ELECTROFACIES, DEPOSITIONAL ENVIRONMENTS AND PETROLEUM GEOLOGY OF THE HARTSHORNE FORMATION IN PARTS OF HUGHES AND PITTSBURG COUNTIES, OKLAHOMA

BY

CORY JOHN GODWIN

Bachelor of Science

Oklahoma State University

1997

Submitted to the Faculty of the Graduate College Oklahoma State University in partial fulfillment of the requirements for the Degree of MASTER OF SCIENCE July, 2004

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By

Cory John Godwin

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Thesis Approved:

Thesis Advisor

Dean of the Graduate College

ACKNOWLEDGEMENTS

I would like to first like to thank Dr. Jim Puckette for his patience and guidance, not only during the process of compiling this work, but also during the time spent in class and in the field at Oklahoma State University. I would also like to extend my gratitude to the other members of my thesis committee Dr. Surinder Sahai and Dr. Stan Paxton.

I would also like to thank the many other professors who have tought me so much during my time at Oklahoma State University: Dr. Zuhair Al-Shaieb, Dr. Arthur Cleaves, Dr. Gary Stewart, and Dr. Ibrahim Cemen. I would like to thank my friends and family for their support. A special thanks to Doug and Nikki Dennis (and Jacob) for feeding me and being my adopted family as I passed though on my way from one school to another. I have met so many people and made so many friends during my time in geology that it would take too many pages to thank them all, and thus making this thesis even longer. I would want them all to know how much I have appreciated them.

I would also like to thank all the people at the Questar Exploration and Production Company, Tulsa Division for their support and the chance to earn a living doing something I enjoy.

And a special thank you to my parents, without whom none of this would be possible.

iii

TABLE OF CONTENTS

Chapter	
I. INTRODUCTION	1
Purpose	1
Location	
Methods	2
Previous Work	12
General Stratigraphy	14
II. GEOLOGIC SETTING	19
Tectonic and Depositional History of the Arkoma Basin	19
Overview of Deltaic Deposition	20
Tectonic Influence	22
Sea Level Change	22
Climatic Conditions	23
Fluvial-Dominated Deltaic Systems	24
Deltaic Facies	27
Prodelta	
Delta Front	29
Delta Plain	29
Incised Valley Fill/Incised Channel	30
III. HARTSHORNE DEPOSITIONAL MODEL	
Overview	
Deltaic Facies of the Hartshorne Delta System	46
Prodelta	46
Delta Front	47
Delta Plain	50
Incised Valley Fill/Entrenched Distributary Channels	51
Hartshorne Coal	
Discussion of Hartshorne Depositional Model as Applied to	
the Study Area	
Lower Hartshorne Member	61

Prodelta	61
Delta Front	
Distributary Mouth Bar and Bar Fringe	
Delta Plain	
Distributary Channel Sandstone	
Crevasse Splay	
Lower Hartshorne Coal	
Upper Hartshorne Member	
Prodelta	
Delta Front	
Delta Plain	
Incised Valley Fills/Entrenched Distributary Channels	
Local Structure.	
	7(
IV. PETROLEUM GEOLOGY	
Regional Overview	
Volumetric Methodology	
Conventional Hartshorne Play	
Coalbed Methane	
Gas Field Summaries	
Cabannis NW Field	
Hill Top Field	
Hill Top North Field	
Horntown SE Field	
Lamar East Field	
Reams Northwest Field	
Scipio Northwest Field	
Shady Grove Field	
South Pine Hollow Field	
Stuart Southwest Field	
Ulan Field	
Calvin and Greasy Creek Fields	
Coalbed Methane Production	
Hydrocarbon Production Potential	
Coalbed Methane Play	147
V. SUMMARY	149
Evidence Supporting the Depositional Model	150
Conclusions	
BIBLIOGRAPHY	161
APPENDIXES	165
Appendix A: Hartshorne Gas Production Data	166

Appendix B: Hartshorne Production Sorted By Field	178
Appendix C: Hartshorne Production Sorted By Facies Interpretation	184
Appendix D: Hartshorne Isopach Values	192
Appendix E: Formation Tops	201

LIST OF FIGURES

Figure

Page

1. Regional tectonic map	3
2. Location Map	6
3. Gamma-ray type log	7
4. Stratigraphic column	
5. Historical nomenclature chart	17
6. Coal-split illustration	
7. Idealized tectonic model	
8. Facies distribution and log signatures	
9. Deltaic Model: Lower Hartshorne	
10. Deltaic Model: Upper Hartshorne	
11. Entrenched Distributary Model: Lower Hartshorne	39
12. Entrenched Distributary Model: Upper Hartshorne	40
13. Incised Valley Model: Lower Hartshorne	41
14. Incised Valley Model: Upper Hartshorne	
15. Picture – lenticular bedding, distal delta front	48
16. Picture – horizontal burrows, upper delta front	49
17. Picture – Heavner roadcut	43
18. Picture – Lower Hartshorne Coal underclay, Heavner roadcut	56
19. Picture – Lower Hartshorne Coal underclay, Heavener roadcut	
20. Picture – outcrop illustrating the cyclicity the delta front	
21. Type-1 and Type-2 Distributary Channels	
22. Local structural trends	
23. Diagram showing how volume of reservoir was taken from net pay	
24. Hartshorne Production Map: Cabannis NW Field	82
25. Hartshorne Net Pay Isopach Map: Cabannis NW Field	
26. Distributary mouth bar/distributary channel succession	84
27. Type-2 distributary channel	
28. Picture – possible upper distributary mouth bar facies	
29. Hartshorne Production Map: Hill Top Field	
30. Distributary mouth bar, Hill Top Field	
31. Distributary mouth bar, Hill Top Field	
32. Hartshorne Production Map: Hill Top North Field	
33. Lower Hartshorne gross sandstone Isopach map: Hill Top North Field	
34. Distributary mouth bar production, Hill Top North Field	
35. Bar fringe production, Hill Top North Field	101

36.	Delta front/distributary mouth bar, Hill Top North Field	.102
	7. Lower Hartshorne Net Pay Isopach Map, Horntown SE Field	
38.	8. Type-1 distributary channel production, Horntown SE Field	
39.	39. Hartshorne Production Map: Lamar East Field	
40.	Type-2 distributary channel production, Lamar East Field	.109
41.	Hartshorne Production Map: Reams NW Field	.112
42.	Example of Incised Channel (IC-1) production, Reams NW Field	.113
	Structure Map: Reams NW Field	
44.	Net Pay Isopach Map: Reams NW Field	.115
	Distributary channel gas production, Scipio NW Field	
46.	Distributary mouth bar gas production, Scipio NW Field	.120
47.	Distributary mouth bar/crevasse splay, Scipio NW Field	.121
48.	Productive facies within Shady Grove South Field	.125
49.	Type-1 distributary channel facies, Shady Grove South Field	.126
	Net Pay Isopach Map: Shady Grove South Field	
	Type-2 distributary channel and coalbed gas production	
	Type-2 distributary channel facies, South Pine Hollow Field	
53.	Distributary mouth bar/bar fringe/delta front, South Pine Hollow Field	.134
	Hartshorne Production Map: Stuart SW Field	
55.	Incised Channel (IC-1) facies production, Stuart SW Field	.138
	Structure Map: Top of Lower Hartshorne Coal, Stuart SW Field	
57.	Distributary mouth bar/channel margin? Succession, Stuart SW Field	.141
	Coalbed gas production, Ulan Field	
	Upper Hartshorne delta/incised valley cycle model	
	T1: Lower Hartshorne delta progradation	
	T2: Lower Hartshorne incised valley development	
62.	T3: Lower Hartshorne peat marsh development	.157
63.	T4: Upper Hartshorne delta progradation	.158
	T5: Upper Hartshorne incised valley development	
65.	T6: Upper Hartshorne peat marsh development	.160

LIST OF TABLES

Table

Page

I. Volumetric Summary: Cabanniss NW Field	89
II. Volumetric Summary: Hill Top Field	93
III. Volumetric Summary: Hill Top North Field	97
IV. Volumetric Summary: Horntown SE Field	103
V. Volumetric Summary: Lamar East Field	110
VI. Volumetric Summary: Reams NW Field	116
VII. Volumetric Summary: Scipio NW Field	122
VIII. Volumetric Summary: Shady Grove South Field	128
IX. Volumetric Summary: South Pine Hollow Field	135
X. Volumetric Summary: Stuart SW Field	142
XI. Volumetric Summary: Ulan East Field	
XII. Depositional Environment Summary	152

LIST OF PLATES

- Plate 1: Basemap
- Plate 2: Hartshorne Production Map
- Plate 3: Gross Sandstone Isopach Map: Lower Hartshorne
- Plate 4: Gross Sandstone Isopach Map: Hartshorne Undifferentiated
- Plate 5: Net Sandstone Isopach Map: Lower Hartshorne: Porosity $\geq 8\%$
- Plate 6: Net Sandstone Isopach Map: Lower Hartshorne: Porosity $\geq 12\%$
- Plate 7: Net Sandstone Isopach Map: Hartshorne Undifferentiated: Porosity $\geq 8\%$
- Plate 8: Net Sandstone Isopach Map: Hartshorne Undifferentiated: Porosity ≥12%
- Plate 9: Net Pay Isopach Map: Lower Hartshorne: Porosity $\ge 8\%$, Sw $\le 40\%$
- Plate 10: Net Pay Isopach Map: Lower Hartshorne: Porosity ≥12%, Sw ≤40%
- Plate 11: Net Pay Isopach Map: Hartshorne Undifferentiated: Porosity ≥8%, Sw ≤40%
- Plate 12: Net Pay Isopach Map: Hartshorne Undifferentiated: Porosity ≥12%, Sw ≤40%
- Plate 13: Structure Map: Top of Lower Hartshorne Coal
- Plate 14: Structure Map: Base of Hot Shale Marker
- Plate 15: Coal Thickness Isopach Map: Lower Hartshorne Coal
- Plate 16: Coal Thickness Isopach Map: Upper Hartshorne Coal
- Plate 17: Facies Map
- Plate 18: Cross-Section Location Map
- Plate 19: Cross-Section A-A'
- Plate 20: Cross-Section B-B'
- Plate 21: Cross-Section C-C'
- Plate 22: Cross-Section D-D'
- Plate 23: Cross-Section E-E'
- Plate 24: Cross-Section F-F'
- Plate 25: Cross-Section G-G'
- Plate 26: Cross-Section H-H'

NOMENCLATURE

bcf	billion cubic feet
CBM	coal bed methane
FCP	flowing casing pressure
FTP	flowing tubing pressure
mcf	thousand cubic feet
mcfd	thousand cubic feet per day
mmcf	million cubic feet
mmcfd	million cubic feet per day
OGIP	original gas in place
psi	pounds per square inch
RGIP	recoverable gas in place
Rw	formation water resistivity
SITP	shut-in tubing pressure
SP	spontaneous potential
Sw	formation water saturation
tcf	trillion cubic feet

Electrofacies, Depositional Environments, and Petroleum Geology of the Hartshorne Formation in parts of Hughes and Pittsburg Counties, Oklahoma

CHAPTER I

INTRODUCTION

Purpose

The Hartshorne Formation is an important source of natural gas in the Arkoma Basin. Natural gas is produced from the sandstone and coal within the Hartshorne Formation. The purpose of this study is to interpret the depositional facies from subsurface logs, establish depositional environments, and describe the occurrence of petroleum within the Hartshorne Formation in parts of Pittsburg and Hughes Counties, Oklahoma.

The Hartshorne Formation is composed of a succession of shale, sandstone, and coal. Three models for the deposition of the Hartshorne Formation are presented and examined. The first model is that the Hartshorne Formation was deposited within two primary cycles of delta progradation and delta abandonment represented by widespread coal. The second is a modified version of the first with the inclusion of entrenched distributary channels resulting from processes outside of the delta system. The third model suggests that a drop in sea level and formation of incised valleys followed each

delta progradation. This was followed by a rise in sea level that flooded the old delta plain and formed a mire or marsh system in which the coal forming peat was deposited.

The occurrence of coal and natural gas within the Hartshorne Formation is well known and the exploitation of these hydrocarbons has a long history. A better understanding of the Hartshorne depositional model is needed to help identify bypassed reserves in mature areas. In addition, a modern conceptual model is required to gain a greater understanding of the overall distribution of gas-producing Hartshorne lithofacies in order to predict new exploration trends. This study is not designed to identify new reserves, but rather to establish a model that can be applied to development of mature area and locate new reserves in underexplored areas. The final purpose of the study is to use the depositional model to help predict gas producing facies.

Location

The study area is located within the Arkoma Basin geologic province of Oklahoma and Arkansas (Figure 1). The Arkoma Basin is bordered on the south by the Ouachita Mountains/Ouachita Thrust Belt. To the northeast is the Ozark Uplift, a likely source area for much of the Hartshorne Sandstone. To the northwest is the Northeast Oklahoma Platform, also known as the Cherokee Platform. To the southwest is the Arbuckle Uplift. The Arkoma Basin is bordered/covered to the east in Arkansas by the onlapping Gulf Coastal Plain. The study area is comprised of a nine township block that includes T.5N. to T.7N. and R.11E. to R.13E. in Pittsburg and Hughes County, Oklahoma (Figures 2).

Methods

An extensive literature search was conducted to establish a history of previous work on the Hartshorne Formation and coal-bearing strata. Wireline electric logs from more than 500 wells within the nine township study area were collected and correlated using a grid of East-West and North-South trending cross-sections. A stratigraphic framework was established using accepted economic and oil and gas industry nomenclature. The upper and lower members of the Hartshorne were identified, where both are present.

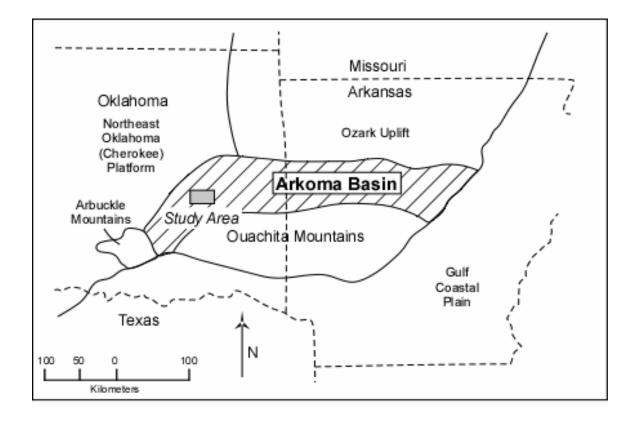


Figure 1: Regional tectonic map (Modified from Matteo, 1983)

A series of maps were constructed to analyze gas production, establish sandstone trends, interpret structural attitude and define coal thickness. The first map that was constructed was a production map that shows the cumulative gas production for wells that produce gas from the Hartshorne Formation. Data for this map were compiled to assess the area's potential for additional gas production. The second map that was constructed was a gross sandstone map of the Lower Hartshorne Member (Plate 3). For this map, a 50% "clean" sandstone cut-off was established based on the gamma ray A second gross sandstone map was built for the southernmost thicker sandstone curve. body (Plate 4). Houseknecht et al (1983), Matteo (1981), Fields (1987), and Andrews (1997) have divided thick, linear sandstone bodies that lie south of the coal split into the Lower and Upper Hartshorne Members. This interpretation was based on the premise that distributary channels or incised valley/channels of the Upper Hartshorne delta system eroded into the Lower Hartshorne Member and are superimposed on the Lower Hartshorne channel sandstones, giving the appearance of a thick stacked channel succession. The boundary between the Upper and Lower Hartshorne Members within this sandstone body is typically interpreted to occur at a shale break within the sandstone. Two wells encountered a coal within the thick sandstone body. This coal has been interpreted as the Lower Hartshorne Coal, and supports the division of the sandstone body into Upper and Lower Hartshorne. However, the depth of the coal within the sandstone body does not correlate to the Lower Hartshorne Coal away from the thick sandstone body, and does not fit with the gradual thickening of the Upper Hartshorne Member away from the coal-split. Instead, the coal within the thick sandstone body appears to be lower in the section than the Lower Hartshorne Coal in wells that show a

distinctive Lower and Upper Hartshorne division. This difference in position could be a result of differential compaction of the sand and adjacent mud, but the vertical difference in position appears to be too great. Therefore it was decided to map the southern sandstone body as Hartshorne "Undifferentiated," and suggest that the entire sandstone body may be composed of sediments deposited during Upper Hartshorne time.

After the gross sandstone maps were completed and the overall sandstone trends were defined, net sandstone and net pay maps were constructed, and compared to the gross sandstone map to determine if similarity exists. Net sandstone is simply defined as all clean sandstone (mapped as gross sandstone as explained previously) that has porosity equal to or greater than a defined minimum porosity. Net pay is defined as all clean sandstone that has a porosity greater than or equal to a defined minimum value and a water saturation (Sw) less than or equal to a defined maximum value.

The porosity cut-off was established after examining the porosity values in wells that produced natural gas in varying quantities and comparing those values to porosity values in reservoirs that are too "tight" (too low of porosity) to produce economic volumes of natural gas. It should be noted that low porosity is not the only reason gas is not produced from a sandstone reservoir. Low permeability (the connectedness of the pore space and the ability of fluid to move through the rock) is often more important than porosity in determining the ability of the reservoir to hold and produce fluids, including oil and gas. After comparing numerous resistivity and density porosity logs of highvolume and low-volume, gas-producing wells, as well as dry holes, two porosity cut-offs were established for mapping. These are density porosities of 8% and 12%. Both values

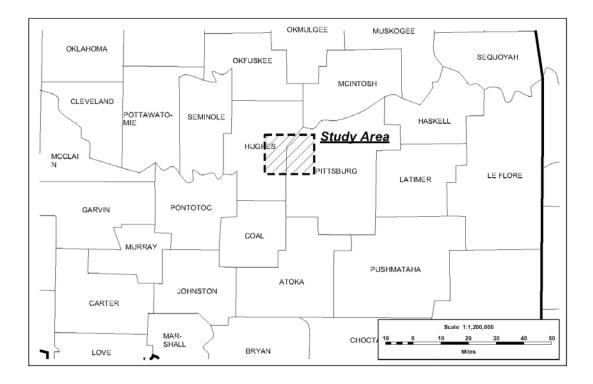


Figure 2: Location of study area along the boundary between Hughes and Pittsburg Counties, Oklahoma.

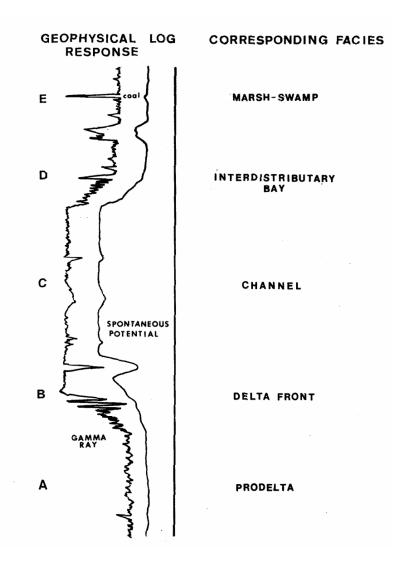


Figure 3: Type log of gamma ray response profiles through the various deltaic facies (Matteo, 1983)

were used to establish net sandstone and net pay, which was subsequently mapped (Plate 5-8). The thickness of net sandstone was compared to production volume to determine which porosity cut-off value was a better predictor of gas production volumes and trends. The primary porosity cut-off value that effectively predicted economic gas production is the 8% density porosity value. The net sandstone map based on the 12% density porosity cut-off is still useful for high-grading potential drilling locations. The next step was to define a water saturation cut-off so that net pay could be mapped. Net pay maps were constructed using the 8% and 12% porosity cut-offs. A water saturation value of 40% was used in combination with both the 8% and 12% porosity cut-off to construct net pay maps and define the trend of gas-producing Hartshorne sandstone. The resulting net pay maps support the production trends seen on the Hartshorne production map.

Two structure maps were then constructed using various formation tops and subsurface markers. The first structure map was constructed on the top of the Lower Hartshorne Coal (Plate 13), which is assumed to be correlative to the single Hartshorne Coal north of the coal-split line. The second structure map was constructed using the base of the "hot shale" marker in the McAlester Formation above the Hartshorne Formation (Plate 14). The Lower Hartshorne Coal is very extensive, and therefore a good subsurface marker. Coal-forming peat tends to be deposited on relatively flat surfaces near sea level; therefore it serves as a very good structural marker. The only difficulty that arose during mapping the structure of the Lower Hartshorne Coal is that it is absent or unidentifiable within the wells that penetrate the southern-most thick sandstone body. This relationship indicates that during Upper Hartshorne time a channel eroded down into the Lower Hartshorne, removing the coal. There is also some question as to the true identity of the Hartshorne coal that lies to the north of the coal split. Is it solely Lower Hartshorne Coal equivalent, or does it represents continuous peat deposition that began in Lower Hartshorne time and continued, uninterrupted, into Upper Hartshorne time? Houseknecht et al (1983), Andrews (1998), and others have stated that the Hartshorne Coal north of the coal split is correlative to the Lower Hartshorne Coal that is identified south of the coal split line. It is possible that this single Hartshorne coalbed north of the coal split line is correlative to the Upper Hartshorne Coal. Therefore a structure map of the Lower Hartshorne Coal may not present an accurate depiction of the structural attitude. Fortunately the "hot shale" marker that lies about 40 to 80 feet above the Hartshorne Formation in the McAlester is widespread and easily recognized. It is used during drilling of horizontal Hartshorne coalbed methane wells to establish a vertical position of the Hartshorne Coal. The "hot shale" marker also represents the top of the Lower Booch Sandstone interval. The Lower Booch Sandstone is present in the southeastern part of the study area. This hot shale marker was the primary structural marker used in this study, despite being located more than fifty feet above the Hartshorne Formation. Comparison of the "hot shale" marker and the Lower Hartshorne Coal structure maps indicates that there is no significant change in structural attitude and grain between the two. Stratigraphic thickening from north to south is evident in McAlester, Hartshorne, and Atoka Formations. A structure map was not constructed on the boundary between the Hartshorne and the Atoka since the identification of the boundary is questionable. Workers who have mapped the Hartshorne-Atoka boundary on the surface place it at the base of the lowermost sandstone in the Hartshorne Formation (Andrews, 1998). Workers who have mapped the boundary in the subsurface place it at a

resistivity marker lower in the Hartshorne Formation. Two "hot shale" markers are evident in the upper part of the Atoka, but sparse well control in most of the study area prevented their use. Based on correlations evident on the grid of cross-sections, structure does not change appreciably from below to above the Hartshorne. Therefore, it was determined that the two structure maps are suitable. The structure maps indicate an overall structural dip to the south-southeast, which is the same as the general direction of overall thickening of the stratigraphic column.

Electrofacies were interpreted using published log signatures for the various deltaic facies (Visher et al, 1971; Brown, 1979; Matteo, 1981; Houseknecht et al, 1983; Fields, 1987; Galloway and Hobday, 1997; Suneson, 1998; Andrews, 1998). The primary electric log curve used to determine lithofacies within the Hartshorne Formation was the gamma-ray curve.

Figure 3 illustrates the accepted gamma ray log profiles for the various lithofacies within a deltaic system (Matteo, 1983). The gamma-ray curve reflects clay content within the rock. The gamma-ray curve is almost always located on the left track of an electric log display. The more volume of shale (clay) within the rock the higher the gamma ray curve will read (high gamma ray deflects to the right). The scale on the gamma ray is usually 0 (or negative) to the left and 150 units on the right, with some variation in the scale based on logging preferences of companies and individuals. The highest reading will represent the shale baseline and any deflection to the left indicates a decrease in shale, thus an increase in sandstone or limestone. The spontaneous potential (SP) curve may be used to interpret lithofacies, but is not as reliable as the gamma-ray tool because it is influenced by porosity, permeability, and formation fluid types. It

should be noted that gamma ray curve profiles are not unique to specific facies. A delta front sandstone has a coarsening-upward profile caused by an upward increase in sand and decrease in clay content. Bed thickness will also increase upward in a delta front succession. A prograding barrier bar system will exhibit a similar profile. Distributary channel sandstones typically have a blocky to fining upward (bell shaped) electric log pattern (gamma-ray and resistivity). Shaley facies such as prodelta, interdistributary bay, and lower (distal) delta front will have very little deflection away from the shale base line on the gamma ray curve. Distributary mouth bar sandstones will have a blocky to upward coarsening profile. Because the distributary channel and distributary mouth bar share a common blocky profile, as well as their proximity to one another within the depositional system, it is often difficult to distinguish between the two facies on the electric log. Coal can be a very distinctive marker on an electric log given the proper log and thickness. If the coal is 2 or more feet thick, a very distinctive negative or leftward deflection in the gamma-ray curve is present. Coal will also read anomalously low on the bulk density curve (less than 2 grams per cubic centimeter) and high on the neutron and density porosity curves (greater than 30% porosity). This combination of log curve signatures can form a very distinctive subsurface marker. Without the gamma-ray and porosity curves, coal is very difficult to identify. It is almost indistinguishable on wireline logs with only SP and resistivity curves.

Volumetric calculations were used to determine the original gas in place (OGIP) and the recoverable gas in place (RGIP). These equations and explanations of their use are in Chapter IV.

Previous Work

Chance (1890) first described rocks of the Hartshorne Formation, calling the coal the Grady Coal Group and the sandstone the Tobucksy Sandstone. Taff (1899) later renamed these units the Hartshorne Coal and the Hartshorne Sandstone. Taff (1899) defined the top of the Hartshorne Sandstone as the first sandstone below the Hartshorne Coal, with the Hartshorne Coal being grouped with the overlying McAlester Formation (Suneson, 1998). Taff and Adams (1900) identified a second Hartshorne Coal and named them the Upper and Lower Hartshorne Coals. The Lower Hartshorne Coal and the shale separating it from the sandstone were defined as part of the Hartshorne Sandstone, whereas the Upper Hartshorne Coal was still grouped with the overlying McAlaster Formation. The base of the Hartshorne Sandstone now became the base of the lowermost sandstone. Oakes and Knechtel (1948) noted, "The two coals coalesce or are separated by only a few inches of bony coal or coaly shale" (Matteo, 1981). Branson (1956) suggested the Hartshorne Sandstone be changed to the Hartshorne Formation. McDaniel (1961) suggested that the Hartshorne be divided into Upper and Lower Members, with the Upper Member containing the Upper Hartshorne Coal and all sandstone and shale between the upper and lower coal, and the Lower Member consisting of the Lower Hartshorne Coal and all sandstone and shale between the lower coal and the top of the Atoka Formation.

Housknecht (1983) at the University of Missouri, with the help of numerous graduate students, did extensive work on the Hartshorne Formation in both Oklahoma and Arkansas. His work was the foundation for the current accepted model for

Hartshorne deposition. The most important contribution, to this study was the work of Matteo (1981), who focused on the Hartshorne Formation within an area in eastern Pittsburg County and western Haskell and Latimer Counties, Oklahoma. The work done by Housknecht (1983) and his students was the most important contribution to the accepted Hartshorne depositional model. The model of Hartshorne deposition developed by earlier workers and further refined by Houseknecht et al (1983) was that of a multiple cycle high destructive deltaic system.

McQueen (1982) examined the Hartshorne Formation in a generalized study that covered the entire Arkoma Basin McQueen's (1982) study contained a broad overview of the Hartshorne Formation within the Arkoma Basin and was useful in establishing the basic regional depositional system.

Fields' (1987) subsurface study covered an area in parts of Pittsburg, Hughes, and Haskell Counties, and in fact overlaps the area in this study. Fields (1987) described the petrologic characteristics of the Hartshorne Formation using two cores that were taken from the Hartshorne Formation in Oklahoma. Fields (1987) determined the mineralogical composition of the Hartshorne Sandstone and reported that the sandstone is primarily composed of quartz (76% in the cores examines). The sandstone also contained rock fragments, feldspar, and minor amounts of muscovite, tourmaline, and zircon. The sandstone contained 2% detrital matrix. There were also trace amounts of organic matter. Fields (1987) also examined core from a well within the current study area, the Hunt Garrett #1 (Section 34-T.6N.-R.13E.), located in South Pine Hollow Field. Two intervals were cored, 3555 to 3561 feet and 3561 to 3601 feet, and the overall condition of the core was poor. Fields (1987) interpreted these cores to contain Upper Hartshorne

distributary channel sandstone, stacked on top of Lower Hartshorne distributary sandstone. Neither the upper or lower contacts were cored.

The Oklahoma Geological Survey has published a significant volume of work on the Pennsylvanian of southeastern Oklahoma. Hemish (1988) reported on coal core drilling program. Hemish (1991, 1992, 1993, and 1995) and Hemish, Suneson, and Furgeson (1990) also constructed several surface geologic maps of quadrangles in Le Flore, Latimer, and Pittsburg Counties. The most recent stratigraphic and sedimentological work done was by Andrews and others (1998). Andrews et al (1998) introduced sequence stratigraphy into the depositional model of Hartshorne deposition.

Suneson (1998) published a field trip guide containing numerous measured section descriptions. Many of the measured sections correlated back to nearby wireline logs. The field trip stops are south and east of the study area but were valuable in interpreting the Hartshorne depositional history.

