOFREDS DELAWARE	57	SS	UPP	SG	4900	210	20	33 1 2	44	35	441	2385	104	WF,CO2,PM	63	40	25	55	10 3	12.1	22
8	WHEAT	25	SS	UPP	SG	4300	230	20	19. 0 1	35	36		1850		WF		20		88	20 7	22 0	25
						3870	278	22	29	41	39	649	1863	98		60 %		19	484	76 9	92 1	19

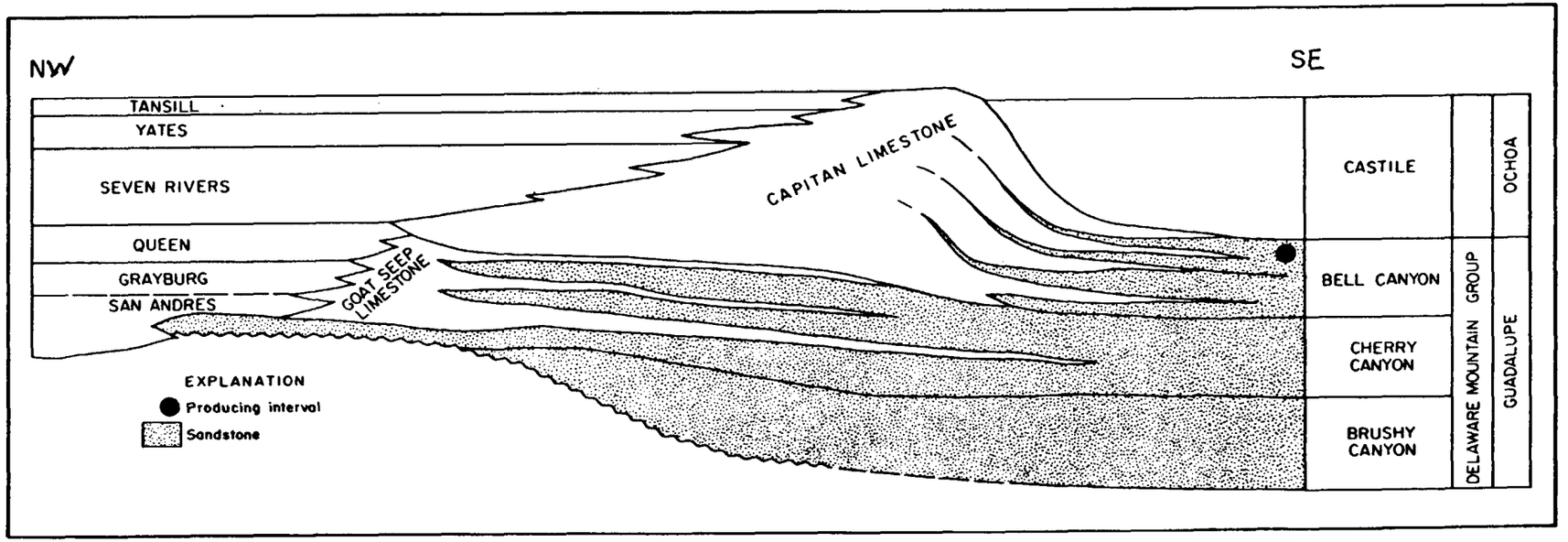
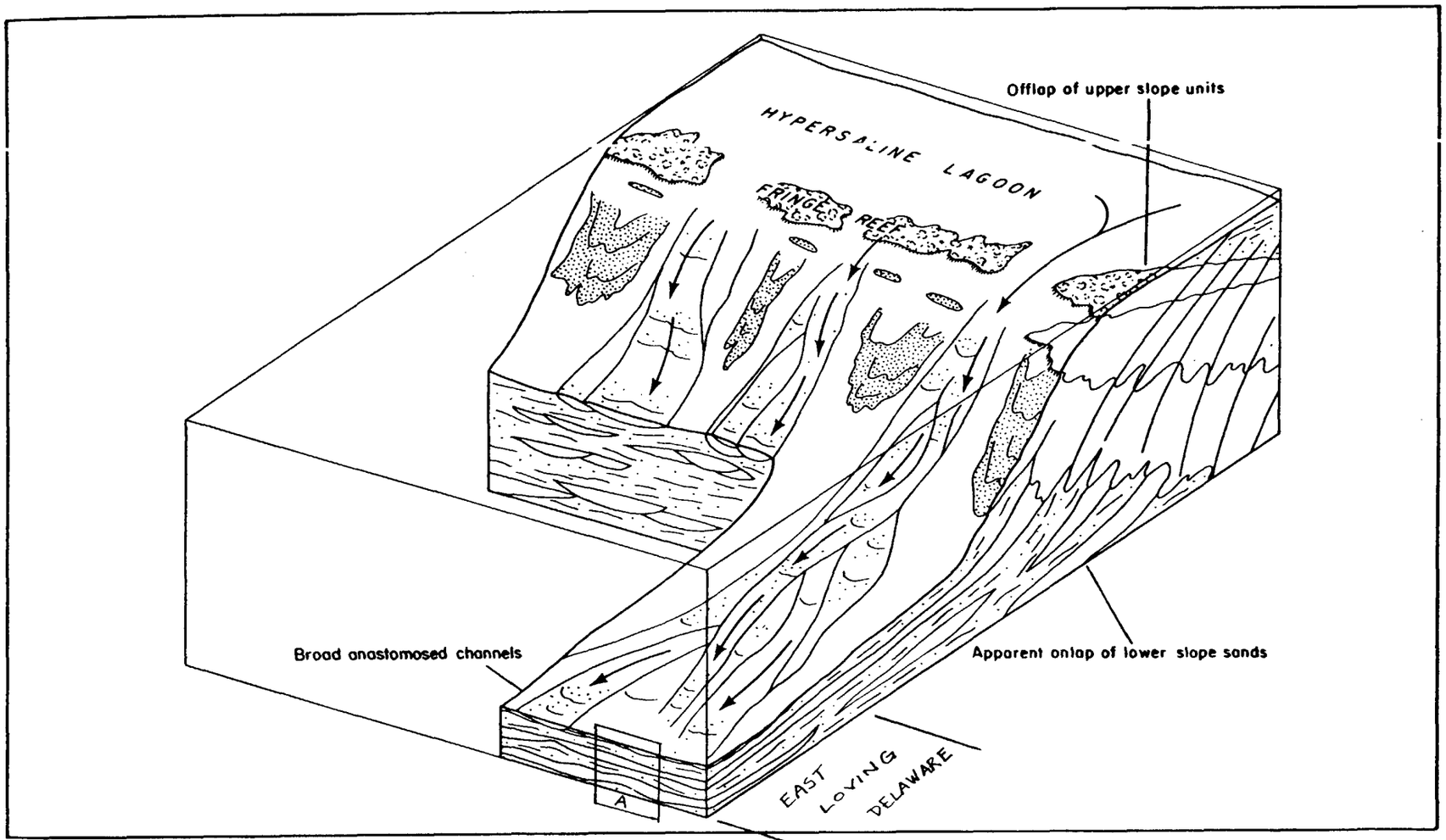


Figure 413. Schematic cross section showing the basinal position of the productive Delaware sandstones (Delaware Mountain Group). Western, northern, and eastern margins of the deep basin were fringed by progradational platform-margin reefs of the Capitan Limestone.



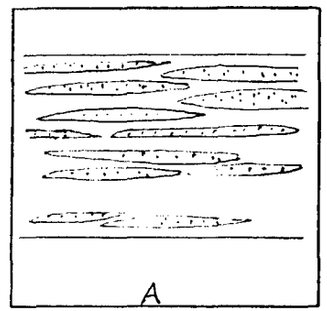


Figure 414. Block diagram of the depositional setting of the slope/basin channel systems in which Delaware sandstones were deposited. Sediment was swept from the shallow evaporite shelves, through the fringing reef, down the forereef slope, and across the basin floor by saline density currents. Most reservoir sandstones were deposited within broad anastomosed submarine channels. Modified from Bozanich (1979).