General Stratigraphy

The Hartshorne Formation, which is named for the town of Hartshorne Oklahoma, is the oldest formation in the Krebs Group, Desmoinesian Series (Pennsylvanian). The Hartshorne, which is composed of shale, sandstone, and coal, is immediately underlain by the Atoka Formation (Atoka Series) and overlain by the McCurtain Shale Member of the McAlester Formation (Krebs Group) (Figure 4).

The Atoka Formation is composed primarily of shale with some interbedded sandstone. The lower part of the Atoka Formation is considered to be of deep marine origin, while the Upper Atoka is thought to be composed shallow marine shelf and transition deposits. The uppermost part of the Atoka may represent the distal prodelta facies of the Hartshorne delta system (Matteo, 1981). Within the uppermost Atoka there are sandstone stringers that are known by various local names, one of the sandstones can is present in several wells in the northwest part of the study area.

The overlying McAlester Formation is dominantly shale. Within the McAlester there are localized sandstone, coal, and limestone beds and stringers, including the Booch sandstones and coals. The lower Booch sandstone develops in the southeast part of the study area, the top of which is represented by the upper "hot-shale" marker. The "hot-shale" marker may represent a marine maximum flooding surface or highly carbonaceous shale of paralic or terrestrial origin. Based on the interpretation of Pennsylvanian hot shales (Marshall, 2002) this "hot shale" may be the key to interpreting the sequence stratigraphic of the Hartshorne and McAlester Formations.

As mentioned previously, the Hartshorne Formation was originally defined as the sandstone lying directly beneath the Hartshorne Coal (Taff, 1899). Later the Hartshorne was redefined to include both the Lower and Upper Hartshorne Coals. The Hartshorne was subsequently divided into two members, the Upper and the Lower. The Upper Hartshorne Member includes the Upper Hartshorne Coal and sandstone between the Upper Hartshorne Coal and the Lower Hartshorne Coal. The lower member includes the sandstone body below the Lower Hartshorne Coal, as well as the coal itself. The historical development of the Hartshorne nomenclature is illustrated in Figure 5.

The Upper Member is only present in the southern part of the Arkoma Basin in Oklahoma (Matteo, 1982). In the northern part of the Oklahoma portion of the Arkoma Basin and the entire basin in Arkansas, the Hartshorne Formation is represented by a

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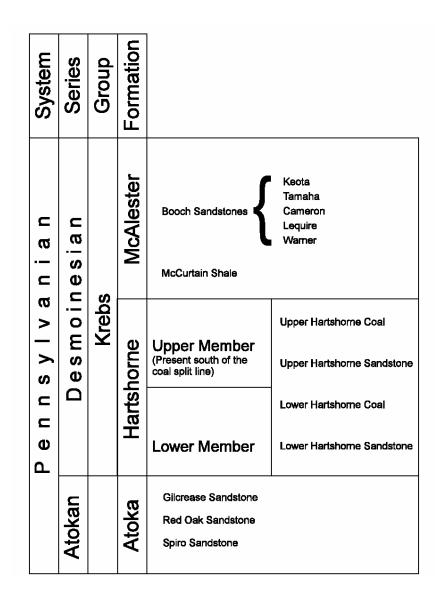


Figure 4: Generalized stratigraphic column, Arkoma Basin, Oklahoma (Modifiedf from Andrews, 1997 and Hemish & Suneson, 1997).

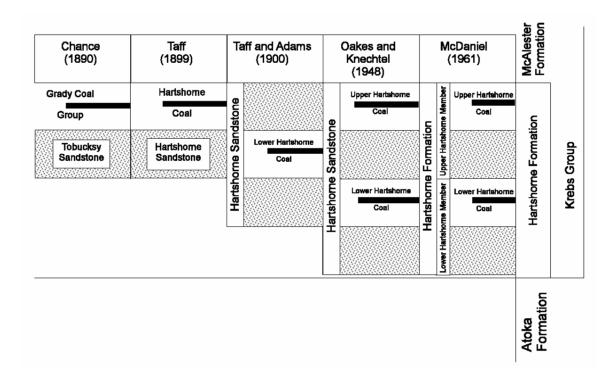


Figure 5: Summary of the history of the Hartshorne Formation nomenclature.

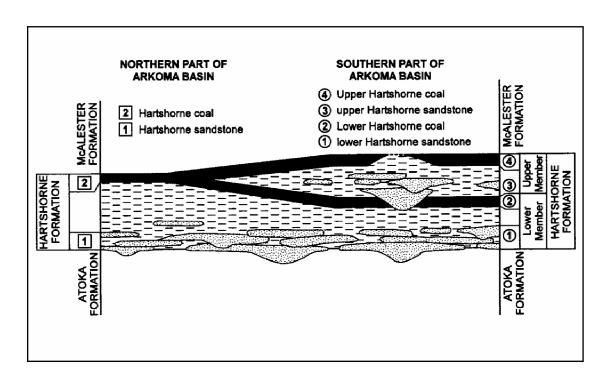


Figure 6: Illustration of the coal-split that occurs within the Hartshorne Formation from north to south in the Arkoma Basin, Oklahoma (From Hemish & Suneson, 1997).

single sandstone-coal package that is presumed to be correlative to the Lower Member in the south (Figure 6). For the purpose of this study and simplicity, the term "Lower Hartshorne Member" will be used to indicate that part of the formation below the Upper Hartshorne Member where both members are present. In addition, Lower Hartshorne will be used to describe the Hartshorne Formation (undivided) north of the coal-split line. This nomenclature is the same as reported by Houseknecht et al (1983) Andrews (1998).

The Hartshorne Formation in Arkansas differs in several ways to the Hartshorne in Oklahoma.. In most of the Arkoma basin within Arkansas, the Hartshorne Formation consists of a single coal and sandstone package and no coal-split is evident, except in the far western part (Houseknecht et al, 1983). The Hartshorne Formation is interpreted to be of dominantly fluvial origin and described as a series of thick, broad channel sandstones (Houseknecht et al, 1983). Near the Arkansas-Oklahoma border these channel sandstones become narrower and thinner (Houseknecht et al, 1983).

CHAPTER II

GEOLOGIC SETTING

Tectonic and Depositional History

The Arkoma Basin extends from south-central Oklahoma into central Arkansas (Figure 1). Bounding structural features include the Ouachita and Arbuckle Uplifts to the south and the Ozark Uplift to the northeast. To the southeast is the Gulf Coastal plain that extends from southeastern Arkansas to the Gulf of Mexico. To the northwest is the Oklahoma Platform, also known as the Cherokee Platform, which extends into Kansas. The history of the Arkoma Basin begins in the Late Precambrian. During this period of time, rifting occurred as the North American plate began to separate from Africa and South America. All were previously sutured together to form the supercontinent "Proto-Pangea." As rifting continued into the Paleozoic, a passive margin developed along the southern edge of North America. During the Early Mississippian, part of the present day trough within the Arkoma Basin was structurally high (Rieke and Kirr, 1984). During the passive margin stage of the Early and Middle Paleozoic, shallow water carbonates and clastics were deposited on a broad shelf. This passive margin continued into the Late Devonian and Early Mississippian, at which time the ocean basin began to close and a southward dipping subduction zone formed (Houseknecht et al, 1983). This is supported by evidence for a Devonian metamorphic event (Denison, 1982). During this transition from passive to active continental margin the rate of sedimentation increased.

Throughout most of the Mississippian, the depositional setting remained a shelf, which was dominated by clastic deposition (Houseknecht et al, 1983). During the Pennsylvanian, sediment continued to be shed into the basin as it transformed into an active continental margin. Sediment was deposited in the basin in fluvial dominated deltaic systems during the Pennsylvanian. During the Late Pennsylvanian, the Arbuckle orogeny formed the Arbuckle Uplift in southern Oklahoma, which separated the present Ft. Worth and Arkoma Basins (Rieke and Kirr, 1984). The tectonic evolution of southern Oklahoma is illustrated in Figure 7 (Houseknecht et al, 1983).

Overview of Deltaic Depositional Systems

Deltaic depositional models have dominated the interpretations of the Hartshorne Formation. Therefore, an overview of deltaic processes and resulting facies is included. A delta forms at the point where a flowing river enters a standing body of water such as the ocean or a lake. The delta represents the building out or progradation of the river plain into the body of water. As the river enters the standing water, the fluvial system gradually loses current energy and deposits its sediment load. The sediment load contains grains with a wide variety of sizes and densities. The particles with the greatest mass, which are typically larger, are deposited first, proximal to the stream mouth, whereas less massive, smaller sediment is deposited at increasing distances from the mouth. The result is a lateral gradation of grain sizes from the mouth of the river to the more distal part of the delta. There is also a vertical gradation of grain sizes that results as the delta builds out into the standing body

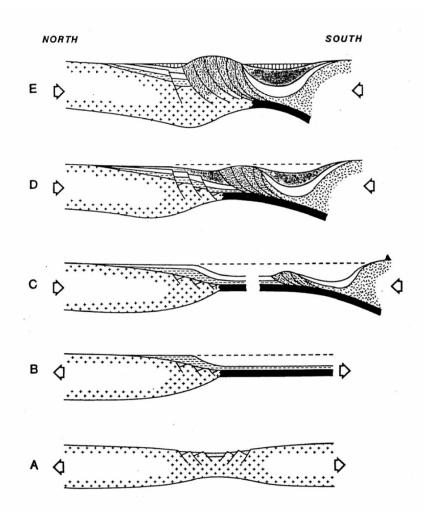


Figure 7: Idealized model for the evolution of the Arkoma Basin (from Houesknecht et al, 1983).

of water. Proximal, coarser grain facies are deposited above the more distal, finer grain facies.

The processes that control the formation of a delta system can be divided into three categories, fluvial, wave, and tidal, with wave and tidal often being grouped together (and with other basin processes) as marine processes. In any delta system, all three of these processes are present and act upon the delta in varying degrees. This interaction creates a unique type of delta, which is then defined and named by the dominant process, hence fluvial-dominated deltas, wave-dominated deltas, and tidedominated deltas.

There are several factors outside of fluvial and marine processes that influence the morphology and evolution of a delta system. These factors include tectonic setting, relative sea level changes, climate and the geometry of the depositional basin The most important factor is relative sea level, which may be influenced by tectonic activity, eustatic sea level changes, and subsidence (basin wide and local).

Tectonic Influence

Tectonic activity can affect a delta system in several ways. Regional uplift may create topographically high areas that increase river gradient and sediment supply. This increase in gradient and sediment load will directly affect the delta system by rejuvenating the constructive phase. This can change a wave-dominated delta to a fluvial-dominated delta system as the influence of river processes increase. The magnitude of the affect of tectonic activity on the delta system is controlled by both the intensity of the tectonic event as well as the proximity of the uplift to the delta system. For example, if uplift occurs close to the shoreline, a fan-delta may form, or a preexisting fluvial-dominated delta may transform into a fan delta system.

Sea Level Change

The evolution of sequence stratigraphy has redefined and enhanced the role of sea level change on defining patterns of deposition within coastal environments. Typically, changes in sea level can be placed into two categories, (i) regional and (ii) eustatic.

22

Regional changes in sea level are restricted to a particular basin and are not seen at a global level. Eustatic sea level changes are those that are recognized globally. Relative changes in sea level typically result from the interaction of tectonic uplift, basin subsidence, lobe switching, delta subsidence, and other events that are confined to the basin, as well as the ongoing eustatic fluctuations of sea level.

A delta forms at the point at which a river enters a basin or intersects shoreline. Changes in sea level cause the shoreline to migrate, thus affecting any depositional system linked to the shoreline, including a delta. The effect on the delta system can vary. Minor fluctuations will have a minimal affect on the delta system and result in a redistribution of deltaic facies. Major regressive or transgressive events induce a much larger affect on the depositional system, including the complete destruction of the delta system in both cases. In the case of a major regressive event, the delta will be cannibalized by its own distributaries as they erode or incise into it. A major transgressive event, which overtakes fluvial discharge, will flood the delta plain, and sediments may be reworked and redistributed by marine processes, leaving little evidence of the former deltaic system. In instances of regional tectonic activity or subsidence, there may be a localized, drops or rises in sea level that are not related to global eustatic processes.

Climatic Conditions

Regional climate is a controlling factor in the formation and evolution of delta systems. For sediment to be delivered to the basin by the delta system, there must be a flow of water. In an arid climate the amount of rainfall runoff may be minimal and small

volumes of sediment is delivered to the delta system. This is especially true if the sediment source is distal to the delta. In an area that receives seasonally high discharges, a delta may form, but because of the lack of constant discharge, may be dominated by marine processes. In more moderate climates, a year round discharge would allow for continual delta building. Periods of high water discharge may cause both the upstream fluvial system and the deltaic distributary systems to erode into their underlying substrate.

Fluvial-Dominated Deltaic Systems

Deltas are composed of a proximal and distal framework facies. The proximal framework for all deltas (wave-, tide- and fluvial-dominated) is the distributary channel sand (Galloway and Hobday, 1996). The differences between the delta types are exposed in the distal framework facies. For fluvial-dominated deltas, the distal framework facies include distributary mouth bars and delta front sheet sands. The distal framework facies component for wave-dominated and tide-dominated deltas are beach ridge or strand plain sands and tidal ridge/bar sands, respectively (Galloway and Hobday, 1996).

Both fluvial and tide-dominated deltas contain a high amount of mud and clay, whereas wave-dominated deltas are cleaner or sand rich as a result of wave action that winnows away the finer material. Although the composition of fluvial and tidedominated deltas is similar, geometry and sedimentary structures are quite different. Tidal inundation often creates irregular geometries; the Me-Kong Delta is a good example of a tidal dominated delta. Fluvial-dominated deltas show a greater protuberance as the influx of sediment builds the delta basinward in a lobate or elongate (birdsfoot)

The Mississippi Delta is a good example of a fluvial-dominated delta. Sand pattern. bodies in fluvial-dominated deltas contain sedimentary structures that indicate a singular direction of flow, whereas sedimentary structures in sands associated with tide-dominated deltaic sediments show patterns indicating bimodal directional water flow associated with the ebb and flow of tidal currents. Fluvial-dominated deltas may contain some marine influenced sedimentary structures that occur mostly in the distal delta front. In contrast, marine influence in a tide-dominated delta may extend up into the distributary channel during high tide. Wave-dominated deltas also contain sedimentary structures that display patterns indicating bimodal sediment transport resulting from wave action. Both fluvial- and wave-dominated deltas may display a lobate geometry, but they are different in that the distal framework of wave-dominated systems is composed of sands (beach ridge/strandplain) that strike subparallel with the coastline. The distal framework facies of a fluvial-dominated delta system (distributary mouth bars and delta front sands) will strike perpendicular to the coastline and extend basinward.

Some delta descriptions have characterized fluvial dominated deltas as "constructive," whereas deltas that are more heavily influenced by wave and tidal energy are "destructive" (Houseknecht et al, 1983). The origin of this description is understandable as river-dominated deltas will typically prograde basinward more than either wave- or tide-dominated deltas. The description is also accurate in that sediments that are deposited in wave- and tide-dominated deltas are heavily reworked by marine processes, often exhibiting characteristics that are more indicative of shallow-marine deposition than fluvial. In reality, these delta types are all influenced, to varying degrees, by both fluvial and marine processes. The terms "constructive" and "destructive" are

25

more aptly applied to phases within the lifespan of the delta. As long as a river is depositing sediment at its mouth and supply exceeds accommodation space, it should be considered to be in its constructive phase. Once that fluvial input diminishes and the delta is dominated by marine processes, it may be considered to be in a destructive phase. This is an important distinction because in major delta systems there are typically multiple phases of construction and destruction occurring simultaneously as one delta lobe is abandoned and another develops as a result of lobe switching. This process is evident in modern deltas such as the Mississippi and most likely was the case for large ancient delta systems such as the Hartshorne, which had multiple active distributaries.

Relative sea level change must be considered when describing the evolution of a delta system. Change in sea level may be the result of subsidence due to compaction of the sediment, tectonic uplift in the hinterlands, basin subsidence, or global sea level changes. A fluvial-dominated delta system develops because a river feeds sediment to a system than can be altered by marine processes. Marine processes can dominate the fluvial process if flooding that results from a relative rise in sea level and increasing accommodation space. If this occurs at a rate that exceeds the rivers sediment supply, the fluvial system will be unable to maintain the delta. It should be noted that sand and mud within the delta contain a high volume of water and will compact over time, resulting in subsidence and a relative rise is sea level. Unlike the "constructive" and "destructive" phase in delta evolution, sea level changes do not necessarily end the existence of the delta. Fluctuations in sea level may simply adjust the location of the delta lobes and the distribution of sediment. Given a relatively stationary sea level and sediment input exceeding the rate of delta subsidence resulting from compaction, a delta will build out or

prograde into the basin. This is referred to as a progradational delta stage. If the sediment input remains constant and the rate and magnitude of sea level rise increases, but is not so great as to overtake it, the delta may backstep away from the basin or retrograde. Older deltaic sediments will be flooded, but sufficient sediment delivery will maintain a delta system as the coastline. This is the retrogradational delta stage. While the progradational stage of deltaic development is always in the constructional phase, retrogradational stages may be either in the constructional or destructional phase of development. If marine incursion overtakes the sediment input volume the distributary channels will be flooded and an estuarine-type environment may form, which is similar to a tide-dominated delta. This would be classified as a destructional phase of delta evolution. If sea level is maintained and sediment is delivered to the delta at a rate that is approximately equal to the amount needed to fill the accommodation space created by deltaic subsidence, then a delta will simply aggrade, or build upon itself at its current location. This is referred to as the aggradational stage of delta development, which is constructional because fluvial process still dominate.

Deltaic Facies

There are three primary facies within a deltaic depositional system, prodelta, delta front, and delta plain (Bhattacharya and Walker, 1992). Each of these can be divided into subfacies. Figure 3 illustrates the typical vertical succession of deltaic facies and their gamma ray response profile on an electric log. Figure 8 illustrates the distribution of the deltaic facies and their respective electric log response profiles.

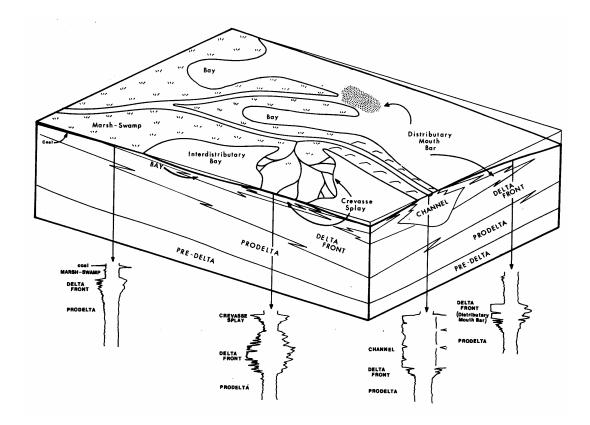


Figure 8: Distribution of facies within a deltaic system and their representative log curve signatures (From Matteo, 1981)

Prodelta

The prodelta represents the most distal part of the delta system. This is where the smallest-sized material is deposited. The prodelta is often divided into distal and proximal subfacies. The prodelta facies of the delta depositional system is composed primarily of clay or mud with minor amounts of silt and sand. The minor amounts of silt and sand are deposited as a result of periods of high stream discharge. The volume of sand will increase up section in a prograding delta system. This represents the initial coarsening upward vertical profile that is characteristic of a prograding delta system.

Delta Front

The delta front facies consists of the delta fringe (distal delta front) and distributary mouth bar subfacies. The delta fringe represents the transition from proximal prodelta deposition to delta front deposition. The delta fringe or distal delta front is composed of fine-grained sandstone, with interbedded shale and siltstone (Brown, 1979). The thickness and frequency of sandstone beds will increase upward as the delta fringe grades into the distributary mouth bar. The distributary mouth bar represents the point of the most active deposition and is deposited at the head of the distributary channels as elongate sand bodies. The distributary mouth bar consists of fine- to medium-grained sand. Sedimentary structures include medium- to large-scale trough cross bedding within a thick sand body. In both delta fringe and distributary mouth bar deposits where there is a high rate of deposition, water-laden sediment is deposited. As more sediment is deposited and overburden increases, the water is forced out of the sediment and the result is a variety of soft-sediment deformation features including flame structures and ball and pillow structures. The proximal part of the delta front is represented by the distributary mouth bar subfacies.

Delta Plain

The delta plain facies is the most diverse of the three primary facies. Subfacies within the delta plain facies includes distributary channel, interdistributary bay, marsh and swamp, and crevasse splay.

The distributary channel subfacies is the local fluvial component of the delta system. Distributary channels may, like their terrestrial counterpart, have a tendency to

migrate laterally or meander. Distributary channels may also become well entrenched and take on a more linear trend.

Crevasse splays develop when the distributary channels breach their natural levees and the sediment load spills into the low energy environment of the interdistributary bay. The result is the formation of a small scale delta system, compared to the larger delta system of which it is a part. Some crevasse splays may be very large, depending on the nature of the flooding event. The crevasse splay facies may exhibit a coarsening upward profile that reflects the progradational nature of the deposit.

Incised Valley Fill/Entrenched Distributary Channel

Incised valley systems and incised valley fills, including those in the Hartshorne, have become a very important topic because of their significance as oil and gas reservoirs and their role in sequence stratigraphy. The recognition of incised valley deposits is not new, but their interpretation in the context of sequence stratigraphy has accentuated their importance to interpreting depositional systems.

Incised valley systems form when a river erodes underlying sediment to create a topographic low river valley. The erosion is a response to disequilibria with base level, which may result from uplift or the lowering of base level relative to the current river mouth. If the base level begins to rise and marine waters inundate the valley, stretches of the valley may fill with marine sediment. The drop of base level is often a result of relative sea level fall and the resulting valley may represent a sequence boundary (Van Wagoner et al, 1990).

The presence of an incised valley system is one of the primary criteria for identifying a sequence boundary, as the base of the valley is correlative to the regional sequence boundary. During the regressive event, the existing deltaic, marginal marine, and marine sediments are often exposed and evidence for exposure within the interfluve areas can be identified (Zaitlin et al 1994). The valley will incise underlying strata, including any regionally significant markers in the area (Zaitlin et al, 1994). In the sequence stratigraphic framework, the incised valley is an important indicator of a sequence-scale event; the base of the valley (and the correlative interfluve) is defined as a sequence boundary. The fill of the incised valley may contain fluvial deposits toward the base that represent deposition during the lowstand systems tract. During the subsequent transgression, these fluvial deposits are flooded and the valley transitions into an estuarine-type depositional system. Thus the valley-fill shows an upward transition from fluvial to marine deposition. However, not all incised valleys and incised valley fill deposits represent a sequence boundary or are a result of relative sea-level fall. Incision may result from climatic change, stream capture, or a tectonic uplift in the sediment source area, all of which may increase discharge that results in channel entrenchment or incision.

Channel-fill sandstone that are interpreted as valley fill deposits are the most important economic facies within the Hartshorne delta system. This facies was added to the Hartshorne depositional model by workers at the Oklahoma Geological Survey (Andrews, 1998). Van Wagoner et al (1990) and Dalrymple et al (1994) explain that not all valleys are "incised valleys" of sequence stratigraphic definition. Van Wagoner et al (1990) and Dalrymple et al (1994) indicate that some distributary channels erode through the delta front deposits and into, but not through, the prodelta deposits, juxtaposing fluvial distributary sands on prodelta marine shale. The result is an apparent basinward shift in facies. The distributary channels become entrenched and may form a large aggradational channel complex, as it is unable to migrate laterally. As there is no major regression, the delta plain is not exposed.

CHAPTER III

HARTSHORNE DEPOSITIONAL MODEL

Overview

The Hartshorne depositional model has evolved as most geological models change in response to new information and ideas. The first and most widely accepted model for Hartshorne deposition is that of a widespread fluvial-deltaic system (Figures 9 and 10). Houseknecht (1983) described it as a high-constructive lobate delta system that prograded from northeast to southwest during two primary phases (Matteo, 1981). A high-constructive delta is one that is dominated by fluvial processes and is continually prograding basinward. A high-constructive delta may also be subject to high frequency multiple lobe abandonment and lobe switching. This original interpretation was based on the widespread coal beds that were thought to have formed during multiple destructive phases that punctuated the delta progradation cycles. Peat deposition was first suggested to have occurred during delta progradation within the large interdistributary bays and within the distributary channels during channel abandonment. Later interpretations suggested that the peat was deposited within a widespread coastal marsh during a largescale delta-system abandonment. However, studies of modern systems suggest that economically viable coal forming peat is not deposited close to clastic deposition and may be separated from underlying strata by a significant hiatus (McCabe, 1984). The high influx of clastic sediments into the interdistributary bay cause the peat, and subsequent coal, to have a ash content that is too high for economical coals to form (McCabe, 1987; Hobday, 1987; Cohen et al, 1987).

The depth of the water into which the Hartshorne delta system prograded was relatively shallow and there is compelling evidence for a strong wave influence in the form of extensive mud rip-ups and eroded bedding surfaces (Andrews, 1998). The Hartshorne delta morphology is thought to be lobate, which also indicates the influence of wave action. Sources of Hartshorne are believed to include the Ozark Uplift to the north-northeast, the Ouachita Mountains to the south, and other sources to the east (Andrews, 1998).

The Lower Member (including all undivided Hartshorne north of the Coal-Split Line) represents the initial phase of deltaic sedimentation. The Lower Hartshorne Coal (and the undivided Hartshorne Coal north of the coal-split line) represents either widespread delta abandonment or an unrelated flooding event during a subsequent sea level rise. The Upper Member represents a second phase of deltaic deposition (Houseknecht et al, 1983). The Upper Hartshorne delta appears to have prograded into shallower water. Deltaic facies within the Upper Hartshorne are more poorly developed and thinner than in the Lower Hartshorne Member. There is no strong evidence for the presence of a major prodelta package within the Upper Hartshorne.

In Arkansas, the Hartshorne Formation consists of a single member, that is believed to be correlative with the Lower Hartshorne Member of the study area. In the eastern part of the Arkoma Basin in Arkansas, the Hartshorne Formation is composed of three channel sandstone bodies that merge in western Arkansas (Housknecht, 1983). These are interpreted to be fluvial and deltaic distributary channels. They are as much as

120 feet thick and 3 to 9 miles in width. Matteo (1983) explains that local differential subsidence of mud/shale below and adjacent to the active distributary created a cycle of continuous sand deposition and subsidence that resulted in the development of these thick distributary channels. They are separated by strata that are interpreted to to be the result of deposition in extensive interdistributary bays. As the Hartshorne extends into the Oklahoma side of the Arkoma Basin, it becomes two linear sandstone trends that are thinner and less widely distributed than the three to the east. As the channel sands decrease in width, the interdistributary bays increase in area. This trend continues into the western side of the Arkoma, where the interdistributary deposits are more widespread than the channel sandstones. Houseknecht et al (1983) also noted that the prodelta facies in the western Arkoma Basin is similar to that in the eastern portion of the basin, but that delta front facies are thin or absent. Within this deltaic model all sandstone bodies that exhibited characteristics of a fluvial nature were considered to be distributary channels deposits of the delta plain facies. Houseknecht et al (1983), Matteo (1981), and Fields (1987) interpret the Upper Hartshorne distributary channels as being spatially distributed directly on top of and adjacent to distributary channels of the Lower Hartshorne Member.

A second model proposed is that of a deltaic system with an entrenched distributary or fluvial system (Figures 11 and 12). This model is a modification of the purely deltaic model of Houseknecht et al (1983) and is proposed to account for the relationship of the thin deltaic sediments and the abnormally thick linear sandstone bodies or trends that had been classified as distributary channels. This model is proposed with the idea that tectonic uplift within the active Arkoma Basin caused the distributary channel to erode into the older deltaic sediments.

Andrews (1998) redefined the Hartshorne depositional model within a sequence stratigraphic framework (Figures 13 and 14). This third model suggests that a drop in sea level and the formation of an incised valley and correlative unconformity or sequence boundary, punctuated each of the two primary delta cycles. This phase was followed by a rise in sea level and flooding, the extent of which is important when considering the formation of the Hartshorne coals. The overall system of deposition remained same and contained two phases of delta progradation. The primary difference between the older model of Houseknecht et al (1983) and the Andrews (1998) model was the inclusion of an incised valley and subsequent valley fill in the latter model. The multiple incised valleys are believed by Andrews (1998) to have formed after each Hartshorne delta progradation represented by the Upper and Lower Hartshorne Members. Andrews (1998) redefined the thick distributary channel sands of Houseknecht et al (1983) as being incised valley channel sands that were deposited as a result of a major regressive event. The implications of this are twofold: 1) it would suggest a relative drop in sea level after each phase of delta deposition, and 2) sediment transported through the incised valley would be deposited elsewhere, thus implying that a significant downdip accumulation of sediment occurred if the sea level fall was sufficient enough to allow for sediment bypass (Andrews, 1998). Andrews (1998) describes the thick sandstone bodies as being "falling stage deposits" of an incised valley system, and suggests that the basic model of incised valley fill architecture does not apply, as the transition upward from fluvial to estuarine

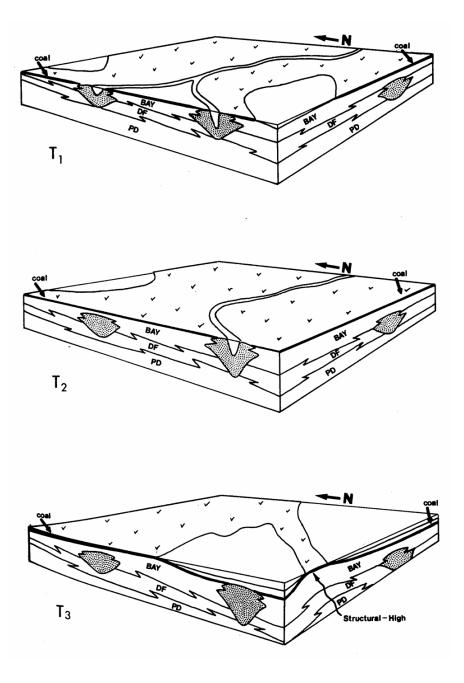


Figure 9: Deltaic Model, Lower Hartshorne deposition (from Matteo, 1983)

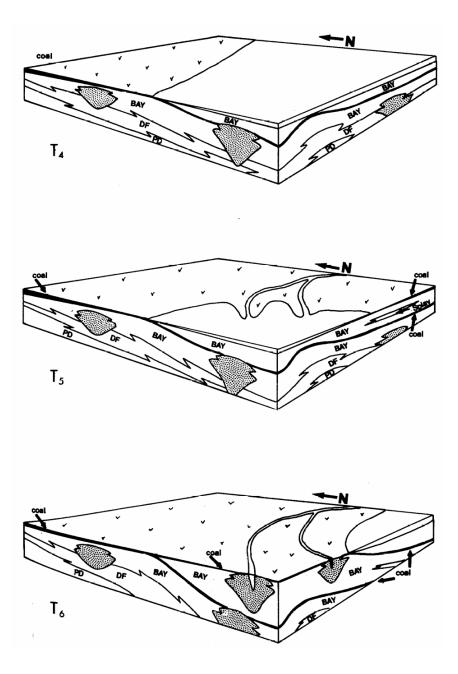
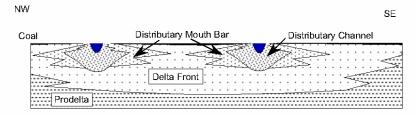


Figure 10: Deltaic Model, Upper Hartshorne deposition (from Matteo, 1983)



To1 - Initial Lower Hartshome delta progradation

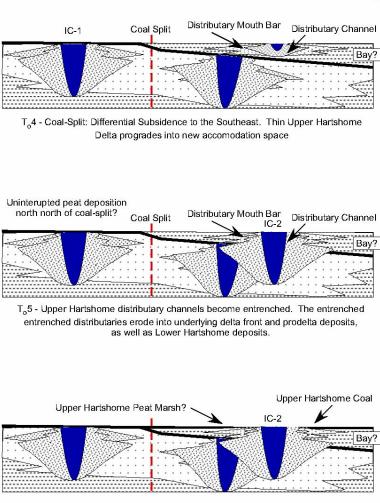
IC-1	IC-2 (Lower Hartshorne?)

 ${\rm T_o2}$ - Entrenchment of distributary channels into the underlying delta front and prodelta deposits.

Peat Marsh	

 $\rm T_{\rm o}3$ - Regional delta abandonment and development of a widespread peat marsh.

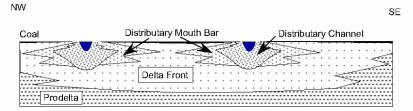
Figure 11: Lower Hartshorne delta cycle (Entrenched Distributary Model) illustrating distributary entrenchment as the origin of the thick sandstone trends (IC-1 and IC-2)



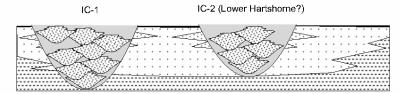
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 $\rm T_o6$ - Widespread delta abandonment and development of Upper Hartshorne peat marsh system.

Figure 12: Upper Hartshorne delta cycle (Entrenched Distributary Model)) illustrating distributary entrenchment as the origin of the thick sandstone trends (IC-1 and IC-2)



T1 - Initial Lower Hartshornedelta progradation



T2 - Lower Hartshorne Incised Valley/Channel development. Andrews (1998) interprets the valley fill as falling stage deposits with some marine deposition.

 Lower Hartshome Coal

T3 - Marine transgression and flooding and development of a coastal? peat marsh system, possible hiatus between Lower Hartshorne Coal and Lower Hartshorne sandstones and shales.

Figure 13: Lower Hartshorne depositional model with incised valley development.

IC-1	Coal Split	Distributary Mouth Bar	Distributary Channel
			Bay?
		e to the Southeast. Thin new accomodation space	
Uninterupted peat deposition north north of coal-split?	n IC-1 ∎	IC-2 - Upper Hartsho	ome?
		R C	

T5 - Upper Hartshome Incised Valley (Incised Channel?) erodes through Upper Hartshome Delta and into Lower Hartshome sediments. IC-2 as mapped represents Upper Hartshome stacked on top of Lower Hartshome or Hartshome Undifferentiated or possibly Upper Hartshome Only.

Upper Hartshorne Peat Marsh?	Upper Hartshorne Coal

T6 - Transgression and flodding. Development of Upper Hartshome coastal? peat marsh system.

Figure 14: Upper Hartshorne depositional model with incised valley development.

deposition during valley flooding did not occur. Andrews (1998) model indicates the presence of downdip delta front deposition. In this model, the extensive coalbeds of both the Lower and Upper Hartshorne Members formed during the subsequent marine transgression, which would be similar to the coal formation during delta destruction (Matteo, 1981). It is also suggested that the coals may have formed concurrently with incised valley filling (Andrews, 1998). This would imply that the coal forming peat was deposited in a raised mire system, but would not explain the presence of coal directly above the incised valley fill deposits.

The widespread coal above the incised valley fill could result from a rise in sea level as rising base level would cause a rise in the ground water table; possibly creating a poorly drained peat marsh along the interfluves and even on top of the channel sandstones (Shanley and McCabe, 1994). The rise in sea level would create accommodation space, reducing the delivery of clastic sediment to the area to minimal amounts and allowing for the deposition of low ash peat that would form economical coal beds. The formation of peat marshes represents a relatively stable period within the Arkoma Basin (Suneson, 1998).

Suneson (1998) reported that Hendricks et al (1936) documented plant fossils and brackish to freshwater invertebrate fossils contained within the shale overlying the Lower Hartshorne coal in the eastern part of the Arkoma Basin. This was interpreted to represent lacustrine deposition. Hendricks et al (1936) also reported the presence of marine beds in the western part of the Arkoma Basin that were interpreted to have been deposited at the same time as the lacustrine deposits to the east (Suneson, 1998).

43

Paleocurrent analysis using various types of sedimentary structures including cross-bedding, ripples marks, and flow casts has been done by various workers including McDaniel (1968) and Matteo (1981). These paleocurrent analyses indicated a dominant northeasterly to southwesterly flow direction. The primary sediment source was to the northeast, probably the Ozark Uplift. Housknecht et al (1983) suggested that an even more distal northeastern source contributed some sediment and bypassed the Illinois Basin.

Each model is summarized as follows:

Deltaic Model

- 1. Lower Hartshorne delta progradation, peat deposited within interdistributary bays and above abandoned delta lobes.
- Lower Hartshorne delta abandonment, possible widespread peat marsh development.
- Differential subsidence, development of accommodation space in south part of basin.
- 4. Upper Hartshorne delta progradation, peat deposited within interdistributary bays and above abandoned delta lobes.
- 5. Delta abandonment. Possible widespread peat marsh development.

Entrenched Distributary Model

1. (T₀1) Progradation of the Lower Hartshorne Delta System

- 2. (T_02) Small sea level fall or tectonic tilting event that caused distributary channels to incise their course, but no major basinward shift of facies. Distributaries became entrenched.
- (T₀3) Regional delta abandonment or small sea level rise. Development of widespread peat marsh (Lower Hartshorne Coal)
- (T₀4) Differential subsidence between the north and south parts of the Arkoma Basin. Possibly caused by tectonic activity. Progradation of Upper Hartshorne delta system south of the coal-split line.
- (T₀5) Small sea level fall or tectonic tilting event that caused Upper Hartshorne distributary channel entrenchment into underlying delta front and prodelta deposits, as well as Lower Hartshorne deposits.
- (T₀5) Delta abandonment or small sea level rise and flooding. Development of the Upper Hartshorne peat marsh.

Incised Valley Model

- 1. (T1) Lower Hartshorne delta progradation
- (T2) Fall is sea level and formation of Lower Hartshorne incised valley/channel system. Possible development of sequence boundary.
- 3. (T3) Rise in sea level and development of regional peat swamp/marsh, resulting in the deposition of the peat precursor to the Lower Hartshorne Coal. The development of the coal underclay (palsosol) indicates a significant depositonal hiatus.

- 4. (T4) Differential subsidence occurred within the Arkoma Basin, creating new accommodation space in the southern part of the basin for the progradation of the Upper Hartshorne delta system.
- 5. (T5) Fall in sea level and subsequent development of an incised valley/channel system and possible sequence bounding unconformity.
- (T6) Rise in sea level and development of widespread peat marsh and deposition of peat precursor to Upper Hartshorne Coal.

Deltaic Facies of the Hartshorne Delta System

Prodelta

The uppermost part of the Atoka and the lowermost part of the Hartshorne Formation (below the lowermost sandstone) are believed to represent the prodelta facies of the Hartshorne delta system. The prodelta is composed of dark gray shale and abundant fossils and fossil debris. Although the uppermost part of the Atoka Formation is considered to be predominantly marine and representative of the prodelta part of the Hartshorne delta system, Donica (1978) reported that there were thin coalbeds present in the upper Atoka in LeFlore County, Oklahoma (Suneson, 1998). Oakes (1977) also reported coal within the Atoka in Muskogee County, Oklahoma (Suneson, 1998). This would indicate that there may have been some non-marine deposition within the uppermost Atoka, possibly concurrent with marine deposition. In the western part of the Arkoma Basin, the Hartshorne is believed to conformably overlie the Atoka Formation. However, there are instances where an unconformable relationship apparently exists between the Hartshorne and Atoka. This unconformable relationship is the result of the erosion by Hartshorne channels (possible incised valleys) through the delta front and into the Atoka prodelta deposits.

Delta Front

The Hartshorne delta fringe, recognized by Houseknecht et al (1983) as the distalbar, represents the transition from proximal prodelta deposition to delta front deposition.

Delta front, or marine deposits, of the Hartshorne Formation are typically very fine to fine grained, and often exhibit an apparent upward increase in grain size on wireline logs (Figure 3). Delta fringe or distal delta front deposits are typically highly indurated with silica cement (Houseknecht et al, 1983; Andrews, 1998) and are low porosity and permeability. Within the study area, sandstone interpreted to be distal delta front has lower porosity. The lower portion of the delta fringe is composed of laminated and shaly siltstone and sandstone. The upper part is lenticular and flaser bedded, ripple cross-bedded, siltstone and sandstone (Figure 15) (Houseknecht et al, 1983). The base is transitional with the underlying prodelta facies. The delta front sandstone contains horizontal burrows (Figure 16).

The proximal delta front is represented by the distributary mouth bar subfacies and may grade laterally into the distributary channel facies, making it difficult to distinguish between the two.



Figure 15: Laminated shaly siltstone and sandstone of the distal delta front. The gamma ray profile on an electric log would have a very "dirty" or shaley response with a ragged deflection from the shale baseline.



Figure 16: Example of horizontal burrows found at the base of a thick (3 foot) sandstone within the upper delta front deposits.

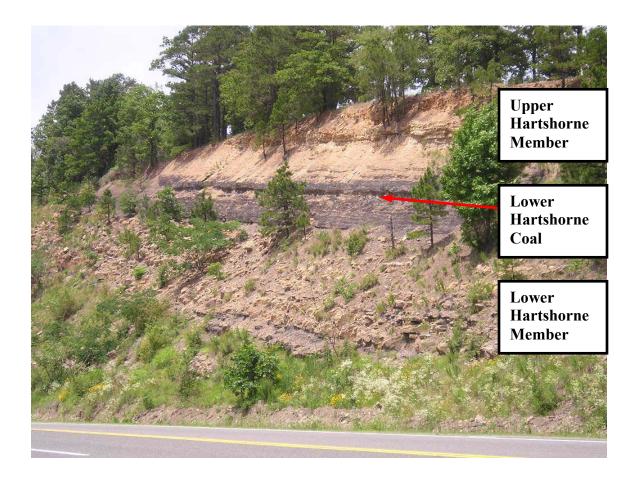


Figure 17: Roadcut south of Heavener, Oklahoma. Exposure includes the Lower Hartshorne Coal, as well as both the Lower and Upper Hartshorne Members.

Delta Plain

In the Hartshorne delta system, the distributary channels appear to bifurcate, creating an anastomosing channel system. This is a common theme in many shallow water deltas and the result of the development of immature levees and subsequent multiple crevassing. As the delta progrades and successive channels erode earlier ones, the characteristics of distributary channels become less deltaic and more fluvial.

Incised Valley Fill/Entrenched Distributary Channels

Valley fill deposits are an important facies within the Hartshorne, since their interpretation implies an additional depositional model. Reinterpretation of the Hartshorne by Andrews (1998) suggests that thick (80-200 feet) sandstone bodies are a result of falling stage deposition within an incised valley system. These sandstones were previously interpreted to be very thick distributary channel deposits by Matteo (1981), Houseknecht et al (1983), and Fields (1987).

Subsurface work by Andrews (1998) and this study suggest that these thick sandstones are genetically unrelated to the deltaic deposits into which they erode. In most cases incised valleys appear to erode through the delta plain and delta front facies and into the prodelta facies in the uppermost Atoka. The incision was likely the result of a decline in sea level. This scenario implies that the boundary between the incised valley fill and the underlying Hartshorne delta deposits represents an unconformity and sequence boundary. Consequently, the Hartshorne may be composed of two sequences, not simply two progradational deltaic cycles.

Hartshorne Coal

Peat, the sedimentary precursor to coal, is deposited in a wide variety of depositional environments. These include, but are not limited to, locations proximal to clastic deposition such as interdistributary bays, floodplains adjacent to river systems, back barrier lagoons and marshes. More often, significant peat deposition occurs away from clastic deposition and results in higher quality (low ash, low sulfur) coal (McCabe, 1987). Fisk and McCabe (1987) suggest that interdistributary bays, such as those found

within the Mississippi Delta, are poor locations for economically important peat deposition because of the high ash content, which measures up to fifty-five percent. They also suggest that leaching during early diagenesis could lower the ash content. Ash content of Hartshorne coal beds ranges from three to fifteen percent (Suneson, 1998). Suneson (1998) also reported average sulfur content for the Hartshorne coals of 0.5 to 4.2 percent. The Lower Hartshorne Coal and Upper Hartshorne Coal have similar ash contents, but the lower coal contains less sulfur than the upper coal (Suneson, 1998 and Friedman, 1974).

In the northern part of the Arkoma Basin, the Hartshorne Coal is represented by a single laterally extensive coal bed, which is considered to be top of the Hartshorne Formation. To the south, this coal bed appears to split into two mappable coal beds (Figure 5). This coal-split has resulted in the division of the Hartshorne into two members, Upper Hartshorne and Lower Hartshorne. The two coals, which have been termed the Upper Hartshorne Coal and Lower Hartshorne Coal, represent the top of each of these members. This coal-split can be seen in subsurface logs (Wells #9, 10, and 11 on Cross-Section F-F', Plate 24) and the trend of the coal-split line can be traced (Plate 16). The genesis of the coal-split is believed to be a result of regional differential subsidence within the Arkoma Basin. The Lower Hartshorne Coal is well exposed in a roadcut south of Heavener, Oklahoma (Figure 17)

The differential subsidence model suggests that during or after the initial Lower Hartshorne delta cycle, the southern part of the Arkoma Basin subsided, while the northern part of the basin remained relatively stable. This subsidence created a shallow basin into which the second (Upper) Hartshorne delta prograded. Matteo (1983)

52

suggested that during Upper Hartshorne time, the peat marsh north of the coal-split line remained active and that the upper part of the undivided Hartshorne Coal in the north formed during the Upper Hartshorne, and is chronostratigraphically equivalent. The single coalbed north of the coal split is consistently thicker (4-8 feet) than either of the individual coals (1-6 feet) south of the coal-split. Rieke and Kirr (1984) reported that the "undivided" Hartshorne Coal north of the coal-split contains a persistent black shale parting that is approximately 1 inch thick. This shale may indicate a break between deposition of Lower and Upper Hartshorne peats. A "bony" coal layer (possibly the equivalent of the black shale parting) has been identified within the Hartshorne Coal north of the coal split and may represent a break in peat deposition during the transition from Lower to Upper Hartshorne. Hamilton and Tadros (1994) reported that bone coals form as a result of excessively wet periods of time within the peat marsh. During this wet period pH of the swamp waters increases, resulting in enhanced bacterial decay of the peat and release of mineral matter to the marsh (Hamilton and Tadros, 1994). Rieke and Kirr (1984) also reported that the Lower Hartshorne Coal is underlain by a thin underclay laver. Houseknecht et al (1983) also reported that the marsh-swamp facies of the Hartshorne contained a "rooted mudstone." This mudstones or underclay as is described as being 0 to 40 cm thick and containing "abundant root traces and macerated plant debris." It is not known if this is the same underclay that Cecil et al (2003) reported as a paleosol. If this underclay is indeed a paleosol, it may indicate a significant hiatus between the deltaic and/or incised valley fill phase and a later peat deposition phase. This hiatus could be very important to interpreting the Hartshorne within a sequence stratigraphic framework. Shanley and McCabe (1994), in referencing Coleman (1966)

and Tye and Kosters (1986) imply that a rise in base level, such as a transgressive event, would result in a rise in the groundwater table. This would create poorly drained areas (swamps or mires) around the valley margins (Shanley and McCabe, 1994), and on the interfluves between incised valleys.

It is generally accepted that the Lower Hartshorne Member identified south of the coal-split line is equivalent to the undivided Hartshorne located to the north of the line. The Upper Hartshorne Member is only present south of the coal split line, except for one instance where it is reported north of the coal-split line by Andrews (1998). Localized coal stringers are associated with some thick, amalgamated channel sandstone complexes. These likely formed from peat deposited within abandoned meanders or other limited bogs associated with the channels. Fields (1987) identified a thin coal seam in the thick sandstone that was cored in the Hunt-Garrett #1 (Section 34-T.6N.-R.13E).

The Lower Hartshorne Coal is laterally extensive, suggesting that suggesting that the peat was deposited during a widespread delta abandonment phase or widespread marine incursion at the end of Lower Hartshorne deposition. The Lower Hartshorne Coal (Hartshorne Coal north of the coal-split) overlies the Lower Hartshorne interval throughout the basin and thins or is absent only in localized areas.

Both the Lower and Upper Hartshorne Coals are now grouped with and assumed to be genetically related to their underlying sandstone and shale intervals. Each coal is interpreted by Housknecht et al (1983), Matteo (1981), and Andrews (1998) to represent the final phase of its respective depositional cycles. There is a school of thought that would suggest that the Hartshorne Coals represent the beginning of a cyclothem (Cecil et al, 2003). A thin "underclay" layer below the coal would suggest a prolonged exposure and development of a paleosol. The Desmoinesian Croweburg Coal of eastern Kansas is interpreted to unconformably overly a paleosol (Cecil et al, 2003). Cohen et al (1987) suggests that modern back-barrier salt marshes and lagoons are inadequate locations for the deposition of economically viable coal forming peats due to the proximity to active clastic deposition. Sohen et al (1987) suggests that peat deposited within this environment would form "thin lenses of high sulfur, high ash" coal. Cohen et al (1987) and McCabe (1987) both describe the Okefenokee Swamp, located far inland from the current coastline, as a location active deposition of high quality peat (that if preserved, could later form economic coal seams) that overlies Pleistocene age beach ridges and lagoonal salt marshes. They both suggest that this subtle unconformity would, if buried and preserved, would be difficult to distinguish in the rock record and the coal would probably be interpreted to be formed within the barrier bar depositional system within back barrier lagoons and marshes. McCabe (1987) suggested "In some case, the overlying strata may be more genetically related to a coal than underlying strata." A more intensive examination of the genetic relationship of the Hartshorne coals and the adjacent siliclastic deposits is highly recommended. Figures 18 and 19 show the relationship of the coal and the underlying underclay. These photographs were taken at a roadcut located 1.5 miles south of Heavener, Oklahoma on State Highway 59.

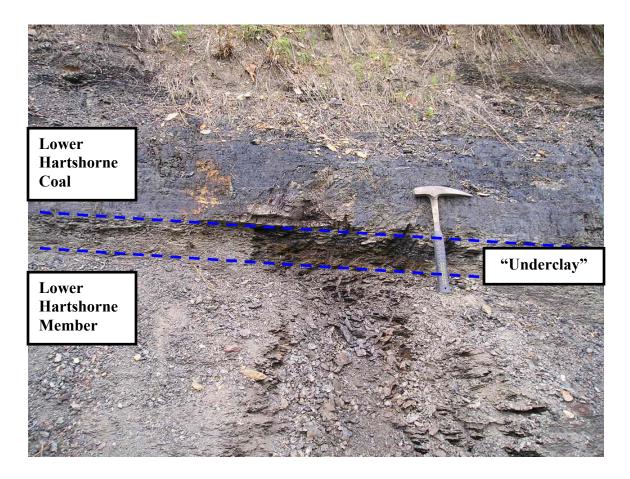


Figure 18: Relationship of Lower Hartshorne Coal to the subjacent thin underclay that shows some evidence of paleosol development. Heavener roadcut, 1.5 miles south of Heavener, Oklahoma.



Figure 19: Close up photograph of the Lower Hartshorne Coal underclay. Note yellow mottling, indicative of root traces and evidence for paleosol development.

Discussion of the Hartshorne Depositional Model as Applied to the Study Area

Within the study area, the Hartshorne Formation is composed of sandstone, shale and coal that formed from sediments deposited within a fluvial-dominated deltaic system during what are interpreted as multiple phases of progradation, entrenchment, and abandonment. Thick shale of the uppermost Atoka and lowermost Hartshorne are believed to represent the prodelta facies. Delta front facies, including distributary mouth bar and bar crest subfacies, are present within the study area, but are not as widespread as other facies (Plate). Delta plain facies are the most abundant within the study area and include distributary channel, interdistributary bay, and crevasse splay subfacies. The overall sandstone geometry and facies distribution of the Hartshorne within the study area was determined using two gross sandstone isopach maps (Plate 3 and 4) and multiple cross-sections (Plates 18 thru 26). The most important feature; one that is most telling about the history of the Hartshorne delta system, is the coal-split that occurs within the Hartshorne Formation. As indicated in the section on stratigraphy, the coal-split line defines the boundary where the Hartshorne Formation can be divided into the Upper and Lower Hartshorne Members. The Lower Hartshorne Coal represents the top of the Lower Member south of the coal-split line, whereas the Upper Hartshorne Coal represents the top of the Upper Member and top of the Hartshorne Formation south of the coal-split line. Within the study area, the split between the Upper Hartshorne and Lower Hartshorne Members is easily mapped as a northeast-southwest trending line (Plate 16). The coal-split is illustrated in Cross-Section H-H' (Plate 26). Northwest of this line only the Lower Hartshorne Member is present and the Hartshorne Coal is undivided.

Southeast of the coal-split line, both members are present and can be mapped separately, except where there is thick fluvial succession or incised valley fill sandstones. The overall Hartshorne interval thickens from the north-northwest to the south-southeast, as do the overlying McAlester Formation and underlying Atoka Formation. This is a result of the basin geometry and increased subsidence to the south. The differential subsidence that occurred between the areas north and south of the coal-split line may have been structurally induced, as normal faulting is common and influence sediment thickness in the Atokan Series (Zachry and Sutherland, 1984).

Within the study area, there are two thick sandstone bodies that trend from the northeast to the southwest. These sandstone bodies are composed of a thick succession of fluvial deposits that were first interpreted by earlier workers as distributary channel facies of the delta system (Housknecht et al, 1983). Andrews (1998) reinterpreted these thick sandstones as falling stage fluvial deposits of an incised valley system that formed as a result of a drop in sea level. Based on mapping and cross-section work, fieldwork, and past core studies it is apparent that these thick sandstone bodies represent a significant change in the depositional system. It is possible for distributary channels to entrench very deeply into the underlying sediment, even into the prodelta mud. This is often not a result of eustatic drop in sea level, but rather a local or regional change in stream discharge, often a result of tectonic uplift or climatic changes (Schumm and Ethridge, 1994; Zaitlin et al, 1994). The northern incised valley, or entrenched distributary channel, (Incised Channel, IC-1) is generally accepted to be Lower Hartshorne only, as it is north of the coal-split line. The southern incised valley, or entrenched distributary channel (Incised Channel, IC-2) is generally thought to be

composed of Lower Hartshorne overlain by Upper Hartshorne. The division of this interval was based on a shale bed that separates the "Upper Hartshorne Sandstone" from the underlying "Lower Hartshorne Sandstone." In this study, the southern incised valley/entrenched channel (IC-2) was mapped as Hartshorne undifferentiated.

The Lower Hartshorne Member contains prodelta, delta front, and delta plain facies, as well as a possible entrenched distributary or incised valley-fill facies. It is considerably thicker than the Upper Hartshorne Member. It ranges from approximately 60 feet thick to more than 200 feet thick. The Upper Hartshorne Member only reaches approximately 60 feet of total interval thickness within the study area. This occurs in the southern area, away from the coal split line. It appears that the only recognizable deltaic facies within the Upper Hartshorne is delta plain facies, which consists of shale that contains thin (2-4 foot thick) sandstone lenses. As stated before, the upper part of the southern incised valley fill/entrenched channel deposit (IC-2, mapped as Hartshorne Undifferentiated) may be Upper Hartshorne distributary channel facies or incised valley fill facies. The accommodation space created by the subsidence of the Lower Hartshorne Delta did not create the depth required for deposition of a complete delta succession.

Matteo (1981), Houseknecht at al (1983), Suneson (1998), and Andrews (1998) interpreted the Lower and Upper Members as two distinct deltaic cycles, punctuated by marine flooding and delta destruction. They suggest that peat formation occurred at the end of Lower Hartshorne deposition, as marine waters drowned the former delta during the transgressive phase. Peat deposition may have continued north of the coal-split throughout Upper Hartshorne deposition.

Lower Hartshorne Member

The Lower Hartshorne Member is interpreted to be correlative to the undivided Hartshorne that lies to the north of the coal split line. At some point, differential subsidence created a topographic low into which the Upper Hartshorne delta complex is thought to have prograded. The Lower Hartshorne Member is the thickest, more widespread, and complex of the two. The Lower Hartshorne Member represents the initial delta depositional cycle, during which there seems to have been several cycles of deltaic sedimentation. As the result of lobe switching and localized subsidence, proximal delta front and delta plain deposits overlie more distal facies. Consequently, the electrofacies patterns indicate that distal facies grade upward to proximal facies. The Lower Hartshorne Member thickens from northwest to southeast toward the Arkoma depocenter. The strike of the trend of sediment thickening and the coal-split parallel the strike of the major structural features within the Arkoma Basin.

Prodelta

The uppermost part of the Atoka Series represents distal prodelta deposition and is composed primarily of shale. Within the northeastern part of the study there is a locally occurring sandstone in the uppermost Atoka, that is believed to be the Gilcrease Sandstone of economic usage. The contact between the Hartshorne and the Atoka appears to be conformable in the study area and is not easily discernable. In the northwestern part of the study area, the contact is represented by a shift in the resistivity that is evident on wireline logs. This marker is mappable throughout most of the study

61

area, but becomes hard to identify in the southern area, where thick channel sands were deposited.

The proximal prodelta/distal delta front transition is most likely represented by the lowermost portion of the Lower Hartshorne Member and comprises what others have termed the transitional facies. It represents a time during delta evolution when increasing amounts of coarser silt and very fine-grained sand was introduced into the prodelta subsystem as the delta prograded. The prodelta facies is not represented on the facies map (Plate 17).

Delta Front

The proximal prodelta deposits grade upward into the distal delta front deposits, which are indicated on wireline logs by an increasing thickness and frequency of sandstone. The delta front facies can be seen in well log 3 in Cross-Section B-B' (Plate 20) and in most wells in the attached cross-sections as the transitional zone between the prodelta shale of the uppermost Atoka Formation and lowermost Hartshorne Formation. Sand content increases upward as the delta progrades. As progradation continued, proximal delta front sediments accumulated on those of the distal delta front. Matteo (1981), Houseknecht et al (1983), and Andrews (1998) have stated that the delta front of the Lower Hartshorne Delta is difficult to identify and may be thin to not present within the study area. The proximal delta front is represented by a very distinct coarsening upward signature on the gamma ray curve. It is typically 20 to 30 feet thick, and may be mistaken for crevasse splay deposits. This is not unusual, as the process of crevassing along a distributary channel is part of the delta building process and crevasse splays may

become new delta lobes. Differentiation between delta front and distributary mouth bar facies is made more difficult as higher frequency sea level changes are imprinted upon the larger delta progradation. This can be seen as a shallowing upward cycle, followed by a deepening upward one, which is succeeded by another shallowing upward cycle. This pattern is evident in outcrop (Figure 20) as well as in electric log profiles (well log #5, Cross-Section C-C', Plate 15). These cycles seem to increase in number and thickness in the southern part of the study area where the overall section is thicker. Well log #11 in Cross-Section C-C' is an example of multiple cycles within the Lower Hartshorne. Log signature indicates delta front and distributary mouth bar electrofacies as well as channel facies.

Distributary Mouth Bar and Bar Fringe

The distributary or channel-mouth bar electrofacies is recognized by a blocky to slightly upward coarsening profile on the gamma-ray curve. The distributary mouth bar is adjacent and subjacent to the distributary channel deposits, as show on the facies map (Plate 17) and in various cross-sections. The channel-mouth bar represents the transition from channel to delta front, and is deposited immediately headward of the channel as the delta progrades. In some cases, it becomes difficult to distinguish between channel and channel-mouth bar electrofacies. Well log #2 in Cross-Section E-E' (Plate 23) is a good example of what is interpreted to be distributary mouth bar facies that is overlain by a Type-1 channel. In well log #2 in Cross-Section B-B' (Plate 20) the sandstone has been interpreted to be channel-mouth bar, but could represent the margin of a Type-1 Channel.

In well log #1 in Cross-Section F-F' (Plate 24) the distributary mouth bar appears to be overlain by interdistributary bay and crevasse splay deposits of the delta plain.

Delta Plain

Within the western part of the Arkoma, including this study area, the delta plain is composed of widespread interdistributary bays crosscut by thin, bifurcating distributary channels. These bays are typically muddy, except where overbank deposits and crevasse splays spilled out into the delta plain. The distributary bay facies is not the most common facies interpreted for wells that penetrated the Hartshorne Formation, but it is widespread and present between the narrow trends of the channel/bar/delta front, as well as superposed on abandoned distributary and crevasse splay/delta front deposits.

Distributary Channel Sandstones

The interpretation of distributary channel facies is problematic. Within the study area, three different types of channels are identified. The first two are defined as distributary channels primarily on the basis of their relationship to other deltaic facies. The third type was originally defined by Matteo (1981) and Houseknecht (1983) as distributary channels, but were redefined by Andrews (1998) as incised valley fill or entrenched channel deposits. Based on the gross sandstone isopach map and crosssections, this third channel type appears to be unrelated to the deltaic facies. Deposits interpreted to be distributary channels are divided into two categories: i) Type-1 Distributary Channels, and ii) Type-2 Distributary Channels (Figure 21). Type-1 distributary channels tend to be located near the top of the Lower Hartshorne interval and are 3 to 15 feet thick. Type-1 channels appear to be closely related to sandstones that are

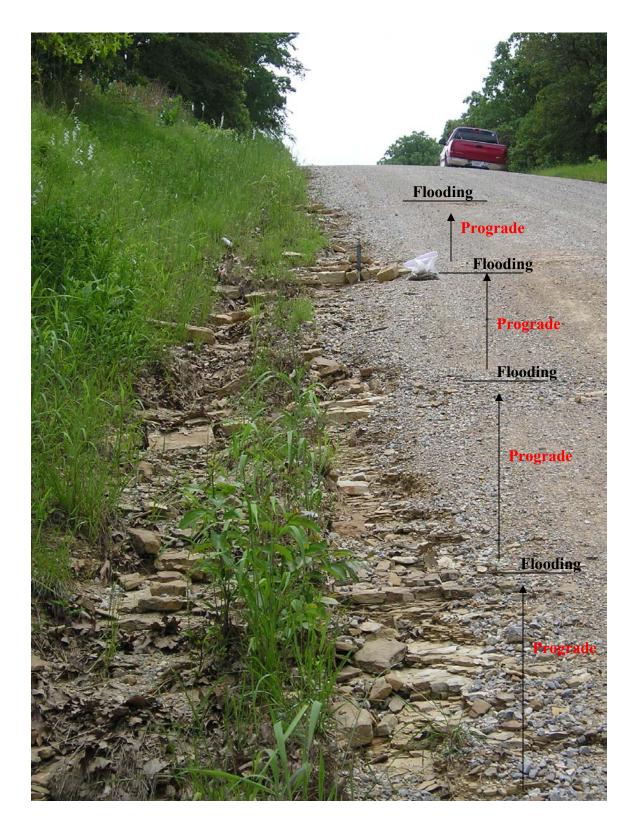


Figure 20: Example of multiple high-frequency sequences within the delta front to distributary mouth bar facies of the Hartshorne delta system. The cycles are actually about the same thickness as they increase in distance away from the camera up the hill.

A' (Plate 13) are examples of Type-1 distributary channel deposits. They have a blocky to fining upward profile on the gamma ray curve. Type-1 distributary channels can be difficult to distinguish from the channel mouth bar and may represent the bar crest portion of the distributary mouth bar, and despite their apparent fining upward log pattern. Type-2 distributary channels are easily identified because they appear to erode through Type-1 channels and distributary mouth bar deposits and into the delta front.

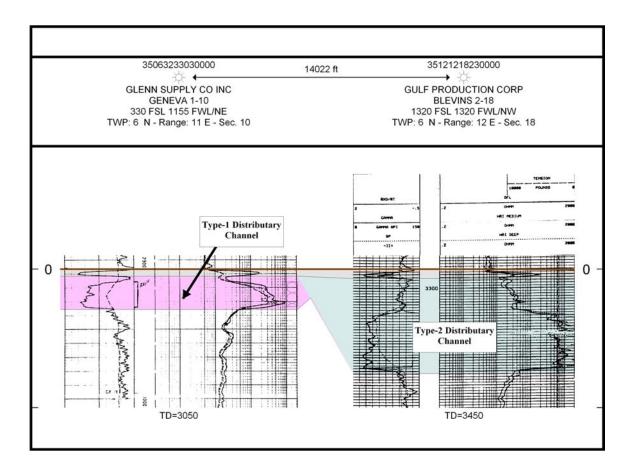


Figure 21: Example of Type-1 and Type-2 Distributary Channels.

This entrenchment of the Type-2 distributary channel may represent the initial erosion associated with an incised valley/entrenched channel system. A second interpretation could be that the Type-2 distributary channel deposits are older than the Type-1 distributary channel deposits, based on their stratigraphic position relative to each other. Type-2 channels sandstones have a blocky to fining-upward profile on the gamma ray profile, but are thicker than Type-1. Type-2 channel sandstones always exhibit a very sharp and probably erosional base. Type-1 channel sandstones may have a sharp base, but are often directly underlain by coarsening upward sandstone that is interpreted to be the distributary mouth bar facies. Type-2 distributary channels are from 20 to 50 feet thick and always overlain by abandonment phase deposits or bay fill deposits with possible crevasse splay sandstones. Well log 7 in Cross-Section B-B' (Plate 14) is a very good example of a blocky Type-2 distributary channel deposits overlain by bay fill deposits, including possible crevasse splay sandstones. This well, the Davis Operating Company Donna #1-16, is located in South Pine Hollow field and has produced significant quantities of gas. Well log 2 in Cross-Section C-C' is another example of what has been interpreted to be a Type-2 channel deposit, as evidenced by the sharp base and fining-upward gamma-ray profile. This well, the Unit Petroleum Company Duncan #1, is more than 10 miles north of the Donna #1-16. The overall interval is thinner in the northern part of the study area and the channel sandstone evident in Duncan #1 is thinner than the one in the Donna #1-16. Well log 4 in Cross-Section F-F' is interpreted to contain channel margin deposits of a Type-2 channel. The entrenchment evident in this location may represent the initial onset of the development of the entrenched channel or incised valley system.

Crevasse Splay

Crevasse splay deposits are not easily recognized and may be mistaken for proximal delta front facies. Distinguishing crevasse splay deposits from proximal delta front (not distributary mouth bar or bar crest) relies on establishing the relationship of the sandstone in question to interpreted distributary channel and distributary mouth bar facies in offset wells. Crevasse splays are an important factor in delta lobe switching, as the splay itself is an incipient delta lobe that may develop further and lead to the flooding and destruction of the former active lobe (Galloway and Hobday, 1997). Wireline logs were closely scrutinized to establish sandstone body geometry. Geometry was integrated with distribution to identify depositional environments. As a result, crevasse splay and channel margin deposits were grouped as a subfacies of the delta plain facies. Crevasse splays occur within bay fill deposits overlying abandoned distributary channels, as is seen in well log 7 in Cross-Section B-B' (plate 14).

Lower Hartshorne Coal

The Lower Hartshorne Coal is present throughout the study area except where it was eroded by the southern incised valley/entrenched channel (IC-2). The Lower Hartshorne Coal is considered the equivalent of the Hartshorne Coal where there is no division between the Lower and Upper Hartshorne Members. It has been suggested that Hartshorne Coal deposition north of the coal split line continued, uninterrupted from Lower Hartshorne time into Upper Hartshorne time (Andrews, 1998; Matteo, 1981).

Because the Lower Hartshorne Coal is so widespread and found above the IC-1, it is likely that the peat did not form until after the transgression that followed incision.

Upper Hartshorne Member

The Upper Hartshorne Member is only present in the southern part of the study area (southeast of the coal-split line) and little or no sandstone is present within it. The Upper Hartshorne Member is believed to represent a second phase of delta progradation that followed the destructive phase of the Lower Hartshorne Delta System. The accommodation space created by the differential subsidence following deposition of the Lower Hartshorne was relatively limited compared to that which was present prior to Lower Hartshorne deposition. The Upper Hartshorne Member thickens to the southeast away from the coal-split, and the hingeline is represented by the regional trend of the Hartshorne Coal-Split. Within the study area, the Upper Hartshorne is mostly shale and believed to represent deposition within an interdistributary bay. There are very thin, 1 to 4 feet thick, siltstone or sandstone beds within the Upper Hartshorne Member, that may represent crevasse splay deposits. These sandstones seldom meet the "clean" sandstone cut-off of 50% that was used for gross sandstone mapping.

Prodelta

There is no strong evidence that supports the interpretation of prodelta deposits within the study area. Very thin prodelta may be present and not distinguishable from what are interpreted to be interdistributary bay deposits. Suneson (1998), in a field trip guide containing numerous measured sections south and east of the study area, presented

69

evidence for the presence of definitive prodelta deposition. Suneson (1998) reported marine shale at the base of the Upper Hartshorne Member, directly above the Lower Hartshorne Coal.

Delta Front

Delta front facies are rarely identified within the Upper Hartshorne in the western part of the Arkoma Basin. Houseknecht et al (1983) identified underdeveloped delta front deposits in the eastern part of the basin. In the Deer Creek #1 well located in Sec 24-T.5N.-R.13E., the Upper Hartshorne Member reaches its greatest thickness and shows some evidence of a coarsening upward electric-log profile as this coarseningupward interval capped by a shale, which is succeeded by a 3 feet thick sandstone, more shale, and finally the Upper Hartshorne Coal. This is the best example of a log profile within the study area that could be interpreted as the Upper Hartshorne delta front electrofacies

Delta Plain

The Upper Hartshorne Member contains sedimentary features and log profiles that suggest it is likely composed primarily of delta plain deposits. There is no evidence for Upper Hartshorne distributary channel deposits.

Incised Valley Fill/Entrenched Distributary Channel Complexes

The Lower Hartshorne and Hartshorne Undifferentiated Gross Sandstone Isopach Maps (Plates 6 and 7) indicate the presence of two thick sandstone trends that are oriented in a northeast to southwest. These are termed IC-1 (north) and IC-2 (south). These thick sandstones were first interpreted by Houseknecht et al (1983) as thick distributary channel sandstones that were part of the original Hartshorne delta system. Andrews (1998) modified the interpretation to include sequence stratigraphic concepts. This recent work resulted in the interpretation of these sandstone trends as incised valley fills that are separate from the delta system and the resulted of a major regressive event (Andrews, 1998). According to this model, incision occurred at the end of each of the Hartshorne deltaic cycles (represented by the Lower and Upper Hartshorne Members). A lowering in sea level resulted in the erosion of older deltaic sediments, and formation of incised valleys or entrenched channels. Andrews (1998) suggests that the sandstone within these valleys represents falling stage deposition.

The northern sandstone body, IC-1, is located north of the coal-split line, and by definition is Lower Hartshorne. Well logs 3 and 4 on Cross-Section C-C' illustrate the relationship between the incised valleys/entrenched channel complex of the IC-1 trend with adjacent Hartshorne deltaic facies in well logs 2 and 5 (Plate 15). This same illustration can be seen in Cross-Section E-E' (Plate 17). A gross sandstone map of the Lower Hartshorne clearly defines the IC-1 incised valley/entrenched channel trend (Plate #3). IC-1 is always capped by the (Lower) Hartshorne Coal; in places the coal sits directly above the sandstone. In other areas there is a shale break between the sandstone and the coal, indicating that at some point this channel or valley was abandoned. The

second thick channel sandstone trend, IC-2, is located south of the coal-split line. Previous workers have divided this channel into Upper and Lower Hartshorne. This separation was based on a shale marker within the channel fill that is not easily identified. Well logs 6 and 7 in Cross-Section C-C' and well logs 7 and 8 in Cross-Section F-F' are representative of sandstone within the IC-2 trend and its relationship to adjacent facies of the Hartshorne delta system. The division of the southern IC-2 sandstone may have been based on the presence of a thin coal bed within the channel fill that was assumed to be the Lower Hartshorne Coal. The coal within the channel fill does not directly correlate to either the Lower or Upper Hartshorne Coals. IC-2 is mapped as Hartshorne Undifferentiated, but the author acknowledges that it may contain Lower and Upper Hartshorne deposits.

It is clear from relationships evident on the cross-sections and sandstone maps that the IC-1 and IC-2 trends eroded through the primary deltaic deposits. The gross sandstone isopach map of the Lower Hartshorne Member confirms that both the northern (IC-1) and southern (IC-2) thick sandstone trends eroded older delta deposits, including Type-2 distributary channel deposits, which themselves may have eroded or entrenched into the delta plain. In Cross-Section G-G' (Plate 19), the Type-2 distributary channel is traceable on either side of the northern IC-1 trend. The two wireline logs on the left of cross-section are located northwest of IC-1, the two wireline logs on the right are located southeast of IC-1, and between IC-1 and IC-2. It stands to reason that incision would occur along the course of an active channel system. As incision occurred, the distributary channel system became entrenched and developed a very linear trend as the channel was no longer allowed to migrate laterally, nor develop crevasse splay lobes; two

processes that helped generate the anastomising channel pattern in the Lower Hartshorne Delta system.

Fields (1987) described core from the Hunt Garrett #1 (Section 34-T.6N.-R.13E.), which is located in South Pine Hollow Field. Two core intervals were taken, 3555 to 3561 feet and 3561 to 3601 feet. The overall core condition was poor. Fields (1987) interpreted this to be Upper Hartshorne distributary channel sandstone, stacked on top of Lower Hartshorne distributary sandstone. Neither the upper or lower contacts were cored. The location of the well is within the mapped IC-2 trend (Plate 5), which was mapped as Hartshorne Undifferentiated. The cored sandstone contains a variety of sedimentary structures including small scale trough cross-bedding, planar bedding, and contorted bedding (Field, 1987). The overall grain size is fine with a two-foot interval of very fine-grained sandstone at the base of the core (Fields, 1987). The sandstone contains black carbonaceous debris and plant fossils, which Fields (1987) suggests indicates that the Upper Hartshorne distributary channel cut through interdistributary bay deposits of the Lower Hartshorne. All cross-bedding indicates unidirectional flow and there was no evidence for marine deposition, although there was a thin coal bed reported in the lower part of the section. A thin coal bed near the base of the may be remnant of the Lower Hartshorne coal if IC-2 sandstone trend represents both Hartshorne Members, or it could simply be a coal stringer representing a short term phase of channel abandonment phase. No evidence was presented by Fields (1987) to suggest that IC-2 trend is an incised valley fill deposit.

Local Structure

To help evaluate the control of gas production two structure maps were constructed. The first defined the structural attitude of the top of the Lower Hartshorne Coal. The second structure map was constructed on the base of a hot shale marker above the Lower Hartshorne Coal. Several prominent structural features that have been mapped and noted by previous workers can be detected in the study area (Figure 22). This map shows that the Tonkawa Syncline and McAlester Anticline are two prominent structural features. Both have a general northeast to southwest trend and plunge. The contour patterns indicate a northeast to southwest structural trend, which coincides with the structural elements presented by Fields (1987). One fault was definitively identified in the southeastern part of the study area. Well control for structural interpretation was limited. Many wells that penetrated deeper than the Hartshorne did not contain wireline log measurements across the Hartshorne interval.

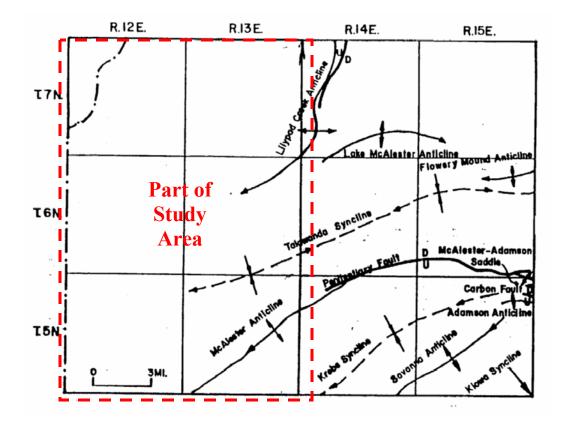


Figure 22: Map showing local structures that trend into the study area (from Fields, 1987).

CHAPTER IV

PETROLEUM GEOLOGY

Regional Overview

Delta systems are prolific habitats of petroleum throughout the world, and the Hartshorne delta in the Arkoma Basin is no exception. The study area is in a gas producing province and natural gas production from the Hartshorne Formation, including coalbed methane production, in the Arkoma Basin in Oklahoma is estimated to be 1.07 tef (trillion cubic feet). Production data could not be quality checked and may include gas from other reservoirs that is commingled Hartshorne production. Within the study area the Hartshorne (including commingled production) has produced in excess of 167 bef (billion cubic feet) from 259 wells, or an average of 0.836 bef per well. This is economically important considering that the average depth of the producing Hartshorne reservoir is only 3000 feet. The current daily production from the study area is 93 mmcfd (million cubic feet per day) from 202 active wells, or an average of 460 mcfd.

Volumetric Methodology

Volumetric calculations were performed to determine the recoverable original gas in place (recoverable OGIP) for each field. The volume of the reservoir was measured using the Net Pay Isopach Map for the Lower Hartshorne and Hartshorne Undifferentiated (Plates 9 and 11) using a porosity cut-off of 8% and a Sw (water saturation) cut-off of 40%. Areas within each contour interval were measured and subtracted from the area of the next lowest contour interval (Figure 23). The net pay value used for each volumetric calculation was the average between that contour interval and the next highest. For example, an average reservoir thickness of 12.5 feet (net pay) was used to calculate the volumetric parameters for the reservoir within the 10 feet contour interval. Similarly, 7.5 feet of net pay was used for the average thickness of pay for the reservoir within the 5 feet contour interval after the area of the 10 feet contour interval was subtracted from the area of the 5 feet contour interval (based on a 5 feet contour interval). The basic equation used in the calculation of Recoverable OGIP is:

(43.56 x Φ x (1-Sw) x A x (Net Pay) x Pi x Tsc x Rf) (Zi x Pa x T)

43,560 is the amount of cubic feet per acre (43.56 will result in Mcf/Acre) Φ - Porosity Sw – Water Saturation Net Pay – (Feet) – Porosity >8% and Sw <40% Pi – Initial Reservoir Pressure Psc – Standard Conditions or Atmospheric Pressure T – Reservoir Temperature in Rankin (460 + degrees F) Tsc – Surface Temperature in Rankin (460 + degrees F) Zi – Gas Compressibility at initial conditions Rf – Recovery Factor

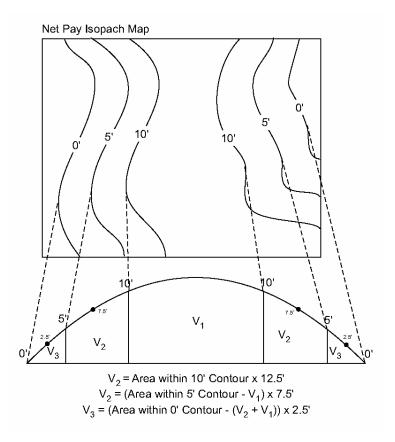


Figure 23: Diagram illustrating method used to determine reservoir volume.

Conventional Hartshorne Play

Four primary gas plays are identified within the study area. They include the (1) Distributary Channel, (2) Channel Mouth Bar, (3) Incised Valley Fill/Entrenched Channel, and (4) Coalbed Methane. All are defined primarily by their stratigraphic control (facies change or pinch-out of sandstone into adjacent shale). Gas is also produced from secondary or marginal plays. Secondary gas plays in the area include channel margin, bar fringe, delta front, and crevasse splay. Production from these facies is limited and economic potential is low. The production volumes that are reported from Hartshorne wells may include production from other reservoirs. As a result, there is some inaccuracy in the production values reported for the Hartshorne. In instances where

production is commingled and initial test rates are provided, the reader can assess the contribution from the Hartshorne. Most wells cited in this study mostly produce only from the Hartshorne Formation. There are also instances where production from the Hartshorne Coal.

The Incised Valley Fill/Entrenched Channel Play has provided the most prolific or highest volume wells. The average cumulative production from this play within the study area is 1.9 bcf (based on 60 wells). The northern IC-1 has produced from 21 wells, with an cumulative production of just over 1 bcf per well. The IC-1 contains a gas-water contact in the updip end of the channel that limits the reservoir volume (see the section below on Reams NW Field). On the downdip end of the channel, the Stuart Southwest Field also appears to be limited by a water leg. Both of these fields produce gas where the valley fill sandstone crosses a structural high. The southern IC-2 has produced over 93 bcf from 39 wells, or an average of 2.4 bcf per well. These wells are all contained within the Pine Hollow South Field, which also produces from the other Hartshorne Facies.

The distributary channel facies is the second best play within the study area. The Type-1 channel facies averages 0.63 bcf per well, based on 11 wells. This production may be closely tied to production from the Distributary Mouth Bar deposits that the channel sandstones appear to overly. The Type-2 Channel Facies Play has produced an average of 0.42 bcf from 43 wells. This production comes from sandstones that are classified as channel margin facies.

The average production per well from the distributary mouth bar facies is 0.29 Bcf. This volume may be slightly overstated as a result of commingling with the Booch Sandstone in the Scipio Northwest and Lamar East Fields. Excluding dry holes, the range of cumulative production values is from 2 mmcf to over 2 bcf per well.

The Delta Front Facies within the study area has produced an average of .15 Bcf per well. The delta front facies may also be referred to as crevasse splay deposits.

Deposits classified as channel margin have produced an average of 0.21 Bcf from 37 wells.

Coalbed Methane

The Hartshorne coals are exploited within the Arkoma Basin. Rieke and Kirr (1985) estimated the gas content of the Hartshorne Coals to range from 73 to 570 cubic feet/ton. The high range for Hartshorne Coal gas content is significantly greater than that of the Booch Coals (200 to 211 cubic feet/ton) and McAlestar Coal (131 cubic feet/ton) (Rieke and Kirr, 1985). Coals located in the eastern part of the Arkoma Basin have a higher gas content than those in the western part of the basin (Rieke and Kirr, 1984).

Several wells in the study area produce gas from Hartshorne coal seams. Most are commingled with production from the underlying Lower Hartshorne sandstone. One example of a coalbed gas well is the Ott #2-22 located in Section 22-T.5N.-R. 12E. This well is completed solely in the Lower Hartshorne Coal.

To date, no horizontal wells have been drilled for coalbed methane within the study area. There is, however, significant activity east of the study area in Latimer and Haskell Counties, Oklahoma. There is potential for the application of horizontal drilling technology to exploit the Hartshorne Coal. Further work should be done; including a regional study of the distribution of ash and sulfur content of the Hartshorne coals.

Detailed microstratigraphic work on the Hartshorne coals should be done to determine the type of vegetation that was present within the mires and swamps during the Hartshorne time.

Gas Field Summaries

Cabannis NW Field

The Cabannis NW Field, which was described in Andrews (1998), is located in Sections 12 and 13 of T.6N., R.11E. and Sections 7-9, 15-21, and 29 of T.6N., R.12E. (Figure 24). The field has produced in excess of 7.29 bcf (as of November 2003) from 21 wells. Drilling in the Cabannis NW Field began in 1979. The first well that produced from the Hartshorne was the Blevins #1-18 (Section 18-T.6N.-R.12E.), which was completed in September 1974 for an initial gas rate of 62 Mcfd, and has subsequently made 0.19 Bcf. The well produced from what is interpreted to be a Type-2 distributary channel sandstone.

The primary gas-producing reservoirs are Type-2 distributary channel sandstones of the delta plain facies and the distributary mouth bar and bar crest of the delta front facies. Gas is also produced from channel margin and bar fringe deposits. There is also production directly from the Lower Hartshorne Coal and cases where the coal gas is completed along with the sandstone and the production is commingled. The wells in the field are shallow, averaging about 3400 feet deep, and have an average cumulative production of 300 mmcf.

Structural control appears to be of minimum importance, the primary trapping mechanism is a change in lithofacies, as sandstone terminates against adjacent interdistributary bay and delta front shale. No gas-water contact is present in the field. Net pay values (based on a minimum of 8% porosity and a maximum of 40% water

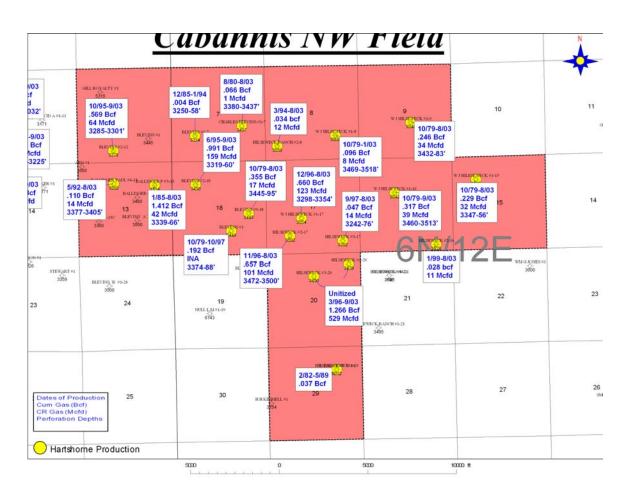


Figure 24: Hartshorne Production Map for Cabannis NW Field, Pittsburg County, Oklahoma.

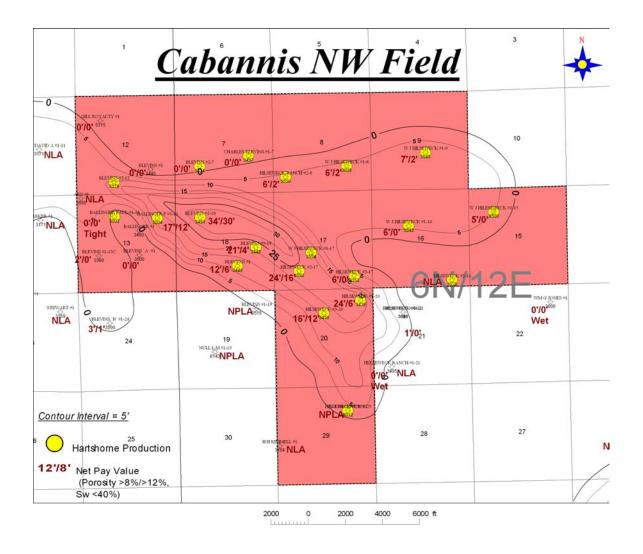


Figure 25: Lower Hartshorne Net Pay Isopach for Cabannis NW Field, Pittsburg County, Oklahoma (Countour Interval = 5 feet).

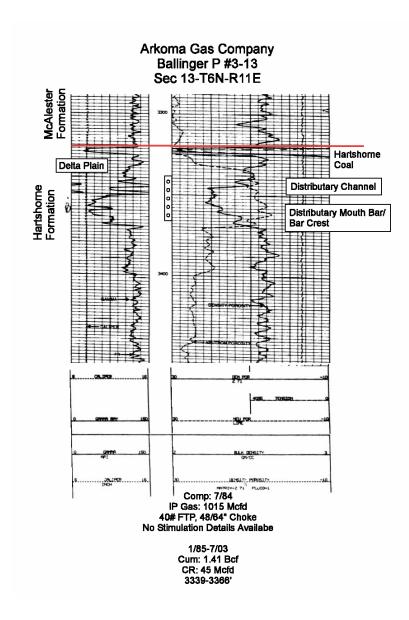


Figure 26: Example of productive distributary mouth bar/type-1 distributary channel succession, Cabannis NW Field, Pittsburg County, Oklahoma.

saturation) are as much as 34 feet within the main channel facies (Figure 25). Total gross sandstone thickness ranges from less than 10 feet to 42 feet.

The highest volume well in the field is the Ballinger 3-13 (Section 13-T.6N.-R.11E.) (Figure 26). The Ballinger #3-13 has produced 1.4 bcf since January 1985, and is currently producing 45 mcfd. The Ballinger #3-13 produces from what is interpreted to be distributary mouth bar subfacies of the delta front. The gamma ray curve through the Hartshorne interval exhibits slight overall coarsening upward character. The Ballinger P #3-13 contains 17 feet of net pay with greater than 8% porosity and less than 40% water saturation. Average porosity and water saturation are 14% and 12% respectively, based on a 0.04 ohm-m water resistivity (Rw), with 150 ohm-m resistivity as measured by the deep resistivity curve.

The Blevins #2-18 (Section 18-T.6N.-R.11E.) is another example of higher volume production from a Type-2 distributary channel sandstone (Figure 27). This well was completed in September 1994 with an initial gas rate of 527 mcfd. The well produced from June 1995 to July 2003 and reached a cumulative gas production of 0.98 bcf. The sandstone calculates 34 feet of net pay with a minimum of 8% porosity and a maximum of 40% water saturation. The average porosity is 14%. The water saturation calculates extremely low, 7%, using the 0.04 ohm-m Rw (formation water resistivity).

Production from distributary channel deposits also occurs 5 miles to the southeast, in T.5N.-R.12E in South Pine Hollow Field. Here, production is from what is interpreted to be a remnant segment of the same distributary complex as the distributary channel reservoir in the Cabannis NW Field. This segmented distributary channel play lies

85

between the two incised valley fill/entrenched channel trends, IC-1 and IC-2, which have eroded through deposits associated with the Lower Hartshorne delta.

Andrews (1998) discussed the production statistics and characteristics of the Cabannis NW Field. He reported an original gas in place (OGIP) of 8.181 Bcf, based on a gross sandstone map, with a reservoir size of 4224 acres (greater than 5 feet gross

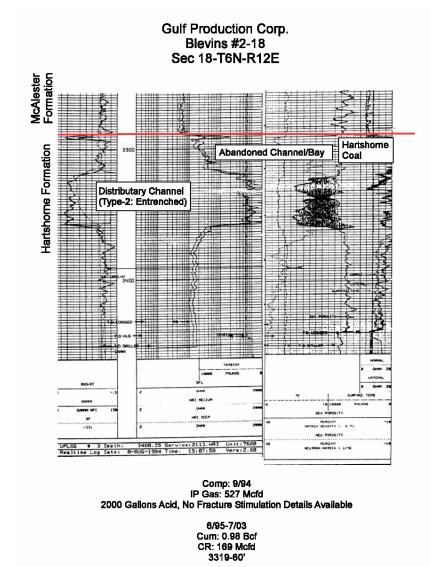


Figure 27: Exmple of a productive type-2 distributary channel sandstone, Cabannis NW Field, Pittsburg County, Oklahoma.

sandstone), an average porosity of 8%, average gross thickness of 16 feet, average Sw of 20%, reservoir temperature of 110 to 115 degrees Fahrenheit, and a initial reservoir pressure of 630 psi (pounds per square inch). Andrews (1998) reported a total field production of 3.553 Bcf, or a 43% recovery. Using Net Pay (based on 8% porosity and 40% Sw cut-offs) volumetrics were calculated for the field. An average porosity and water saturation of 12% and 25%, respectively, were used. The area within each contour interval was measured and adjusted for the area within larger contour lines. Based on the same reservoir parameters (630 psi, 110-115 degrees Fahrenheit, and gas density of .64) a recoverable OGIP (for the area greater than 5 feet net pay) was calculated to be 6.97 bcf., with an OGIP of 7.24. The field has produced 7.29 Bcf as of July, 2003, and is currently producing at a rate of 680 Mcfd from 16 active wells. At least one of the wells in the field is a commingled Hartshorne and Booch producer. It is the Hilseweck #1-29 (Section 29-T.6N.-R.12E.), which only produced 36 mmcf from February 1982 thru May 1989 and is currently inactive. Two wells, the Hilseweck #1-20 (Section 20-T.6N.-R.12E.) and Hilseweck #3-20 (Section 20-T.6N.-R.12E.) comprise a unit that has produced 1.23 bcf. As Andrews (1998) noted, some wells produce gas directly from the coal, and the reservoir potential of the channel margin shales and thinbedded sandstones, which fall outside of mapped net pay, are unknown. Thin-bedded sandstone is difficult to measure with the resolution of most wireline logging tools, and may appear very shaly, which results in pessimistic reservoir calculations. Several wells that produce contain a calculated 0 feet of net pay. Figure 28 is a picture from a Hartshorne Formation outcropping located in Sections 17 and 18 T.1S.-R.10E. The picture illustrates the shaly sandstone and interbedded sandstone and shale of the delta front facies. Suneson (1998)

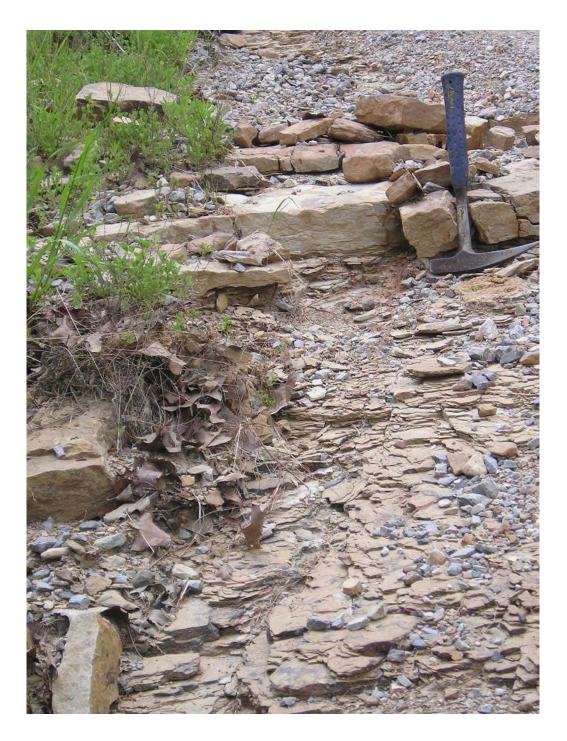


Figure 28: Picture from an outcropping of the Hartshorne Formation, Sections 17 and 18-T.1S.-R.10E. The picture illustrates the shaly sandstone and interbedded sandstone and shale of the Hartshorne Formation. Suneson (1998) interpreted this section to be possible upper distributary mouth bar facies. Rock hammer is 12 inches long.

described this section in a field trip guide as possibly being upper distributary mouth bar.

Potential for infill drilling appears to be limited, although a southwest offset to the Hilseweck #3-20 (Section 20-T.6N.-R.11E.) is one possibility. The average thickness of the Lower Hartshorne Coal is 4 feet, but does reach thicknesses of 5-6 feet within the field. Just to the northeast of the field the coal is 7 feet thick. The minimum thickness needed for horizontal wells in the coal is 4 feet, thus opening the field for possible horizontal Coalbed Methane (CBM) production. Table I contains a summary of volumetric parameters for the calculations for the Cabannis NW Field.

 Table I: Volumetric reservoir summary for the Hartshorne Formation, Cabannis NW Field,

 Pittsburg County, Oklahoma.

Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure (psi)	Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0		12%	25%	4484	1480	0.61	0.58	115	630	25	0.64	96%	158
5		12%	25%	3004	1614	1.99	1.91	115	630	25	0.64	96%	158
10		12%	25%	1390	537	1.10	1.06	115	630	25	0.64	96%	158
15	17.50	12%	25%	853	302	0.87	0.83	115	630	25	0.64	96%	158
20	22.50	12%	25%	551	423	1.56	1.50	115	630	25	0.64	96%	158
25	27.50	12%	25%	238	128	0.58	0.56	115	630	25	0.64	96%	158
30	30.00	12%	25%	110	110	0.54	0.52	115	630	25	0.64	96%	158
Total 7.24 6.97													
Field Production: 7.29 BCF Recoverable OGIP: 6.97 BCF													
Reserves Recovered: 105%													

Hill Top Field

The Hill Top Field is located in the southwest corner of the study area (Plate #1). The field was discovered in 1975. The discovery well, the Pace #1 (Section 18-T.5N.- R.11E.), only produced 21 mmcf over three years. A production map for the field is presented in Figure 29, as well as Plate 2. Only 20 wells have been drilled in the field. Fifteen have a combined production of 4.6 bcf, or an average of 309 mmcf per well. Five were abandoned before production, either for lack of gas production (dry) or mechanical problems within the wellbore. Presently there are 11 active wells with an average daily rate of 33 mcfd per well.

The primary reservoir facies include distributary mouth bar and bar fringe of the delta front. The highest volume well in the field is the Travis P #1-L (Section 21-T.5N.-R.11E.) which has produced over 600 mmcf since June 1991. It appears to produce from distributary mouth bar or delta front deposits. The Travis P #1 contains 11 feet of net pay using the 8% porosity and 40% water saturation cut-offs. The average porosity and water saturation (using 0.04 ohms) are 12% and 19% respectively. The Southern Resources Vernon 1-29 (29-T.5N.-R.11E.) produces from distributary mouth bar or bar fringe, as evidenced from the very slight upward-coarsening gamma ray signature (Figure 30). The Vernon #1-29 contains 8 feet of net pay (porosity >8%, Sw<40%), but contains no net pay using the 12% porosity cut-off. The average porosity and water saturation are 9% and 33% respectively. The well has produced 0.10 Bcf since May 1990.

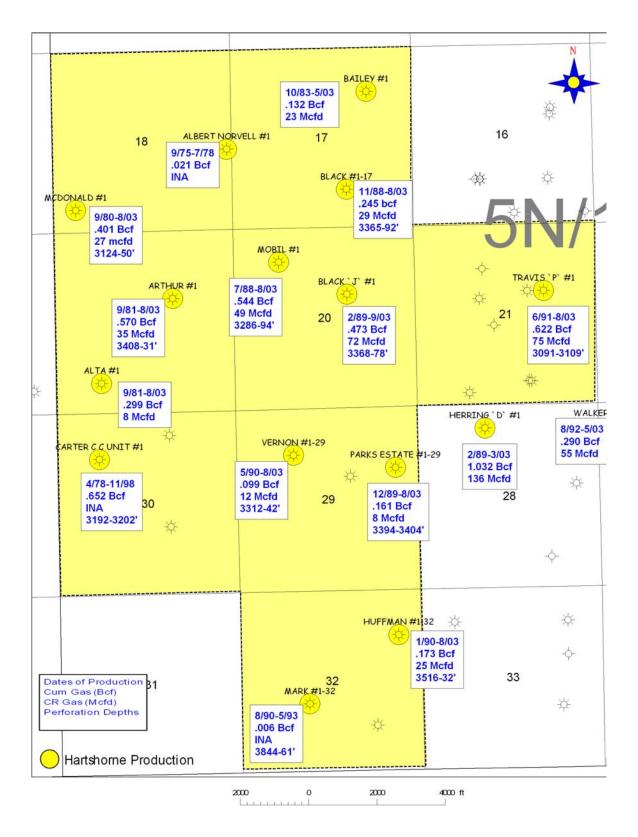


Figure 29: Hartshorne production map for Hill Top Field, Pittsburg County, Oklahoma.

The Mobil #1-20 (Section 20-T.5N.-R.11E.) is an example of a well that may be producing from the distributary mouth bar subfacies of the delta front facies (Figure 31). The Mobil #1-20, which was completed in September 1987, produced 0.54 bcf from July 1988 to July 2003. Initial production was 1400 mcfd, with a flowing tubing pressure of 240 psi on a 48/64 inch choke. Initial shut-in tubing pressure was 620 psi. No stimulation details were available. Average Hartshorne sandstone porosity in the Mobil #1-20 is 12% and average Sw is 20%. The Mobil #1-20 contains 8 feet of net pay using the 8% porosity and 40% Sw cut-offs. The well contains 6 feet of net pay using 12% porosity cut-off and 40% Sw cut-offs.

Using the reservoir parameters of 720 psi original formation pressure, 110-115 degrees Fahrenheit formation temperature, and a recovery factor of 96% and 168 mcf/acre-foot, of recoverable original gas in place (OGIP) was calculated from the net pay isopach map. An abandonment pressure of 25 psi was used. The recoverable OGIP was calculated to be 7.45 bcf from a net pay reservoir of 5930 acres greater than 0'. Volumetric calculations were done following the method described in the methodology. The percentage of the produced recoverable reserves to date is 62%, but as mentioned before this does not account for gas produced from the coal, or thin bedded bar fringe and bay deposits. It should be noted that, as seen on Plate 5, the Hill Top Field shares the same reservoir as the Stuart Southwest Field. A volumetric summary for the Hartshorne Formation is given in Table II.

 Table II: Volumetric reservoir summary for the Hartshorne Formation, Hill Top Field, Hughes

 County Oklahoma.

Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure (psi)	Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0	2.50	12%	20%	5930	2000	1.01	0.98	115	630	25	0.64	96%	168
5	7.50	12%	20%	3930	2494	3.78	3.66	115	630	25	0.64	96%	168
10	12.50	12%	20%	1436	1436	2.90	2.81	115	630	25	0.64	96%	168
<u>Total</u> 7.69 7.45													
Field Production: 4.60													
Recoverable OGIP: 7.45													
Res	Reserves Recovered: 62%												

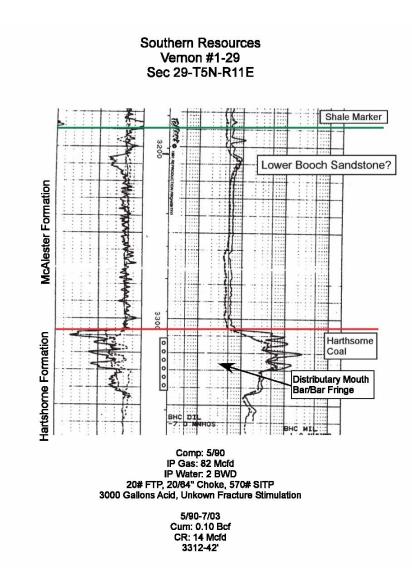


Figure 30: Example of production from possible distributary mouth bar/bar fringe or possible crevasse splay deposits, Hill Top Field, Hughes County, Oklahoma.

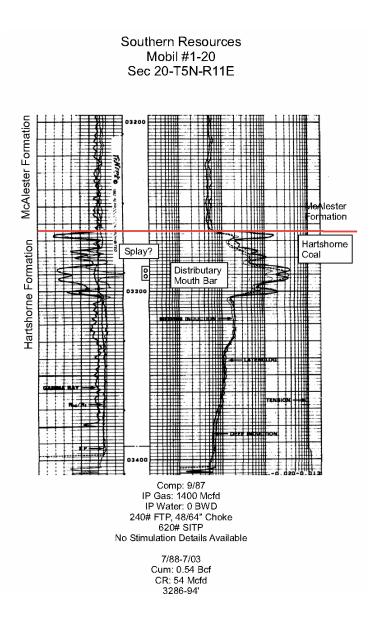


Figure 31: Example of productive distributary mouth bar sandstone in Hill Top Field, Hughes County, Oklahoma.

Hill Top North Field

The Hill Top North Field is located 2 miles north of the Hill Top Field and contains 4 producing wells (Figure 32). Figure 33 is a gross sandstone isopach map for Hill Top North Field. Cumulative production for the field is 478 mmcf, of which 345 mmcf comes from the Lindley #1-30 (Section 30-T.6N.-R.11E.), and includes production from the Middle Booch Sandstone. The Lindley #1-30 (Figure 34), which was completed in June 1987, was the discovery well in the Hill Top North Field. The initial production rate from the Hartshorne was 162 mcfd, whereas the initial rate from the Middle Booch was 483 mcfd, which would suggest that the majority of the production comes from the Booch.

The completion of the Hartshorne in the Lindley #1-30 included 1000 gallons of acid, type unknown, 15,550 gallons of fluid, type unknown, and 25,900 pounds of sand. Initial flowing tubing pressure was 110 psi on a 16/64 inch choke. The primary productive facies within the Hill Top North Field include thin distributary mouth bar/ bar fringe subfacies of the delta front (Plate 17). The Roland #1-20 (Sec 20-T.6N.-R.11E.) produces from distributary mouth bar/Type-1 distributary channel. (Figure 35). The Little #1-19 (Figure 36) is an example of production from thin distributary mouth bar facies.

Volumetrics (Table III) were run to determine the recoverable OGIP using a reservoir temperature of 110 degrees Fahrenheit, initial pressure of 630 psi, and abandonment pressure of 25 psi. The reservoir area was 832 acres, which included all of the area within the 0 feet net pay contour (minimum porosity of 8% and maximum water

saturation of 40%). The calculated recoverable OGIP was 0.51 Bcf, at a recovery factor of 96.32% of OGIP and 135.81 mcf/acre-foot (Table III). The total recovery to date is 78%, and the field is currently producing 59 mcfd from 3 wells, for an average of 19.6 mcfd per well. Again, this does not take into account coal gas production or pessimistic net pay and reservoir calculations due to shaly sand and thin interbedded sandstone and shale.

Table III: Volumetric reservoir summary for the Hartshorne Formation, Hill Top North Field,Hughes County, Oklahoma.

Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)			Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0	2.50	12%	20%	832	319	0.14	0.13	11:	5	630	25	0.64	96%	168
5	6.00	12%	20%	513	513	0.54	0.52	11:	5	630	25	0.64	96%	168
					<u>Total</u>	0.68	0.65							
	Field Production: 0													
F	Recoverable OGIP: 0.													
Re	serves F	Recov	ered:	78%										

Horntown SE Field

This field is composed of a single producing well, the Anderson #1 (Sec 17-T.7N.-R.11E.), that produced 0.29 bcf from April 1985 through October 2002, and is currently producing at a rate of 10 mcfd (Figure 37). Production appears to come from the Type-1 distributary channel facies or distributary mouth bar delta front (Figure 38).

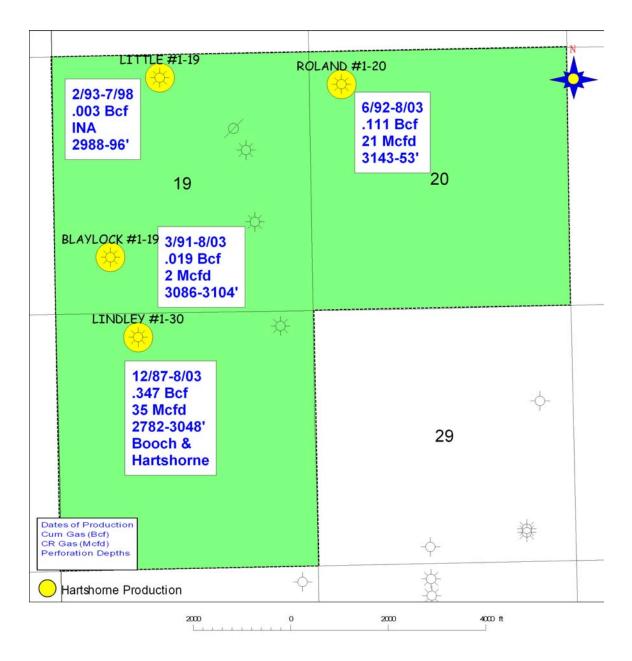


Figure 32: Hartshorne production map, Hill Top North Field, Hughes County, Oklahoma.

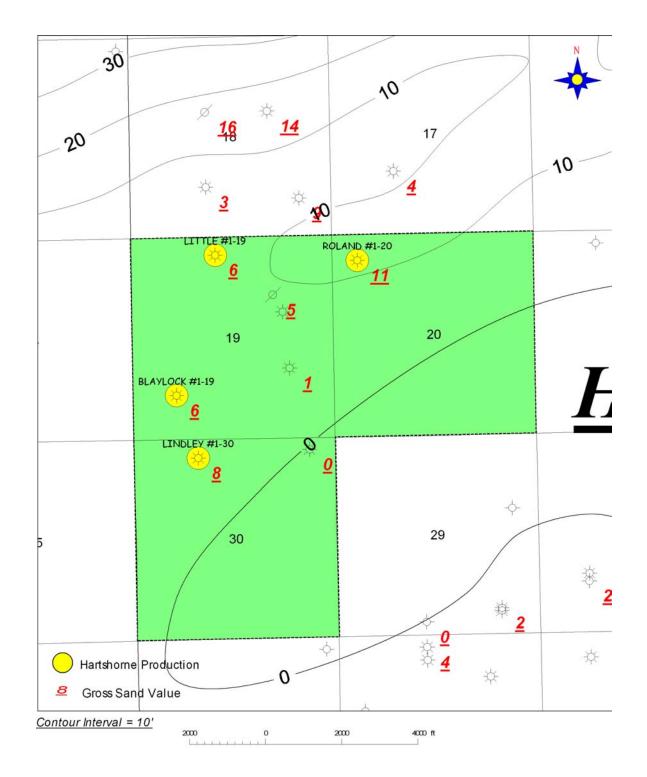


Figure 33: Lower Hartshorne gross sandstone isopach map.

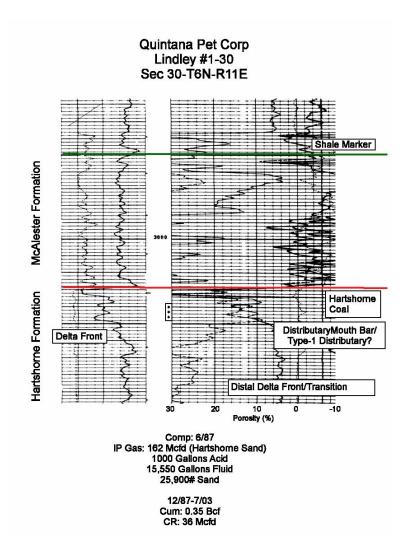


Figure 34: Example of production from distributary mouth bar/delta front and Type-1 distributary channel facies.

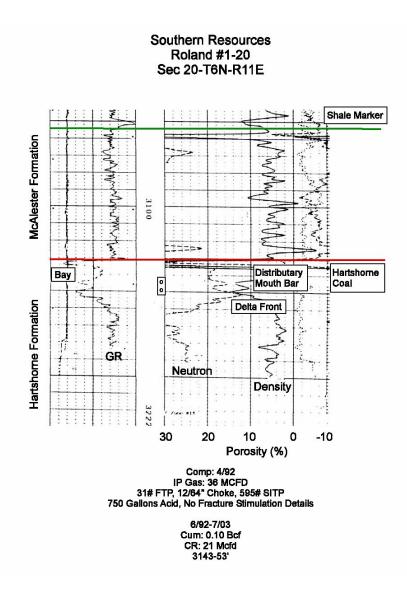


Figure 35: Example of production from distributary mouth bar/bar fringe deposits, Hill Top North Field, Pittsburg County, Oklahoma.

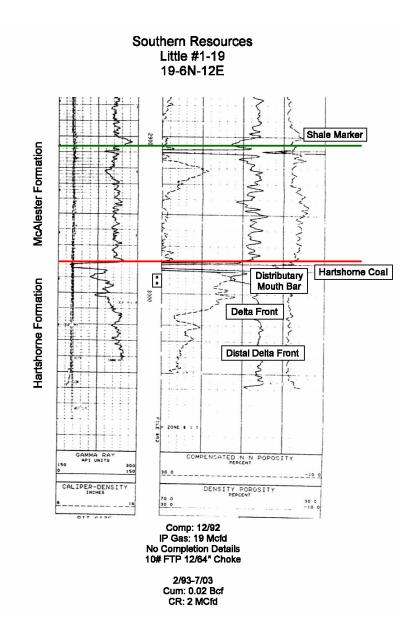
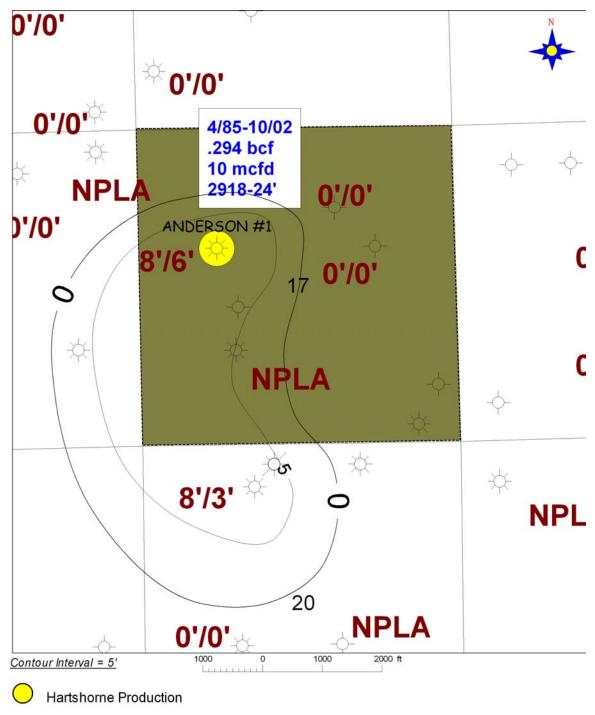


Figure 36: Example of production from distributary mouth bar/delta front sandstone, Hill Top North Field, Hughes County, Oklahoma.

The Anderson #1 penetrated a relatively small reservoir (Plate 5). The sandstone calculates 8 feet of net pay (minimum porosity of 8%, maximum water saturation of 40%) (Figure 37). The average porosity is 15%, average water saturation (Sw) is 24%, with a 0.04 Rw (formation water resistivity). Based on an initial reservoir pressure of 751 psi (from the initial well head shut-in pressure test), and an abandonment pressure of 25 psi, the Anderson #1 has drained and an approximate area of 173 acres. Based on the same parameters, but with 6 feet of net pay based on a minimum porosity of 12%, the Anderson #1 has drained an area of 230 acres. The overall area of the net pay (at least 8% porosity and no more than 40% Sw) within the 5 feet contour interval is 292 acres. The reservoir calculates to have 0.49 Bcf recoverable OGIP, meaning the Anderson has only produced 58% of the reserves in place. At the current rate of production, the likelihood of producing all of the reserves is low, and the need for a replacement well should be evaluated. There appears to be little structural control on production. Table IV contains the volumetric data for the Horntown SE Field.

Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure (psi)	Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0	2.50	12%	20%	832	319	0.14	0.13	115	630	25	0.64	96%	168
5	6.00	12%	20%	513	513	0.54	0.52	115	630	25	0.64	96%	168
					<u>Total</u>	0.68	0.65						
	Field P	Produc	tion:	0.51									
R	Recoverable OGIP:												
Res	erves F	Recov	ered:	78%									

 Table IV: Volumetric reservoir summary for the Hartshorne Formation, Horntown SE Field, Hughes County, Oklahoma.



8'/3' Net Pay Value (Porosity >8%/>12%, Sw <40%)

Figure 37: Lower Hartshorne net pay isopach map, Horntown SE Field, Hughes, County, Oklahoma.

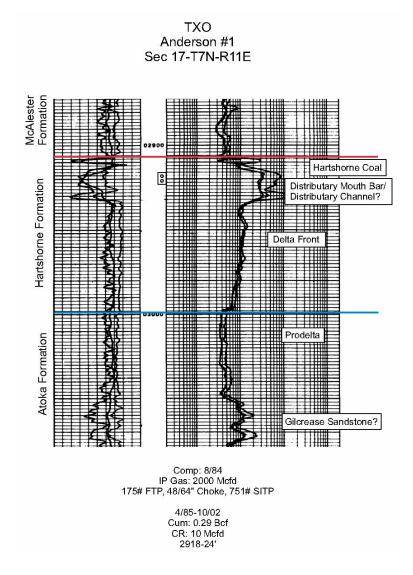


Figure 38: Example of productive Type-1 distributary channel facies, Horntown SE Field, Hughes County, Oklahoma.

Lamar East Field

Lamar Field is located in the northern part of the study area and overlaps with the Scipio Field (Figure 39). Total cumulative gas production from the field is 6.7 bcf from 11 wells. More than 2/3 the production comes from two wells. The Sarkey Unit #1 (Section 7-T.7N.-R.12E.) and the Klene #1 (Section 1-T.7N.-R.11E.) have each produced over 2.0 bcf. These wells appear to produce from distributary mouth bar and distributary channel deposits. The Jay Petroleum Inc. White 13 #1 (Section 13-T.7N.-R.12.E.) is a good example of production from a Type-2 distributary channel, which appears to have eroded through the mouth bar deposits and into the underlying delta front (Figure 40). The classic fining upward log signature is present, indicating abandonment, and reservoir quality sandstone is limited to the base of the channel-fill sandstone. The White 13 #1 has produced 0.24 bcf from June 1985 through July 2003 and currently produces 14 mcfd.

The Sarkey Unit #1, which was the discovery well in the Lamar East Field in 1961, is still active. The primary reservoir facies in this well and the field are distributary mouth bar and distributary channel sandstones, as seen on the gross sandstone isopach and facies maps (Plate 3 and 17).

Volumetrics (Table V) were calculated based on the net pay isopach of the Lower Hartshorne/Hartshorne undivided reservoir. The parameters that were used were 675 psi initial pressure and 110 degrees Fahrenheit reservoir temperature, based on reported well tests, and a 25 psi abandonment pressure. The recoverable OGIP (original gas in place) calculates to only be 4.3 bcf. However, the field has produced 6.7 bcf, and continues to produce at a rate of 208 mcfd from 8 wells. The production reported from the Klene #1 is 2.3 bcf, but the initial gas flow rate from the Hartshorne Formation was 6 mcfd. The well was completed in 1959, reportedly in the sandstone within the interval from 2350 to 2360 feet. The well was drilled to a depth of 3414 feet and encountered other producing reservoirs, including the Booch above the Hartshorne and the Gilcrease Sandstone of the Atoka Formation. The mapped net pay for the well (no porosity log was available) is 12.5 feet, and the reservoir parameters are estimated to be 12% porosity and 20% Sw, based on offset wells. Based on these variables the well has drained more than 1000 acres, which, though possible, brings into some doubt the reliability of the reported production when coupled with the calculated volumetric reserve of the field. The discrepancy between the cumulative field production and the calculated recoverable OGIP is troublesome. Some of the difference can be attributed to thin-bedded or shaly sandstone that is not counted as pay, as well as coal gas, that do not account for a 2+ bcf difference. Part of the reservoir is shared with the Scipio Northwest Field, but the access to the Lamar East Field side of the reservoir is limited to a narrow net pay corridor defined by the deposition trend of channel and channel mouth bar sandstone. There is also an area of unknown net pay due to the lack of available porosity logs. This area in the northeast part of the field, contains only one producing well, but may extend the reservoir and account for the discrepancy in the reserve calculations.

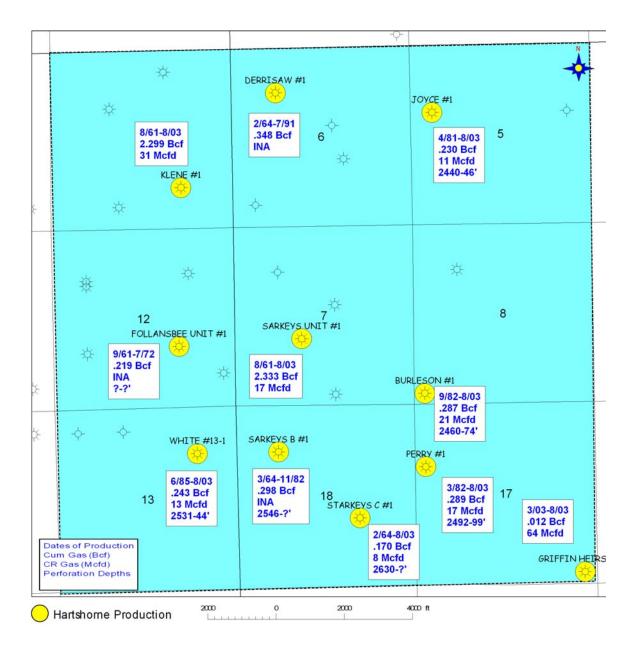


Figure 39: Hartshorne Production Map, Lamar East Field.

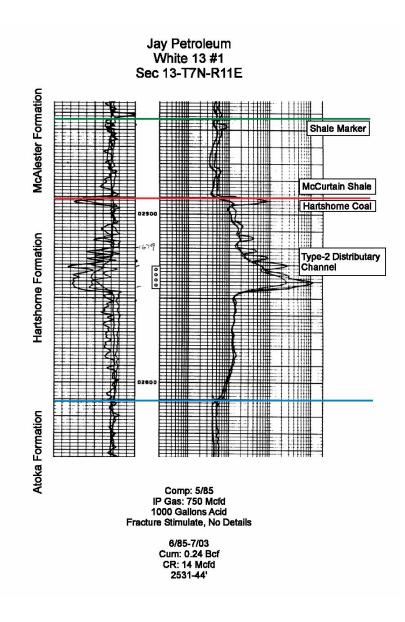


Figure 40: Example of production from a Type-2 distributary channel sandstone, Lamar East Field, Hughes County, Oklahoma.

Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure (psi)	Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0	2.50	12%	20%	3350	997	0.48	0.46	110	675	25	0.64	96%	184
5	7.50	12%	20%	2353	1144	1.64	1.58	110	675	25	0.64	96%	184
10	12.50	12%	20%	1209	854	2.01	1.94	110	675	25	0.64	96%	184
15	16.00	12%	20%	355	355	1.08	1.05	110	675	25	0.64	96%	184
	Total 5.21 5.03 Field Production: 6.70												
	ecover erves F			5.03 133%									

 Table V: Volumetric reservoir summary for the Hartshorne Formation, Lamar East Field, Pittsburg and Hughes Counties, Oklahoma

Reams Northwest

Reams Northwest Field is located in the northeast part of the study area. It has produced 8.8 bcf from 14 wells, for an average of 0.64 bcf per well (Figure 41). The highest cumulative volume well has produced 2.7 bcf. The average depth of the Hartshorne is 2600 feet. There are 12 active wells in the field with an average daily rate of 68 mcfd per well.

The first well, which was the the State #1-35 (Section 35-T.7N.-R.13E.) was drilled in 1980 and cumulated 0.6 bcf from October 1980 to April 1987. The State #1-35 produced from the upper part of IC-1. This thick sandstone had a gas-water contact at 2648' (-1941 feet subsea) (Figure 42). After the State #1-35 quit producing, the State #2-35 was drilled and completed in the Lower Hartshorne Formation in 1986. It has produced over 1.0 bcf from perforations in the upper part of the IC-1, above a gas-water contact at 2620 feet (-1917 feet subsea).

The State #2-35 is 24 feet structurally higher than the State #1-35. Production in the field is structurally controlled (Figure 43). The structure map indicates that the production in the IC-1 facies follows a small anticlinal nose (Plates 13 and 14). The Lower Hartshorne Net Pay map illustrates the development of pay within the sandstone as it drapes over the structure (Figure 44; Plates 9 and 10). The combination of the distribution of quality reservoir and structural attitude is responsible for gas accumulation.

Several wells in the field appear to have been completed in the channel margin of the IC-1 or the thin overbank sands of the interdistributary bay facies. These wells, located in Section 25-T.7N.-R.13E., are believed to produce primarily from Booch Sandstone, but were commingled with the Hartshorne sandstone.

Volumetrics for the Reams Northwest field were calculated using 630 psi initial reservoir pressure (based on reported tests), 25 psi of abandonment pressure, and 115 degrees Fahrenheit reservoir temperature. The average porosity and Sw are 15% and 25% respectively. The area within each net pay contour interval was measured and the internal area of the contour interval greater than each contour was subtracted. The recoverable OGIP was then calculated with a 96.32% recovery factor (based on the reservoir temperature and pressure, as well as the gas gravity of 0.64). The recoverable OGIP for the Reams Northwest Field is 13.75 bcf from a net reservoir area of 3100 acres (above the 0' contour interval). The field has produced 64% of the recoverable reserves, and continues to produce at a rate of 667 mcfd.

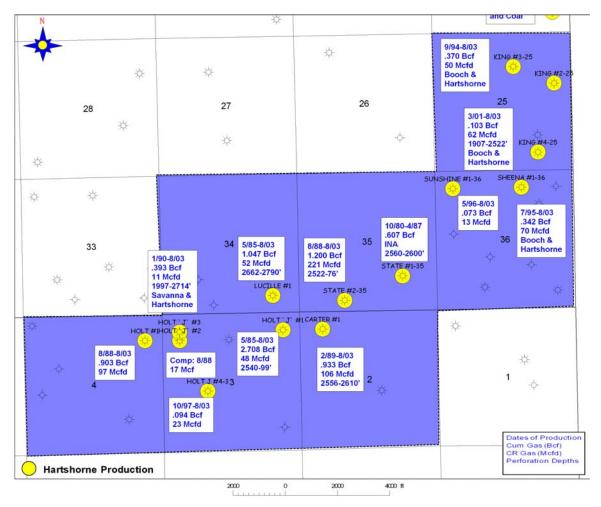


Figure 41: Hartshorne production map, Reams NW Field, Pittsburg County, Oklahoma.

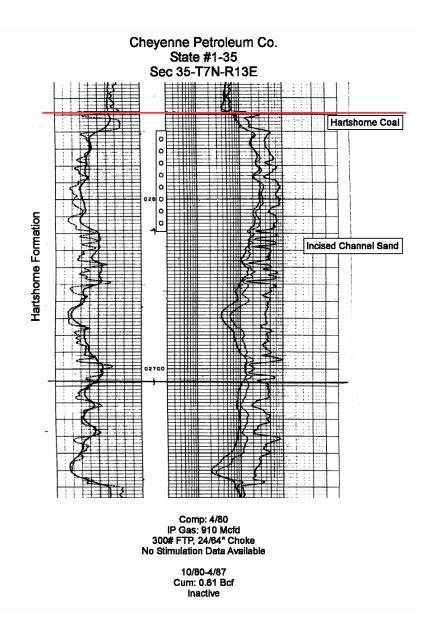


Figure 42: Example of production from the IC-1 entrenched channel/incised valley fill facies, Reams NW Field, Hughes County, Oklahoma.

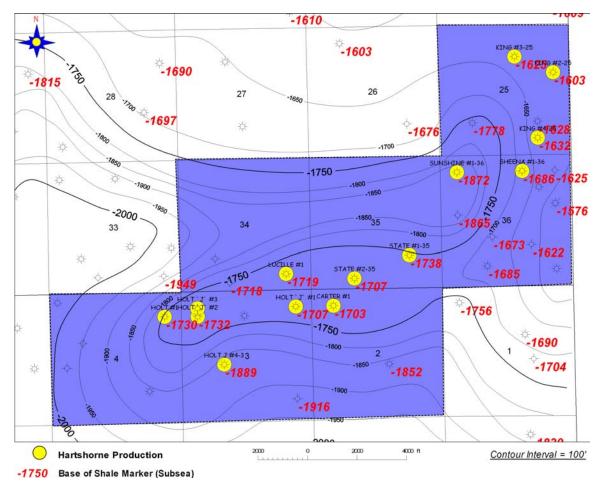


Figure 43: Structure map: Base of "Hot Shale" marker, Reams NW Field.

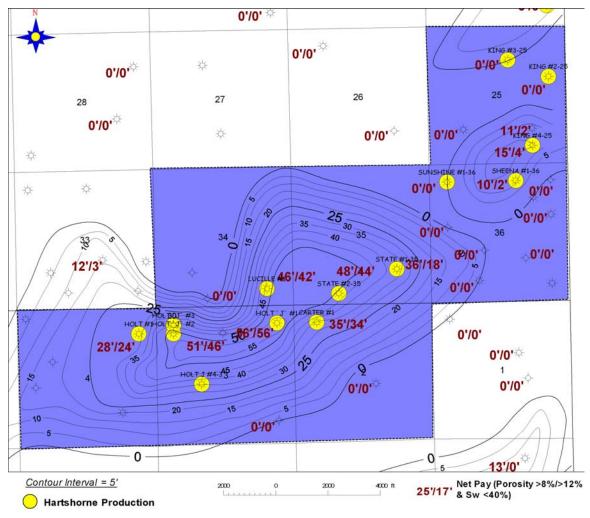


Figure 44: Net pay isopach map, Reams NW Field.

Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure (psi)	Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0	5.00	15%	25%	3100	950	0.97	0.94	115	630	25	0.64	96%	159
10	15.00	15%	25%	2150	747	2.30	2.21	115	630	25	0.64	96%	159
20	25.00	15%	25%	1403	564	2.89	2.78	115	630	25	0.64	96%	159
30	35.00	15%	25%	839	309	2.22	2.14	115	630	25	0.64	96%	159
40	45.00	15%	25%	530	287	2.65	2.55	115	630	25	0.64	96%	159
50	50.00	15%	25%	243	243	3.25	3.13	115	630	25	0.64	96%	159
	<u>Total</u> 14.28 13.75												
	Field P			8.80									
	ecover erves F			<u>13.75</u> 64%									

Table VI: Volumetric reservoir summary for the Hartshorne Formation, Reams NW Field, Hughes County, Oklahoma.

Scipio Northwest Field

The Scipio Northwest Field is located in the northern part of the study area and is composed of the Scipio Field, West Scipio Field, East Scipio Field, and NW Scipio Field. The field has produced over 6.0 Bcf from 38 wells, an average of 0.16 Bcf per well. The field was discovered in 1963 by the drilling of the Broadstreet #1 (Section 22-T.7N.-R.12E.) which subsequently produced 0.69 bcf from 2/63 to 8/69 from commingled Hartshorne and Booch reservoirs. Commingling production makes it difficult to gauge the true productivity of the Hartshorne reservoir. The average depth of the Hartshorne Formation within Scipio Northwest Field is about 2550' (-1650' subsea).

The primary reservoir facies within the Scipio Northwest Field include distributary mouth bar and distributary channel. Some wells were completed in channel margin and bar fringe deposits on the edge of the main sandstone trend. The Broadstreet #1, (22-T.7N.-R.11E.) is a good example of production from the distributary channel facies of the delta plain (Figure 45). The channel is stratigraphically lower than some delta front deposits seen in offset well, though the channel filling sandstone is likely younger. This is the result of channel erosion and entrenchment in older sediments. The well was completed in November 1962. The initial gas production rate from the Hartshorne reservoir was 3500 mcfd, flowing after a 5000 gallon, 3000# fracture stimulation. Shut-in tubing pressure was 820 psi. The reservoir characteristics of the Hartshorne sandstone in the Broadstreet #1 are unknown, as a porosity log was not available. The strong deflection of the SP curve on the induction log indicates that the sandstone is clean and likely has good porosity and permeability. The initial gas rate from the Booch Formation was 3000 mcfd. Allocation of production solely based on the initial gas rate suggests that the cumulative production from each of the producing formations is relatively equal at 0.34 bcf.

Based of the gross sandstone and net pay isopach maps (Plate 5) the distributary channel sandstone and distributary mouth bar sandstone in the Scipio Northwest Field are less extensive than in other fields. Where thicker gross sandstone is developed on the southeast side of the field, it appears to be wet and nonproductive.

The Million #1-27 (Section 27-T.7N.-R.11E.) is an example of production from distributary mouth bar of the delta front, or crevasse splay sandstones within the interdistributary bay facies (Figure 46). The Million #1-27 only produced 2000 Mcf from January 1983 through March 1985, demonstrating the poor reservoir quality of delta front sandstones. These

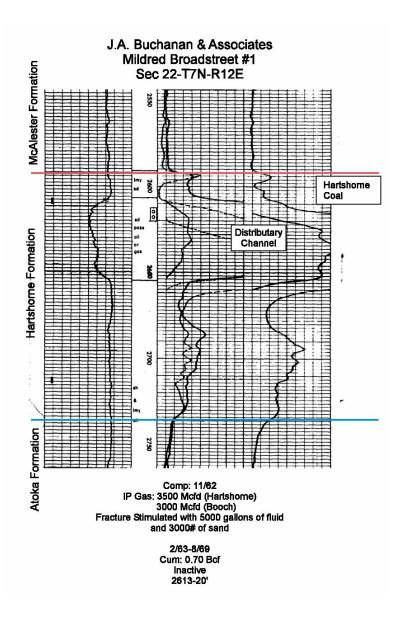


Figure 45: Example of gas production from what is interpreted to be distributary channel sandstone, Scipio NW Field, Hughes County, Oklahoma.

sandstones are thin and clay rich, and as a result have low porosity and permeability. The Million #1-27 was completed in May 1982 with an initial gas rate was 25 Mcfd from Hartshorne and 25 Mcfd from the Booch. Both reservoirs were fracture stimulated, but no details are available.

The Tag Team Resources LLC Michael #2-22 (Section 22-T.7N.-R.11E.) is a well that illustrates production from what is interpreted to be distributary mouth bar/bar fringe facies (Figure 47). The well has produced 0.12 bcf from 8 feet of net pay, that has an average porosity of 12% and calculated water saturation of 22%. The well was completed in April 2001 with an initial gas production rate of 297 mcfd through a 10/64" choke with a flowing tubing pressure (FTP) of 335 psi. The well was acidized with 500 gallons and fracture stimulated with 17,892 gallons of an unknown fluid and an unknown amount of sand-based propant. Initial shut-in pressure was 480 psi.

Volumetrics for the Scipio Northwest Field were calculated using the net pay isopach map based on the porosity and Sw cut-offs of 10% and 30%, respectively. The reservoir parameters were 675 psi initial pressure, 25 psi abandonment pressure, and 110° formation temperature. The recoverable OGIP was calculated to be 8.57 bcf, indicating the field has produced approximately 70% of its reserves.

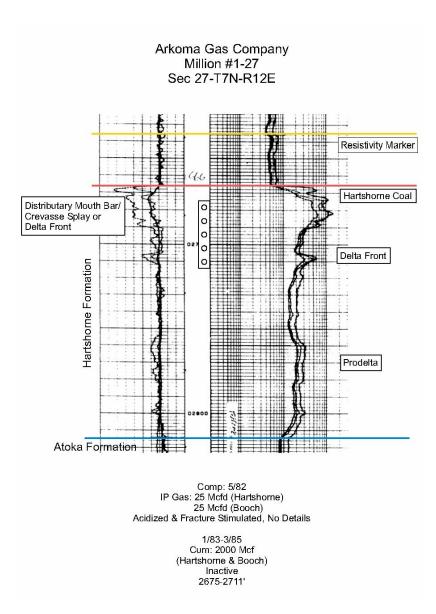


Figure 46: Example of production from possible distributary mouth bar/delta front facies, Scipio NW Field, Hughes County, Oklahoma.

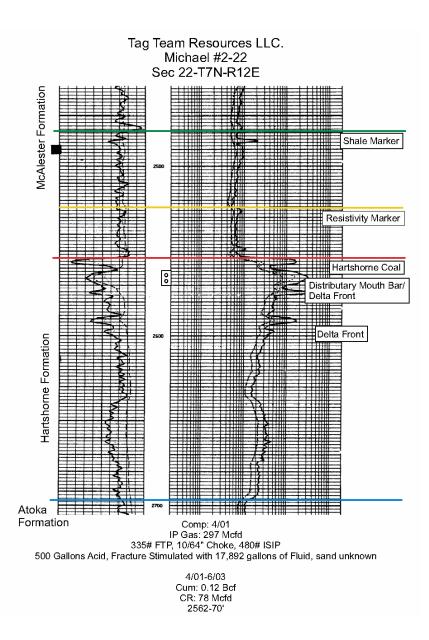


Figure 47: Example of production from fringe deposits of the distributary mouth bar facies. An alternate interpretation is that this is an example of crevasse splay deposits.

Contour Interval Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure (psi)	Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0 2.50	10%	30%	7968	4776	1.54	1.48	115	630	25	0.64	96%	159
5 7.50	10%	30%	5304	3192	3.09	2.98	115	630	25	0.64	96%	159
10 12.50		30%	2473	2112	3.41	3.28	115	630	25	0.64	96%	159
15 17.50	10%	30%	361	230	0.52	0.50	115	630	25	0.64	96%	159
20 20.00	10%	30%	131	287	0.34	0.33	115	630	25	0.64	96%	159
Field Recove Reserves		OGIP:	6.00 8.57 70%	<u>Total</u>	8.89	8.57						

 Table VII: Volumetric reservoir summary for the Hartshorne Formation, Scipio NW Field, Pittsburg and Hughes Counties, Oklahoma.

Shady Grove Field

The Shady Grove Field is composed of the Shady Grove South and Shady Grove Southwest Fields. The field is located in west-central part of the study area (T.6N.-R.11E.) (Plate 1). Cumulative production is 6.7 bcf from 18 wells, for an average of 0.37 bcf per well. The first reported production was in 1964; 3 wells remain active.

The Shady Grove Field represents the westward extension of the Cabannis NW Field. The primary reservoir facies are distributary mouth bar subfacies of the delta front facies and distributary channel subfacies of the delta plain facies.

The well with the largest volume of gas production is the Hill #1-11 (Sec 11-T.6N.-R.11E.) which has produced just over 1.0 bcf from the distributary mouth bar subfacies (Figure 48). The Hill #1-11 contains 11 feet of net pay (minimum porosity of 8% and maximum water saturation of 40%), with an average of 18% porosity. The well was completed in September 1994, and is currently producing at a rate of 183 mcfd. The top of the Hartshorne sandstone (Lower Hartshorne or Hartshorne Undivided) producing zone is 3213 feet measured depth (-2399 feet subsea); top of the Hartshorne Coal is 3189 feet measured depth (-2375 feet subsea). The Hill #1-11 was fracture stimulated with 12,474 gallons of fluid (type unknown) and 11,500 pounds of sand. It was treated with 300 gallons of acid prior to the fracture stimulation. The Hill #1-11 had an initial gas rate of 361 mcfd, flowing on a 12/64 inch choke with 450 psi of flowing tubing pressure (FTP). Shut-in tubing pressure built to 620 psi. Structurally the Hill #1-11 is low compared to wells in the field to the west, and is possibly separated from them by a fault. The overall structure of the field is a northwest-southeast trending synclinal nose (Plates 3 and 4).

The Glenn Supply Co. Inc. Geneva #1-10 (Figure 48) and Glenn Supply Co. Inc. Black #3 (Figure 49) are located in Section 10-T.6N.-R.11E. Both are interpreted to be producing from Type-1 distributary channel subfacies of the delta plain facies. An alternate interpretation is distributary mouthbar/bar crest subfacies of the delta front. The Geneva #1-10 (Figure 48 and Well #4, Cross-Section A-A', Plate 13) produced 0.26 bcf from July 1995 thru July 2003. It contains 16 feet of net pay (minimum porosity of 8% and maximum water saturation of 40%) with an average porosity of 18%. The Black #3 produced 0.47 Bcf (November 1995 thru July 2003) from 18 feet of net pay (porosity >8%, Sw < 40%). Average porosity in the Black #3 is 20% and the calculated water saturation (Sw) is 8%. The calculated Sw seems anomalously low, which may be explained by an Rw that is higher than 0.04 ohm-m. The Black #3 had an initial flow rate rate of 115 mcfd with 295# flowing tubing pressure on a 18/64" choke. Shut-in tubing pressure was only 500#, which may indicate partial reservoir depletion. Figure 50 is a net pay isopach map.

In Section 7-T.6N.-R.11E., the Victor Pryot Boyd #2 produces from what is interpreted to be delta front or possibly crevasse splay deposits (Well #1 on Cross-Section E-E', Plate 15). The well has only produced 80 mmcf and is currently making 5 mcfd.

Volumetrics were calculated for the Shady Grove Field, which is a direct offset to the Cabannis NW Field and may share reserves. The OGIP that was calculated for the Shady Grove Field was 9.01 bcf, with a recovery factor of 96%. The recoverable OGIP is 8.68 bcf, for a 77% recovery to date. This does not take into consideration coal gas, gas from shaly sands outside the mapped net pay isopach, or commingled gas from other non-Hartshorne reservoirs.

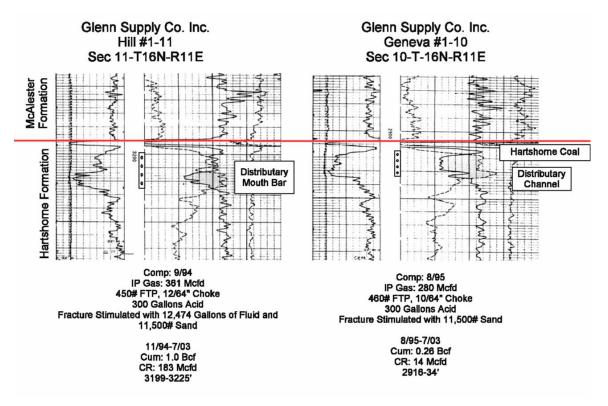


Figure 48: Examples of production from distributary mouth bar (left) and Type-1 distributary channel sandstones within the Shady Grove South Field, Pittsburg County, Oklahoma.

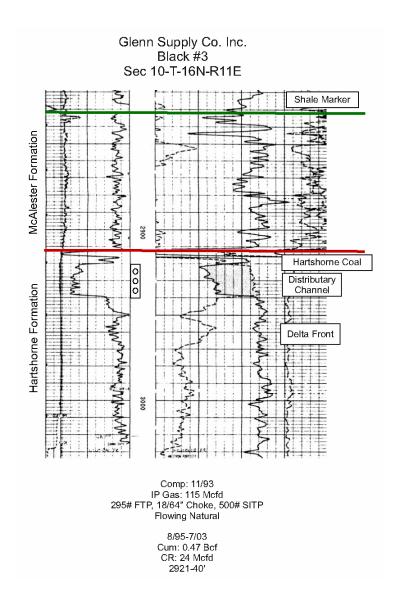
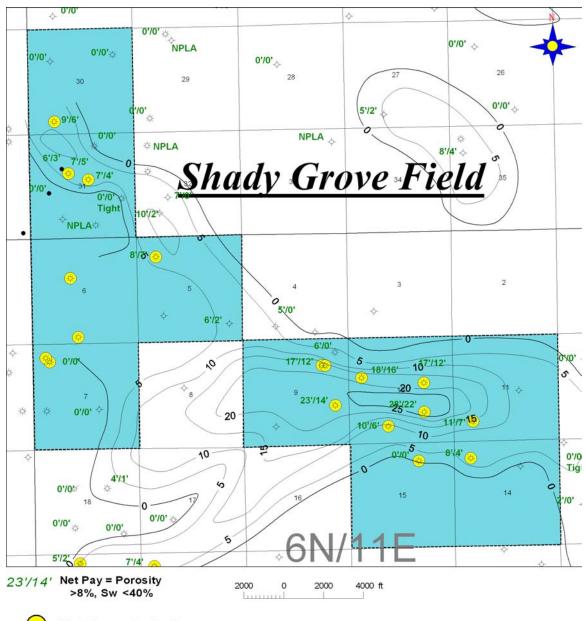


Figure 49: Example of production from the Type-1 distributary channel facies, Shady Grove South Field, Pittsburg County, Oklahoma.



Hartshorne Production

Figure 50: Net pay isopach map, Shady Grove Field.

 Table VIII: Volumetric reservoir summary for the Hartshorne Formation, Shady Grove Field,

 Pittsburg County, Oklahoma.

Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)		Abandonment Pressure (bsi)		Recovery Factor	Mcf/Acre-Foot
0	2.50	12%	20%	6048	2348	1.03	0.99	115	630	25	0.64	96%	159
5	7.50	12%	20%	3700	1763	2.31	2.23	115	630	25	0.64	96%	159
10	12.50	12%	20%	1937	875	1.91	1.84	115	630	25	0.64	96%	159
15	17.50	12%	20%	1062	535	1.58	1.58	115	630	25	0.64	96%	159
20	22.50	12%	20%	527	432	1.70	1.64	115	630	25	0.64	96%	159
25	25.00	12%	20%	95	95	0.42	0.40	115	630	25	0.64	96%	159
	<u>Total</u> 8.95 8.68												
	Field P	roduc	tion:	6.81									
R	ecover	able C	GIP:	8.68									
Res	erves F	Recov	ered:	78%									

South Pine Hollow Field

South Pine Hollow Field is the largest field in both area and production volume. Located in the southern part of the study area (Townships 5 and 6 North and Ranges 12 and 13 East); the field has produced over 112 bcf from 121 wells. Most gas production is from the thick sandstone of IC-1 and IC-2. Average production per well is over 900 mmcf, whereas production for individual wells ranges from less than 2 mmcf to more than 11 bcf.

The primary reservoir for the field is the IC-2 sandstone trend, or incised valley fill/entrenched distributary channel facies. Secondary reservoir facies include distributary channel, channel margin, and delta front. South Pine Hollow Field is located in the most depositionally complex part of the study area and difficult to interpret. The South Pine Hollow Field is bordered on the north by the northeast-southwest trending IC-1 channel and incised by the IC-2 channel. The IC-2 sandstone can be a great as 180

feet thick and very gas productive The incised channel sandstone IC-2, which has been mapped as Hartshorne Undifferentiated, accounts for more than 2/3 of the production in the field. The amount of modification of the original sediments resulting from incision of both channels, as well as the reworking that may have occurred during the subsequent transgression is difficult to access.

Some wells have penetrated the Type-2 distributary channel facies. The Davis Operating Co. Ott #2-22 (Section 22-T.5N.-R.12E.) is a prime example of the distributary channel facies (Figure 51). The Ott #2-22 is also an example of a well that produces from the Hartshorne Coal. The well was completed in the coal with an initial production rate of 30 mcfd in 1999. The well has cumulated 50 mmcf and currently producing 31 mcfd. The production rate has remained relatively stable over the past four years, which is typical for vertical coal wells. Another well that penetrated the Type-2 distributary channel facies is the Davis Operating Co. Donna #1-16 (Section 16-T.5N.-R.12E.), which produced 0.43 bcf from the Lower Hartshorne from September 2000 through August 2003 (Figure 52). The well was completed and flowed gas at a rate of 561 mcfd and currently produces 177 mcfd. The reservoir was fracture stimulated with 35,646 gallons of fluid and 56,240 pounds of sand. The Virgil #1-22 (Section 22-T.5N.-R.12E.) is an example of production from delta front or bar fringe facies (Figure 53).

Remnants of older distributary channel, channel margin/splay, and distributary mouth bar facies are evident within the field, but the interpretation of the original deposition framework is difficult due to possible subaerial exposure and erosion during sea level fall, as well as sediment reworking during the subsequent sea level rise.

129

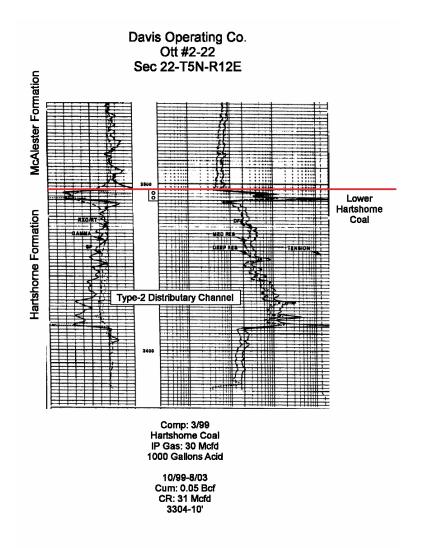


Figure 51: Example of a well that penetrated a Type-2 distributary channel sandstone. Production in this well is from the Lower Hartshorne Coal. South Pine Hollow Field, Hughes County, Oklahoma.

Production in some wells is from multiple facies. The Mustang Fuel Corporation Semeski #1-3, located in Section 3-T.5N.-R.12E., is perforated in what has been interpreted to be distributary mouth bar and possible crevasse splay facies (Well #6 on Cross-Section B-B', Plate 20). The Lower Hartshorne Coal was also perforated in the Semeski #1-3. The well produced 0.22 bcf from October 2000 to September 2003 and has a current gas production rate of 139 mcfd.

Volumetric calculations (Table IX) for the South Pine Hollow Field were calculated using a reservoir temperature used was 115 degrees Fahrenheit, and initial reservoir pressure and abandonment pressure of 650 psi and 25 psi respectively. The volumetric calculations for the South Pine Hollow Field were done in two parts. The first set of calculations was for the Lower Hartshorne, without the south incised channel (IC-2). The second set of calculations was for the southern incised channel, IC-2, mapped as Hartshorne Undifferentiated.

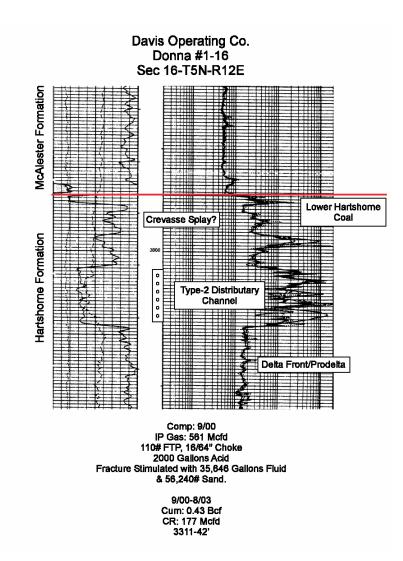


Figure 52: Example of production from the Type-2 distributary channel facies within the South Pine Hollow Field, Hughes County, Oklahoma.

Reserve calculations for the Lower Hartshorne (without the IC-2 Channel) were based on average porosity and Sw of 10% and 25%, respectively. The total recoverable OGIP was calculated to 47.31 bcf using a recovery factor of 96.2% or 132 mcf/acre-foot. Presently, that part of the field has produced 19.11 bcf, a 40% recovery.

Hartshorne Undifferentiated (IC-2) calculations were based on an average porosity of 12% and a calculated Sw of 20%. The total recoverable OGIP was 91.96 bcf using a 96% recovery factor or 174 mcf/acre-foot. The IC-2 part of the field has cumulated 93.94 bcf, or a 102% total recovery to date.

Communication between the IC-2 reservoir and the Lower Hartshorne outside of the incised channel (IC-2) may explain why the total recovery for the IC-2 reservoir exceeds 100%. Some production contribution may be from coalbed gas, as well as from commingled reservoirs. The total estimated recoverable OGIP for the combined Hartshorne reservoir is 139.27 bcf, based on a 96% recovery factor at an average of 155 mcf/Acre-Foot. Total recovery to date, is approximately 80% of the reserves in the field. As a result of higher average porosity and lower water saturation values, the recovery factor was similar for both reservoirs. Volumetric summaries for each can be found in Appendix E.

Stuart Southwest Field

The Stuart Southwest Field is located in the southwest part of the study area and is composed of just 7 wells (Figure 54). The field has produced over 12 bcf of gas, with the majority coming from just 2 wells. The Woodfork #1 (Sec 26-T.5N.-R.11E.) and the

Lackey #1 (Sec 27-T.5N.-R.11E.) have produced 5.4 bcf and 4.2 bcf, respectively,

combining for

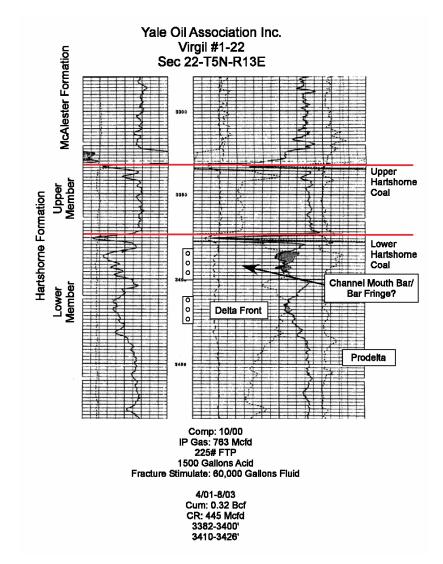


Figure 53: Example of production from distributary mouth bar/bar fringe or possible delta front facies within the South Pine Hollow Field, Hughes County, Oklahoma. Note the presence of both the Upper and Lower Hartshorne Members. Upper Hartshorne is bay facies.

					Lo	ower Ha	rtshorn	e					
Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure (psi)	Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0	2.50	10%	25%	27268	2843	1.00	0.97	115	630	25	0.64	96%	136
5	7.50	10%	25%	24425	9108	9.65	9.31	115	630	25	0.64	96%	136
10	12.50	10%	25%	15317	6228	11.01	10.61	115	630	25	0.64	96%	136
15	17.50	10%	25%	9089	4991	12.35	11.90	115	630	25	0.64	96%	136
20	22.50	10%	25%	4098	2552	8.12	7.82	115	650	25	0.64	96%	136
25	27.50	10%	25%	1546	837	3.25	3.13	115	650	25	0.64	96%	136
30	32.50	10%	25%	709	204	0.94	0.90	115	650	25	0.64	96%	136
35	37.50	10%	25%	505	253	1.34	1.29	115	650	25	0.64	96%	136
40	40.00	10%	25%	252	252	1.43	1.38	115	650	25	0.64	96%	136
					<u>Total</u>	49.08	47.31					96%	
Re	serves	Recov		40% ncised C	hannel (IC	C-2) - Ha	rtshorr	ne Undiffe					
⊂ Contour Interval	Avg. Net Pay	Avg. Porosity	MS . BAR	0082 0082 12800	Adjusted Area	OGIP (BCF)	Recoverable 0GIP (BCF)	Formation Temp 511 (Degrees F)	Initial Formation BPressure (psi)	Abandonment	o Gas Density	66 Recovery 89 Factor	Ncf/Acre-Foot
25	37.50	12%	20%	8943	4197	28.47	27.46	115	630	25	0.64	96%	174
50	62.50	12%	20%	4746	2742	31.01	29.90	115	630	25	0.64	96%	174
75	75.00	12%	20%	2004	2004	27.19	26.20	115	630	25	0.64	96%	174
	Field I Recove serves		GIP:	93.94 91.96 102%	<u>Total</u>	95.37	91.96					96%	

 Table IX: Volumetric reservoir summary for the Hartshorne Formation, South Pine Hollow Field,

 Pittsburg County, Oklahoma.

Reserves Recovered:

80%

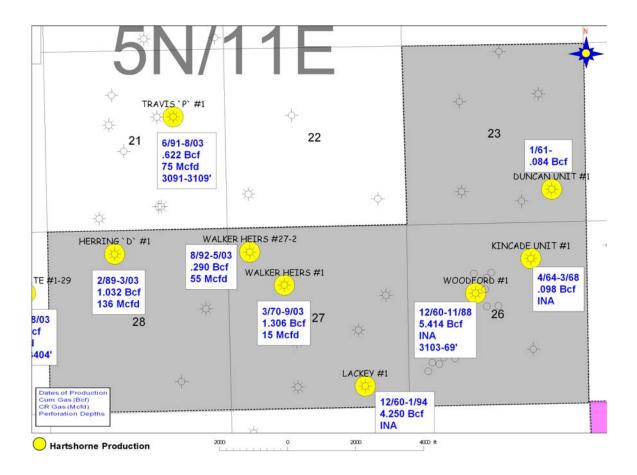


Figure 54: Hartshorne production map, Stuart SW Field, Hughes County, Oklahoma.

more than half of the field's production. Both of these wells produce from the Incised Channel Facies (IC-1) of the Lower Hartshorne. No porosity logs were available for either of these wells, which make reserve calculations difficult and may explain the discrepancy between calculated recoverable reserves and field production. Both wells are located on a small structural closure (Plates 3 and 4), and may be separated from other reservoir sandstones within the field. Another well that produced gas from incised channel facies is the Bell Oil & Gas Company Duncan Unit #1 (Sec 23-T.5N.-R.11E.). This well was completed in 1960, and produced 80 mmcf from perforations in the uppermost part of the sandstone and the Hartshorne Coal. Most of the Hartshorne section in this well is low resistivity and appears water bearing (Figure 55). The Duncan Unit #1 is about 80 feet structurally low to the Woodfork #1 and Lackey #1, demonstrating the strong structural component of production within the incised channel sandstone reservoir (Figure 56).

Several wells have produced from distributary mouth bar and distributary channel deposits that are found at the edge of the incised channel complex. These wells are the Herring D #1 (Section 28-T.5N.-R.11E.) and the Walker Heirs #1 (Section 27-T5N-R11E), have produced over 1.0 Bcf. Based on electrofacies interpretation, the Herring D #1 (Figure 57) produces from distributary mouth bar/bar fringe subfacies of the delta front facies, as well as overlying channel margin subfacies of the delta plain. The delta front exhibits a coarsening upward profile on the gamma ray curve, which is topped by a subtle fining upward signature that is interpreted as channel margin facies.

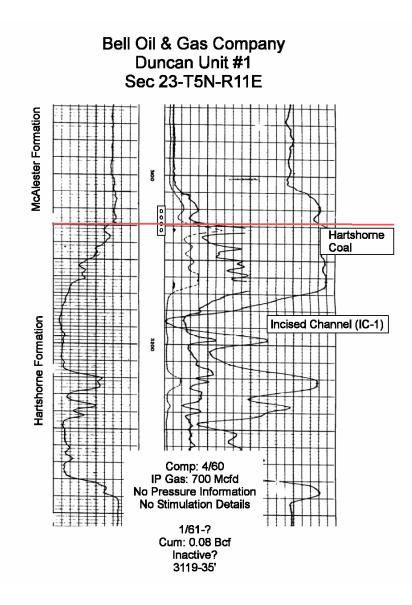


Figure 55: Example of a well that penetrated IC-1 incised channel/incised valley fill facies in Stuart SW Field, Pittsburg County, Oklahoma. Production appears to come primarily from the Hartshorne Coal.

Volumetric calculations were used to establish gas reserves for the field. These calculations were based on an initial formation pressure of 820 psi, which was reported on initial well pressure tests. The abandonment pressure was 25 psi, and the formation temperature used was 115 degrees F. Volumetric calculations for Stuart SW Field were done in two parts. The first set of calculations was for the Lower Hartshorne sandstone that is part of the initial delta system. The second set of calculations are for the Lower Hartshorne incised channel (IC-1).

For the first set of calculations are based on an average porosity and Sw values of 10% and 30%, respectively. The recoverable OGIP was calculated at 1.77 Bcf. The Hartshorne reservoir within this part of the field has produced 2.2 Bcf, or more than 100% of the calculated recoverable OGIP. Some of the discrepancy may be attributed to downhole commingling with other reservoirs, thin-bedded sandstone that does not calculate as pay, or coalbed gas. The second set of calculations used an average porosity of 15% and an average calculated Sw of 30%. The porosity values for the Woodfork #1 and Lackey #1 are unknown, but are likely 15%. The Sw is estimated at 25-30% based on the Reams Northeast Field analog, which produces updip in the IC-1. To account for the discrepancy, a rough calculation of reserves was conducted using the gross sand isopach. An area was chosen that represents the reservoir encountered by the Woodfork #1 and the Lackey #1. The Lacky #1 contains 50 feet of gross Lower Harthsorne (IC-1) sand and the Woodfork #1 contains 105 feet of gross sand. The entire Lower Hartshorne sandstone appears to be productive based on the induction log resistivity, so a base net pay of 50 feet was used in the volumetric calculations. The result was a recoverable.

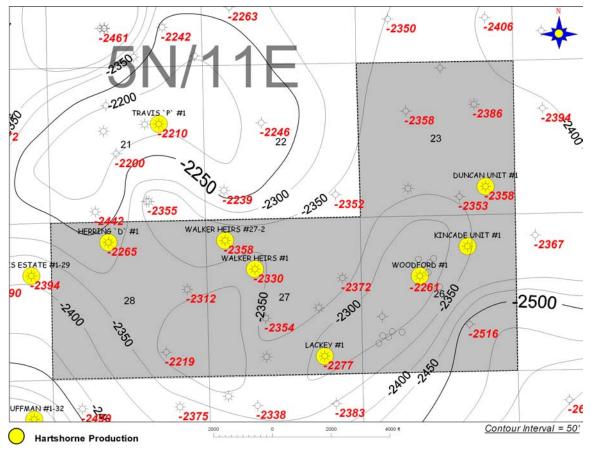


Figure 56: Structure map: Top of Lower Hartshorne Coal, Stuart SW Field.

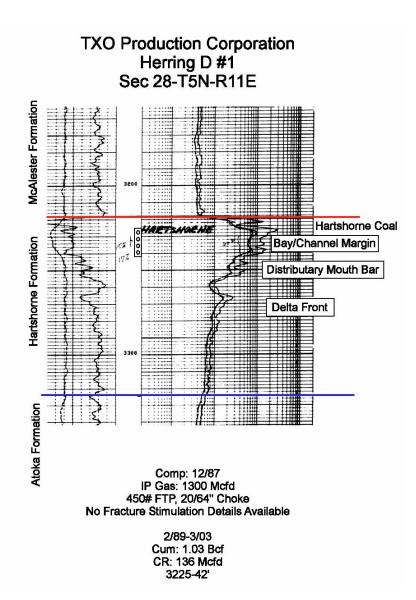


Figure 57: Example of production from the distributary mouth bar/channel margin succession within the Stuart SW Field, Pittsburg County, Oklahoma.

OGIP of 15.07 Bcf The Lackey #1, Woodfork #1, and two other wells have produced 9.8 Bcf from this reservoir, for a total recovery of 65%

The final reserve value of 16.78 Bcf recoverable OGIP, when divided into the field production, indicates that field production is only 72% of the recoverable OGIP. There is more inherent error in these calculations than in the previous field summaries, as no porosity logs were available for the two primary wells in the main producing trend and net pay was estimated. This data is summarized in Table X.

Table X: Volumetric reservoir summary for the Hartshorne Formation, Stuart SW Field, Hughes County, Oklahoma.

					Inci	ised Ch	annel -	- IC-1					
ମୁ Contour Interval	0.00 00 Avg. Net Pay	5 Avg. Porosity	00 Avg. Sw	B B B B C C C C C C C C C C C C C C C C	Adjusted Area	OGIP (BCF)	G G OGIP (BCF)	Formation Temp 511 (Degrees F)	Initial Formation D58 Pressure (psi)	Abandonment	69 69 69	6 84 ∭Factor	24 Mcf/Acre-Foot
	<u>Total</u> 15.50 15.01												
					Lower Ha	rtshorn	e Delta	ic Deposi					
Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure (psi)	Abandonment Pressure (psi)	Gas Density	Recovery Factor	Mcf/Acre-Foot
0	2.50	10%	30%	1347	494	0.58	0.55	115	820	25	0.64	97%	165
5	7.50	10%	30%	853	466	0.59	0.58	115	820	25	0.64	97%	165
10	10.00	10%	30%	387	387	0.66	0.64	115	820	25	0.64	97%	165
					<u>Total</u>	1.82	1.77						
Field 1	Totals												

Field Totals		
Field Production:	12.00 BCF	
Recoverable OGIP:	16.78 BCF	
Reserves Recovered:	72%	

<u>Ulan Field</u>

The Ulan Field is located in the northeast part of the study area and contains three wells. Total cumulative production is 0.66 bcf. The first well in the field was the Ward #2-13 (Section 13-T.7N.-R.13E.), which produced 0.16 Bcf from January 1993 thru July 2003 (Figure 58). The Ward #2-13 is a vertical Hartshorne Coal producer. The coal in the Ward #2-13 is about 5 feet thick. Only one of the wells, the Brower Oil & Gas Hill #1-24 is located within mapped net pay (Plate 5). The Hill #1-24 has produced 0.30 bcf from the Lower Hartshorne sand, Lower Hartshorne Coal, and Booch sandstones. The initial well production tests reported gas flow rates of 300 mcfd from the Booch and 200 mcfd from the Hartshorne sandstone and coal.

Volumetric calculations for the Ulan East Field can be seen in Table XI. One well produces from the Hartshorne Sandstone within the mapped net pay and it is commingled with another reservoir. Production within the field primarily comes from channel margin deposits that do calculate net pay and from the Hartshorne Coal. Judging by the production from the part of the Ulan East Field within the study area, the only economically promising development would be horizontal coalbed drilling.

Calvin Southeast & Greasy Creek Fields

The Calvin Southeast Field contains one well, the Murexco Petroleum Inc. Lyons #1-6, located in Section 6-T.5N.-R.11E.. No log was available for this well. Based on the gross sandstone thickness map (Plate 2) the well appears to have produced from delta front sandstones within the Hartshorne. The well had an initial rate of 201 mcfd on a $\frac{1}{2}$

143

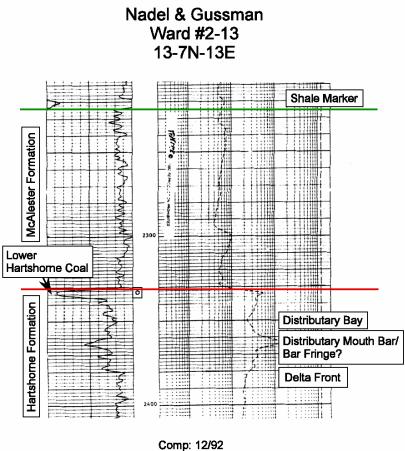
 Table XI: Volumetric reservoir summary for the Hartshorne Formation, Ulan East Field, Pittsburg

 County, Oklahoma.

Contour Interval	Avg. Net Pay	Avg. Porosity	Avg. Sw	Area (Acres)	Adjusted Area (Acres)	OGIP (BCF)	Recoverable OGIP (BCF)	Formation Temp (Degrees F)	Initial Formation Pressure ((psi)	Abandonmen t Pressure (psi)	Gas Density	, Recovery Factor Mcf/Acre- Foot
0	2.50	12%	25%	369	176	0.61	0.58	110	630	25	0.64	96% 158
5	5.00	12%	25%	193	193	1.99	1.91	110	630	25	0.64	96% 158
					<u>Total</u>	2.59	2.50					
	Field I	Produc	tion:	7.29								
	Recove	rable C)GIP:	6.97								
Re	eserves	Recov	ered:	105%								

inch choke with 25 psi of flowing tubing pressure. The well produced 46 mmcf from June 1984 thru August 2003, and is currently producing at a rate of 3 mcfd.

The Greasy Creek Field is a one well field located in Section 6-T.7N.-R.11E.. The sole well, Glenco Turner #5, produced 42 mmcf from commingled Hartshorne and Booch reservoirs between May 1986 thru June 2003. The well had an initial production rate of 30 mcfd on a 16/64" choke with 101 psi of flowing tubing pressure and well is currently producing 14 mcfd. The well appears to produce from the channel mouth barfringe/channel margin facies.



Comp: 12/92 IP Gas: 60 Mcfd (From Hartshorne Coal) 100# FTP, 430# SITP 10/64" Choke

1/93-8/03 Cum: 0.165 Bcf CR: 25 Mcfd 2330-36'

Figure 58: Example of a well that encountered the delta front/distributary mouth bar/distributary bay succession within the Ulan Field, Pittsburg County, Oklahoma. Note that production in this well comes from the Hartshorne Coal.

Coalbed Methane Production

Coalbed methane is an interesting play, in that the coal acts as source, reservoir, and trap for the gas. Initially, coalbed gas was produced the same way as sandstone and carbonate gas reservoirs through conventional vertical well completions that often involved multiple coal seams. With the advent of horizontal drilling technologies, the viability of drilling for coalbed methane has been increased greatly. Coalbed methane is now one of the most active gas plays in the Midcontinent, Rocky Mountain, and Appalachian Regions of the United States.

The Arkoma Basin of Oklahoma and Arkansas has seen a dramatic increase in coalbed methane exploitation using vertical and horizontal drilling and completion methods. The Hartshorne Coal is one of the most sought after coal seams within this play. Gas production from the Hartshorne in vertical or conventional wellbores is often commingled with gas production from the underlying Hartshorne Sandstone, or other reservoirs. Vertical coalbed methane wells, typically produce at a low rates for long periods of time.

Within the study area, there are a number of wells that have produced directly from the coal, either independently or commingled with production from the underlying Hartshorne sandstone. The Ott #2-22 (Section 22-T.5N.-R.12E.) is an example of a well that was completed solely in the Hartshorne Coal (Figure 51). The well was completed in January 2000 and had an initial production rate of 30 mcfd. No water was reported, but most coal wells initially produce high volumes of water. The well has produced for almost four years and has cumulated 0.05 bcf of gas. It exhibits no apparent decline in production rate, and is producing 31 Mcfd. This is typical production for many vertical

146

coal wells that do not produce at high initial flow rates, but instead produce small volumes at a sustained rate for long periods of time.

Hydrocarbon Production Potential

The Hartshorne sandstone reservoir in this area is considered a mature play, but it continues to generate drilling activity. The key to the future development is a thorough understanding of the depletion patterns and identifying potential infill locations within known reservoirs. The shallow depth of the Hartshorne makes drilling for partially depleted reservoirs a viable economic option at present gas prices.

Coalbed Methane Play

Coalbed completions have been a viable option for gas production within the Pennsylvanian section of Oklahoma, Arkansas, and Kansas for many years. Gas production rates from coal seams completed in vertical wellbores is usually relatively small, but these wells produce for periods of time with small rates of decline. With the advent of horizontal drilling technology an entirely new play has emerged with wells that produce at higher sustained rates. The Hartshorne Coal of the Arkoma Basin is frequently drilled using horizontal drilling technology. The minimum coal thickness needed is 4 feet. Logging-while-drilling (LWD) technology is utilized to assist the driller in keeping the bit in the coal seam.

There is sufficiently thick coal within the study area to allow for drilling of horizontal coalbed wells. However the coal does thin to as little as 0-1 foot thick in some areas. The thickest coal occurs where the Upper and Lower Hartshorne Coals are

147

undifferentiated or where they begin to 'split.' At this point, the two coal seams appear become a single coal seam, but may be separated by a layer of bony coal (Fields, 1987).

According to recent Oklahoma Corporation Commission records, several sections within the study area are proposed for horizontal coalbed methane well spacing and unit designation for the Hartshorne Coal.

CHAPTER V

SUMMARY

Depositional Models

The Hartshorne Formation is a complex depositional system that is not completely understood. The Hartshorne has been interpreted as a multicyclic, highconstructional lobate delta system, based on various deltaic facies interpreted in outcrops and the subsurface. These facies include prodelta, delta front (distal delta front and distributary mouth bar), and delta plain (distributary channel, interdistributary bay, and crevasse splay). The upper part of the underlying Atoka Formation is believed to represent the transition from marine to deltaic sedimentation and represents initial prodelta sedimentation. Thick sandstone bodies are interpreted as distributary channel deposits in the deltaic model.

Recent work that integrated the concept of sequence stratigraphy into the earlier work reinterprets the very thick (80-250 feet) sandstone bodies as incised valley fill deposits. Within the study area, there are two such sandstone trends, IC-1 and IC-2. All models agree that the Hartshorne Formation was deposited in two primary cycles, each punctuated by widespread and fundamental changes in the depositional system. The first cycle includes the Lower Hartshorne Member south of the coal-split line and Hartshorne Formation Undivided north of the coal-split line. During this first cycle, the Lower Hartshorne delta system prograded out into the basin. This system was punctuated by a

basin-wide delta abandonment and subsidence that resulted in a large-scale coastal peat marsh system that capped the abandoned delta system. The sequence stratigraphic model suggests that a major regressive followed delta formation and a large incised valley was eroded and subsequently filled. This interpretation also suggests that peat was deposited within widespread coastal marshes as sea level rose. All models indicate that following Lower Hartshorne deposition, structurally induced differential subsidence occurred in the southern part of the area. This created accommodation space that allowed for the deposition of the Upper Hartshorne Member as a shallow delta system, which is presently capped by the Upper Hartshorne Coal. The hinge line of this differential subsidence coincides with the coal-split line and trends southwest to northeast, subparallel to major structural features within the basin. North of this coal-split line only the Lower Hartshorne Member (Hartshorne Undivided) and the Lower Hartshorne Coal are present. The sequence stratigraphic model recognizes another drop in sea level (lowstand) and incision episode within the Upper Hartshorne that occurred prior to deposition of the This valley eroded through the Lower Hartshorne Coal and into the Lower peat. Hartshorne Sandstone. It is believed that peat deposition continued uninterrupted north of the caol-split. This means that the undivided coal north of the coal split line contains both Lower and Upper Hartshorne Coal equivalents. A thin black shale or bony coal layer has been recognized within the undivided coal. This bony coal layer may represent a change in peat deposition that is the boundary between the Lower and Upper Hartshorne cycles.

Evidence Supporting Depositional Model

There is insufficient evidence to completely endorse or reject the proposed depositional models, where differences center around the origin of the thick valley fills. There is evidence concerning sand and peat deposition that should be considered in evaluating. This evidence is outlined below:

- The thick valleys or entrenched channels were eroded through local and regional markers.
- 2) Thick valley fills contain what appear to be fluvial and estuarine or shallow marine deposits, but there electrofacies were not cored. The type of fill within the valleys is key to determining their origin.
- Distribution pattern for older deltaic distributaries and thick valley fills are quite different, suggesting separate depositional systems.
- Production data indicate the delta and thick valley fills can have separate fluid types and are not a common reservoir. This suggests the two are unrelated.
- 5) The Hartshorne coals are widespread and continuous except where they are eroded by younger valley forming processes or they thin or are absent over the top of the thicker channel fills. This latter case suggests the valleys formed topographic highs as a result of differential compaction.
- 6) The thickness and lithologic characteristics of the Hartshorne Coals indicate that saltwater marshes in interdistributary bays are not viable depositional models for the Hartshorne peat. Hartshorne coal is relatively low ash and vertically continuous. Peat that form in saltwater marshes in interdistributary settings tend to contain siliclastic material that causes them to be interbedded/interlaminated

with other sediments and result in high ash content. This would make the later coal seams uneconomical.

- 7) The Hartshorne Peat was likely deposited in a marsh or mire that was distal to active silicastic deposition. This setting may be similar to the setting of the modern Okefenokee and Snuggedy marshes in southern Georgia, U.S.A.
- 8) The underclay/paleosol below the Lower Hartshorne Coal indicate it may represent a significant period of exposure and possible sequence boundary.

tom ising butary channels Normal facies ibution (prodelta, front, mouth bar, annel, and bay.	Entrenched Meander Linear 80-250' Cross-cutting relationship to adjacent sediments Stacked channels sandstone with possible marine	Incised Valley Linear 80-250' Cross-cutting relationship to adjacent sediments Stacked channels with possible marine
butary channels Normal facies ibution (prodelta, front, mouth bar,	80-250' Cross-cutting relationship to adjacent sediments Stacked channels sandstone with possible marine	80-250' Cross-cutting relationship to adjacent sediments Stacked channels with
ibution (prodelta, front, mouth bar,	Cross-cutting relationship to adjacent sediments Stacked channels sandstone with possible marine	Cross-cutting relationship to adjacent sediments Stacked channels with
ibution (prodelta, front, mouth bar,	to adjacent sediments Stacked channels sandstone with possible marine	adjacent sediments Stacked channels with
	influence	influence
high ash content,	Thick, laterally continuous, except were where eroded by younger processes Low ash and low sulfur - distal or unrelated to clastic deposition	Thick, laterally continuous, except were where eroded by younger processes Low ash and low sulfur - distal or unrelated to clastic deposition
numerous clastic	Underclay/paleosol -	Underclay/paleosol - exposure and possible hiatus (sequence
1	numerous clastic as (sandstone and tsone partings)	numerous clastic ss (sandstone and

Table 5: Summary of Evidnece for Channel Deposition

Conclusions

The following conclusions were formulated from this study:

- Interpreting the stratigraphy and depositional history of the Hartshorne Formation is hindered by the scarcity of relevant core data.
- The Hartshorne contains two deltaic systems that are identified by their respective coals.
- The presence of underclay and paleosol beneath the coal indicates a hiatus and possible genetic separation from the underlying lithologies.
- 4) The difference in the trends, fluid types, and thickness of the deltaic distributary channels and the thick valley fills/entrenched distributary channels favor the idea that these were deposited by unrelated processes.
- 5) Characteristics of the coals favor their origin as peat deposited in frewshwater swamps that are removed from siliclastic deposition and not in settings associated with saltwater marsh or distributary channels.
- 6) Highest gas recoveries in the Hartshorne Formation are from the thick valley fill sandstones that often contain a water leg that is not identifiable in older adjacent deltaic sandstones that have been cut through.
- Hartshorne coalbed methane has considerable potential in the study area, especially in the areas of thick coal development.
- Additional drilling for conventional Hartshorne Sandstone reservoir is a viable option when volumetric calculations predict remaining reserves.

- 9) Additional high-resolution stratigraphy is necessary to establish the sequence boundaries and general sequence stratigraphy and depositional history of the Hartshorne Formation.
- 10) Microstratigraphy of the Hartshorne Coals, together with geochemical studies, should be undertaken to establish the paleoenvironmental setting of the peat.
- 11) Integrated electrofacies, outcrop, and core data support a Hartshorne depositional model that contains delta cycles that are separated by en episode of relative sea level fall that resulted in deep distributary entrenchment or valley incision. Subsequent to valley filling, widespread peat marshes formed within the area in response to a relative rise in sea level. As a result, Hartshorne coals may be more genetically related to overlying strata than underlying strata.
- 12) The summary of general depositional setting and history is shown in Figures 59-64.

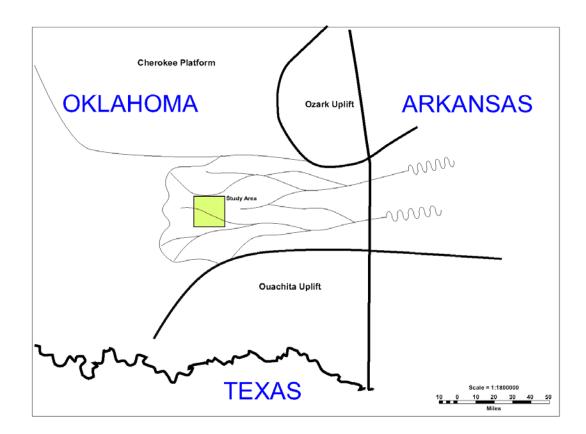


Figure 59: T-1 - Lower Hartshorne delta progradation.

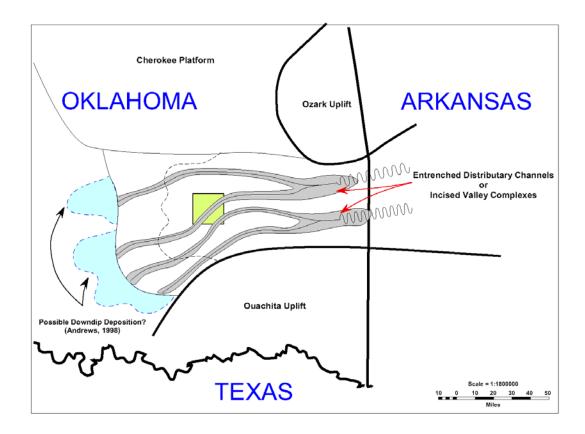


Figure 60: T-2 - Lower Hartshorne incised valley/channel development.

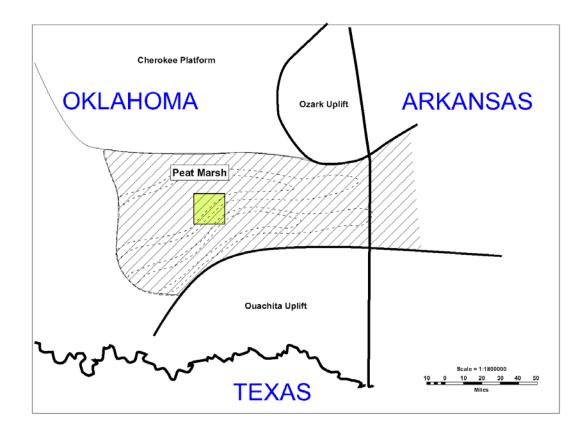


Figure 61: T-3 - Development of widespread peat marsh, with possible unconformity between peat deposits and underlying Lower Hartshorne clastic deposits.

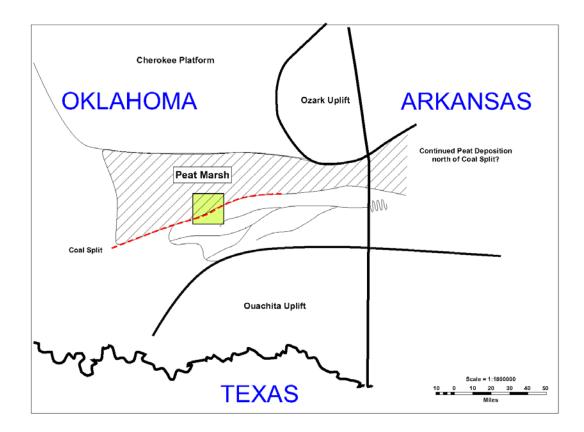


Figure 62: T-4 - Differential subsidence and Upper Hartshorne delta progradation.

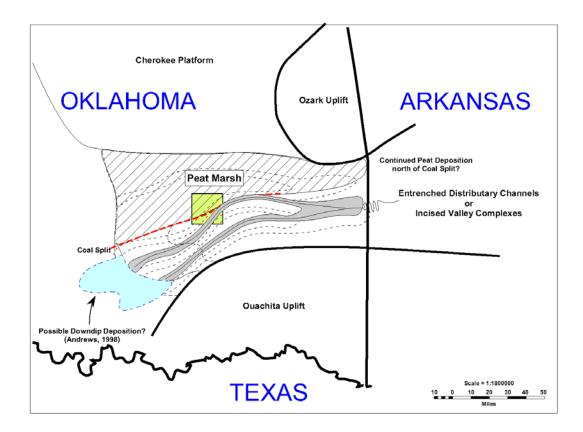


Figure 63: T-5 - Development of incised valley/channel system following Upper Hartshorne delta system.

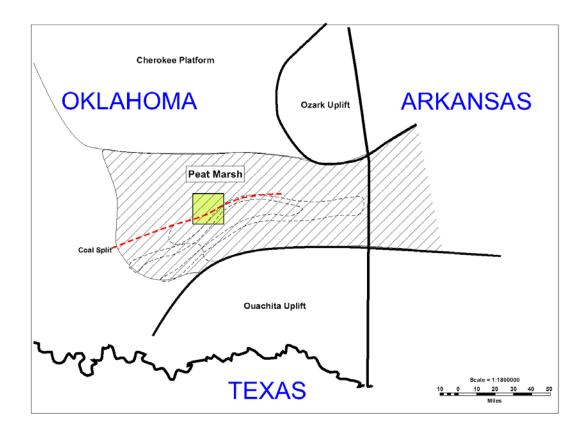


Figure 64: T-6 - Development of widespread peat marsh overlying (possibly unconformably) Upper Hartshorne clastic deposits.

BIBLIOGRAPHY

- Andrews, R.D., Cardott, B.J., and Storm, T., 1998, The Hartshorne Play in Southeastern Oklahoma: Regional and Detailed Sandstone Reservoir Analysis and Coalbed-Methane Resources, Oklahoma Geological Survey Special Publication 98-7, 90 pp.
- Bohacs, K. and Suter, J., 1997, Sequence Stratigraphic Distribution of Coaly Rocks: Fundamental Controls and Paralic Examples, American Association of Petroleum Geology v. 81, p. 1612-1639.
- Bowen, D.W., Weimer, P., and Scott, A.J., 1993, The Relative Success of Siliclastic Sequence Stratigraphic Concepts in Exploration: Examples from Incised Valley Fill and Turbidite Systems Reservoirs, *in* Siliclastic Sequence Stratigraphy: Recent Developments and Applications, American Association of Petroleum Geologists, Memoir No. 58, p. 15-42.
- Busch, D.A., 1971, Genetic Units in Delta Prospecting, American Association of Petroleum Geologists Bulletin, v. 55 no. 8, p. 1137-1154.
- Cecil, C.B., 2003, The Concepts of Autocyclic and Allocyclic Controls on Sedimentation and Stratigraphy, Emphasizing the Climatic Variability, *in* Climate Controls on Stratigraphy, SEPM Special Publication No. 77, p. 13-20.
- Coleman, J.M., and Prior, D.B., 1982, Deltaic Environments of Deposition, *in* Sandstone Depositional Environments, American Association of Petroleum Geologists Memoir 31, p. 139-178.
- Eble, C.F., 2003, Palynological Perspectives of Late Middle Pennsylvanian Coal Beds, *in* Climate Controls on Stratigraphy, SEPM Special Publication No. 77, p. 123-135
- Flores, R.W., 1993, Coal-Bed and Related Depositional Environments in Methane Gas-Producing Sequences, *in* Hydrocarbons from Coal, American Association of Petroleum Geologists, Studies in Geology No. 38, p 287-302, p 13-37.
- Haley, B.R., 1961, Thickness Trends in the Hartshorne Sandstone and McAlester Formation in North-Western Arkansas, *in* Short Papers in the Geologic and Hydrologic Science, United States Geological Survey Professional Paper 424-C, p. C80-81.
- Hamilton, D.S. and Tadros, N.Z., 1994, Utility of Coal Seams as Genetic Stratigraphic Sequence Boundaries in Nonmarine Basins: An Example from the Gunnedah Basin, Australia, American Association of Petroleum Geologists Bulletin, v. 78, p. 267-286.

- Hemish L.A., 1988, Report of Core-Drilling by the Oklahoma Geological Survey in Pennsylvanian Rocks of the Northeastern Oklahoma Coal Belt, 1983-86, Oklahoma Geological Survey Special Publication 88-2, 174 p.
- Hemish, L.A., 1991, Geologic Map of the LeFlore Quadrangle, LeFlore and Latimer Counties, Oklahoma, Oklahoma Geological Survey Open-File Report 1-91, 1 sheet, scale 1:24,000.
- Hemish, L.A., 1992, Geologic Map of the Gowen Quadrangle, Latimer County, Oklahoma, Oklahoma Geological Survey Open-File Report 1-92, 1 sheet, scale 1:24,000.
- Hemish, L.A., 1993, Geology of the Wiser State Park Area, LeFlore County, Oklahoma, Oklahoma Geological Survey Guidebook 28, 28 pp.
- Hemish, L.A., 1995, Geologic Map of the Adamson Quadrangle, Pittsburg and Latimer Counties, Oklahoma, Oklahoma Geological Survey Open-File Report 4-95, 1 sheet, scale 1:24,000.
- Hemish, L.A., 1995, Geologic Map of the Krebs Quadrangle, Pittsburg County, Oklahoma, Oklahoma Geological Survey Open-File Report 3-96, 1 sheet, scale 1:24,000.
- Hemish, L.A., Suneson, N.H., and Chaplin, J.R., 1995, Stratigraphy and Sedimentation of Some Selected Pennsylvanian (Atokan-Desmoinesian) Strata in the Southeastern part of the Arkoma Basin, Oklahoma, Oklahoma Geological Survey Open-File Report 3-95, 107 p.
- Hendricks, T.A, Done, C.H., and Knechtel, M.M., 1936, Stratigraphy of the Arkansas-Oklahoma Coal Basin, American Association of Petroleum Geologists Bulletin, v. 20, p. 1342-56.
- Koinm, D. N. and Dickey, P.A., 1967, Growth Faulting in the McAlester Basin of Oklahoma, American Association of Petroleum Geologists Bulletin, v. 51, No. 4, p. 710-718.
- Kosters, E.C., and Bailey, A., 1983, Characteristics of Peat Deposits in the Mississippi River Deltaic Plain, Transactions of the Gulf Coast Association of Geological Societies 33, p. 311-325.
- Matteo, A.P., 1981, Depositional History of the Hartshorne Formation, Arkoma Basin, East-Central Oklahoma: University of Missouri unpublished M.S. thesis, 80 pp.
- McCabe, P.J., 1984, Depositional Environments of Coal and Coal-Bearing Strata, *in* Sedimentology of Coal and Coal-Bearing Sequences, p. 13-42.

- McCabe, P.J., 1987, Facies Studies of Coal and Coal-Bearing Strata, *in* Coal and Coal Bearing Strata: Recent Advances, p. 51-66.
- McDaniel, G.A., 1961, Surface Stratigraphy of the Hartshorne Formation, LeFlore, Latimer, and Pittsburg Counties, Oklahoma, in Arkoma Basin and North-Central Ouachita Mountains of Oklahoma: Tulsa Geological Society and Fort Smith Geological Society Guidebook, p. 66-71.
- McQueen, K.C., 1982, Subsurface Stratigraphy and Depositional Systems of the Hartshorne Formation, Arkoma Basin, Oklahoma: University of Arkansas unpublished M.S. thesis, 49 pp.
- Posamentier, H.W., 2001, Lowstand Alluvial Bypass Systems: Incised vs. Unincised, American Association of Petroleum Geologists Bulletin, v. 85, p. 1771-1793.
- Retallack, G.J., 1997, A Colour Guide to Paleosols, John Wiley and Sons Publisher, West Sussex, England, 175 pp.
- Rieke, H.H. and Kirr, J.N., 1984, Geologic Overview, Coal, and Coalbed Methane Resources of the Arkoma Basin – Arkansas and Oklahoma, *in* Coalbed Methane Resources of the United States, AAPG Studies in Geology Series #17, p 135-161.
- Scholes, P.L., and Johnston, D., 1993, Coalbed Methane Applications of Wireline Logs, in Hydrocarbons from Coal, American Association of Petroleum Geologists, Studies in Geology No. 38, p 287-302
- Schumm, S.A. and Ethridge, F.G., 1994, Origin, Evolution, and Morphology of Fluvial Valleys, in Incised Valley Systems: Origin and Sedimentary Sequences, SEPM Special Publication No. 51, p. 11-27.
- Shanley, K.W. and McCabe, P.J., 1994, Perspectives on the Sequence Stratigraphy of Continental Strata, American Association of Petroleum Geologists Bulletin, v. 78, p. 544-568.
- Stayaert, D.J., 1980, Facies, Depositional Environments, and Petrology of the Hartshorne Formation, Eastern Arkoma Basin, Arkansas, Unpublished Master's Thesis, University of Missouri, Columbia, MO, 115 pp.
- Suneson, N.H., 1998, Geology of the Hartshorne Formation, Arkoma Basin, Oklahoma Oklahoma Geological Survey, Guidebook 31, 74 pp.
- Tyler, R., Scott, A.R., Kaiser, W.R., and McMurry, 1997, The Application of a Coalbed Methane Producibility Model in Defining Coalbed Methan Exploration Fairways

and Sweetspots, Bureau of Economic Geology Report of Investigation No. 224, 59 pp.

- Visher, G.S., Saitta, S.B., and Phares, R.S., 1971, Pennsylvanian Delta Patterns and Petroleum Occurrences in Eastern Oklahoma, American Association of Petroleum Geologists Bulletin, v. 55, No. 8, p. 1206-1230.
- Zaengle, J.F., 1980, Depositional Environments and Sandstone Petrogenesis of The Hartshorne Formation, Arkoma Basin, West-Central Arkansas, Unpublished Master's Thesis, University of Missouri, Columbia, MO, 160 pp.
- Zaitlin, B.A., Dalrymple, R.W., and Boyd, R., 1994, The Stratigraphic Organization of Incised-Valley Systems Associated with Relative Sea-Level Change, in Incised Valley Systems: Origin and Sedimentary Sequences, SEPM Special Publication No. 51, p. 45-60.

APPENDIXES

<u>Appendix A</u>: Hartshorne Gas Production Data, With Facies Interpretation.

Well Name	Well #	Location	Formation	Eield Name	Cumulative Gas (Mc <u>r)</u>	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	<u>Secondary Facies</u>
LYONS	1-6	6-5N-11E	HARTSHORNE	SOUTHEAST	46,254	3	1984/06	2003/08	DF	1
BLACK	1-17	17-5N-11E	HARTSHORNE	HILL TOP	245,241	29	1988/11	2003/08	DMB	
BAILEY	1	17-5N-11E	HARTSHORNE	HILL TOP	131,633	23		2003/05	DF	
MCDONALD	1	18-5N-11E	HARTSHORNE	HILL TOP	401,182	27		2003/08	DF	
PACE	1	18-5N-11E	HARTSHORNE	HILL TOP	21,377	0	1975/09			
ARTHUR #1	1	19-5N-11E	HARTSHORNE	HILL TOP	569,869	35		2003/08	DMB	
ALTA #1	1	19-5N-11E	HARTSHORNE	HILL TOP	299,093	8	1981/09		DMB	
MOBIL #1	1	20-5N-11E	HARTSHORNE	HILL TOP	544,250	49	1988/07	2003/08	DMB	
BLACK J	1	20-5N-11E	HARTSHORNE	HILL TOP	472,784	72	1989/02	2003/09	DMB	
TRAVIS P	1L	21-5N-11E	HARTSHORNE	HILL TOP	621,903	75	1991/06	2003/01	DMB	C-1
DUNCAN	1	23-5N-11E	HARTSHORNE	STUART SOUTHWEST STUART	83,900	0	1961/01		IC-1	
WOODFORK	1	26 EN 11E	HARTSHORNE	SOUTHWEST	5 412 727	0	1060/12	1000/11	IC-1	1
WOODFORK		26-5N-11E	HARTSHORNE	STUART	5,413,737	0	1900/12	1988/11	10-1	—
KINCADE	1	26-5N-11E	HARTSHORNE	STUART	97,600	0	1964/04	1968/03	IC-1	
LACKEY C S 2 NE	1	27-5N-11E	HARTSHORNE	SOUTHWEST	4,249,974	0	1960/12	1994/01	IC-1	
WALKER HEIRS	1	27-5N-11F	HARTSHORNE	STUART SOUTHWEST	1,306,286	15	1970/03	2003/09	IC-1	
WALKER HEIRS		27-010-112	HARTOHORRE	STUART	1,000,200	10	1070/00	2000/00	10-1	<u> </u>
27-2	27-2	27-5N-11E	HARTSHORNE	SOUTHWEST	290,973	55	1992/08	2003/05	IC-1	1
21 2	21 2	21 011 112	HARTSHORNE	STUART	200,010	00	1002/00	2000/00	10 1	
HERRING D	1-C	28-5N-11E	/ JEFFERSON	SOUTHWEST	1,032,069	136	1989/02		IC-1	
VERNON	1-29	29-5N-11E	HARTSHORNE	HILL TOP	98,612	12	1990/05	2003/08	DF	
VERNON PARK ESTATE	1-29	29-5N-11E	HARTSHORNE	HILL TOP	160,930	8	1989/12	2003/08	DF	
PLP CARTER	PLP2	30-5N-11E	HARTSHORNE	HILL TOP SOUTHWEST	652,029	0	1978/04	1998/11		
CARTER C C	1	30-5N-11E	HARTSHORNE	HILL TOP SOUTHWEST	251,921	0	1978/05	1980/12	DF	BF
HUFFMAN	1-32	32-5N-11E	HARTSHORNE	HILL TOP SOUTHWEST	173,087	25	1990/01	2003/08	DMB	
MARK	1-32	32-5N-11E	HARTSHORNE	HILL TOP SOUTHWEST	5,954	0	1990/08	1993/05	DF	
SHIRLEY#1	1	36-5N-11E	HARTSHORNE	PINE HOLLOW SOUTH	87,827	8	1986/04	2003/06	DF	СМ
MARBET LLC		1-5N-12E	HARTSHORNE	REAMS NORTHWEST	199,182	150	2000/04	2003/03	DF	DMB
SHERRILL	1	2 5N 12E	HARTSHORNE		166,008	72	1007/04	2003/08	DF	DMD
SHERRILL	3-2	2-5N-12E	HARTSHORNE / BOOCH	SOUTH PINE HOLLOW SOUTH	71,385	73 77		2003/08	DF	DMB DMB
	5-2	2-JIN-12E	, 50001	PINE HOLLOW	71,505	~ ~	2001/00	2003/00		DIVID
SEMESKI	1-3	3-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	217,786	139	2000/10	2003/09	СМ	DF
EVERETT 1	1	3-5N-12E	HARTSHORNE	SOUTH	279,023	62	1991/01	2003/08	СМ	DF

Well Name	Well #	Location	Formation	Field Name	<u>Cumulative Gas (Mcf)</u>	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	Secondary Facies
ROSE	1-4	4-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH PINE HOLLOW	110,079	61	2001/02	2003/08	СМ	DF
LOFTIS	1	8-5N-12E	HARTSHORNE	SOUTH	3,787	0	2000/08	2000/10	IC-1	
BETHEL	3	9-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	154,148	59	2000/05	2003/08	C-2	СМ
BETHAL	2-9	9-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	118,352	30	1999/05	2003/08	C-2	
BLEVINS		9-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	40,085	82	2002/05	2003/08	C-2	
COOPER	1	10-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	778,565	140		2003/08	C-2	см
CRAWFORD		10-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH		38		2003/08	C-2	СМ
	1			PINE HOLLOW	152,357					
WATKINS #1	1	10-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	532,012	152	1984/02	2003/08	C-2	СМ
WILLARD	1-10	10-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	722,003	110	1999/02	2003/08	C-2	
MARVIN	3	11-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	495,062	225	1999/10	2003/06	СМ	DMB
MARVIN	4	11-5N-12E	HARTSHORNE	SOUTH	26,210	0	1999/12	2000/02	СМ	DMB
MARVIN	5	11-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	1,227	0	2001/03	2001/03	СМ	DMB
MARVIN	6	11-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	2,387	42	2003/02	2003/03	СМ	DMB
MARBET	17	12-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	254,191	152	2000/01	2003/03	DF	СМ
JEFFERSON	1	12-5N-12E		PINE HOLLOW SOUTH	258,557	61		2003/03		DF
FIELD HEIR	1	13-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	3,255,168	24		2003/09		
				PINE HOLLOW						
WAGEMAN	1	14-5N-12E		SOUTH PINE HOLLOW	109,498	55		2003/08	СМ	DF
JUDY	1	15-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	6,009	200	2003/07	2003/07	DF	СМ
WILCOX	1-15	15-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	378,555	56	2001/02	2003/08	C-2	
TRACEY	1	16-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	53,744	67	2002/06	2003/08	C-2	СМ
DONNA	1	16-5N-12E	HARTSHORNE	SOUTH	434,511	177	2000/09	2003/08	C-2	
GOODE#1	1	16-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	456,606	6	1985/01	2003/08	C-2	см
ADAMS J W	1-16	16-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	243,096	20	1998/07	2003/08	C-2	
JOHNNY	1-16	16-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	716,366	147	1999/05	2003/08	C-2	см

Well Name	Well #	Location	Formation	Field Name	<u>Cumulative Gas (Mcf)</u>	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	Secondary Facies
ISENHOWER	1-17	17-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	463,477	148	1999/09	2003/08	C-2	
KRISTY LEE	1-17	17-5N-12E		PINE HOLLOW SOUTH	33,779	17	2000/07	2003/08	C-2	СМ
BROOKS	1-18	18-5N-12E	HARTSHORNE / SENORA	PINE HOLLOW SOUTH	16,675	0	1984/03	1996/11	IC-1	
HARRISON	1-18	18-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	281,510	157	1999/10	2003/08	IC-1	
VANDEVEER	1	19-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	517,653	126	1975/04	2003/09	СМ	DF
VANDEVEER WESTLAKE	2-19	19-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH PINE HOLLOW	2,347	78	2003/09	2003/09	СМ	DF
HEIRS	1-20	20-5N-12E	HARTSHORNE	SOUTH	177,031	26	1987/05	2003/08	C-2	
ТІМ	2-20	20-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	10,003	15	2002/08	2003/08	СМ	C-2
BLACK	1	20-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	1,572	0	1980/12	1982/07	DF	DMB
GARRETT A	1	21-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	637,888	29	1966/04	2003/08	DF	СМ
GARRETT	1-A	21-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	178,807	0	1966/04		СМ	DF
JENNIFER	1-21	21-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	45,011	52	2001/12	2003/08	DF	СМ
GARRETT	2-21	21-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	16,077	0	1999/09	2000/10	см	DF
JENNIFER	2-21	21-5N-12E		PINE HOLLOW SOUTH	17,529	17		2003/08	см	DF
GARRETT	3-21		HARTSHORNE	PINE HOLLOW SOUTH	82,910	49		2003/08	см	DF
GARRETT	4-21		HARTSHORNE	PINE HOLLOW SOUTH				2003/08	СМ	DF
MORAN S			HARTSHORNE	PINE HOLLOW SOUTH				2003/08		
оп	2	22-5N-12E		PINE HOLLOW SOUTH	52,983	32	1999/10		C-2	
ELLIS G W	 1B	22-5N-12E		PINE HOLLOW SOUTH	115,101	82	2001/11			
оп			HARTSHORNE	PINE HOLLOW SOUTH	123,980			2003/08		DF
DELILAH	1	23-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	1,693,279	137	1985/10	2003/09	IC-2	
LOFTIS	2	23-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	4,239,153	0	1968/10	1985/09	IC-2	

Well Name	Well #	Location	<u>Formation</u>	Field Name	Cumulative Gas (Mcf)	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	Secondary Facies
LOFTIS AUSTIN E	1	23-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	892,201	87	1985/10	2003/09	IC-2	
DELILAH		23-5N-12E	HARTSHORNE	SOUTH	1,216,608	0	1985/10	1992/11	IC-2	
MORRIS OSSIE	1	24-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	11,017,443	276	1965/08	2003/09	IC-2	
MORRIS O	3-24	24-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	46,175	38	2000/11	2003/09	IC-2	
DEPOT	1	25-5N-12E		PINE HOLLOW SOUTH	260,615			2003/09	IC-2	
				PINE HOLLOW						
WORKING EE	1	25-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	8,166,885	180	1965/08	2003/09	IC-2	
DAVIS	1	26-5N-12E	HARTSHORNE	SOUTH	7,660,105	175	1965/10	2003/09	IC-2	
BLACK	3-28	28-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	429,743	80	1993/08	2003/06	C-2	СМ
HALL	1	29-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	519,302	43	1981/07	2003/09	C-2	СМ
ROGERS	1-30	30-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	746,296	41	1978/06	2003/08	C-2	
LOFTIS	1-30	30-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	1,068,855	122	1986/10	2003/08	C-2	
HALL	1	31-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	428,728	19		2003/08	C-2	
				PINE HOLLOW					C-2	
HALL MCDONALD	1	32-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	470,147	0	1966/11	2000/10		
SUSAN	1	35-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	8,044,198	78	1965/08	2003/09	IC-2	
USA #36	1	36-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	864,986	0	1966/03	1983/11	IC-2	
THOMPSON	1	1-5N-13E	HARTSHORNE	SOUTH	304,160	32	1984/10	2003/08	C-2	СМ
WATKINS	1	2-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	793,928	37	197 <u>5/0</u> 9	2003/09	IC-2	
FOOD SE SW NW	1	3-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	2,258,446	40	1965/08	2003/09	IC-2	
FOOD	2-3	3-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	345,576			2003/09		
GIBSON WINNIE	2-4	4-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	77,738			2003/08		
GIBSON WINNIE	1	4-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	948,223			2003/09		
LINDSAY GIBSON NE SW	1	4-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	3,730,939	0		1990/04		
THORNTON SE			TANTONNE	PINE HOLLOW		-				
NW SE	1	5-5N-13E	HARTSHORNE	SOUTH	1,508,564	34	1965/08	2003/09	IC-2	

Well Name	Well #	Location	<u>Formation</u>	Eield Name	Cumulative Gas (Mcf)	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	<u>Secondary Facies</u>
STIPE	1-6	6-5N-13E	HARTSHORNE	SOUTH	83,798	0	1999/12	2002/07	DF	СМ
REYNOLDS	1	7-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	2,161,911	96	1979/07	2003/09	IC-2	
FIRESTON	1	7-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	678,818	0	1966/04	1977/04	IC-2	
BUSE SW NE	1	8-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	6,868,237	113	1965/08		IC-2	
WALLACE W C NE SW NW	1&2	9-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	1,700,574			2003/08	IC-2	
				PINE HOLLOW						
WINNIE	1	10-5N-13E	HARTSHORNE	SOUTH PINE HOLLOW	101,532	13	1988/08	2003/08	СМ	DF
GIBSON	10-1	10-5N-13E	HARTSHORNE	SOUTH	123,071	17	1985/01	2003/08	DF	СМ
WATKINS	1	11-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH PINE HOLLOW	545,907	63	1980/11	2003/08	C-2	СМ
WATKINS	1	12-5N-13E	HARTSHORNE	SOUTH	520,858	66	1984/10	2003/08	C-2	
HOPKINS	1	13-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	295,379	46	1981/09	2003/08	C-2	СМ
JUANITA	1-13	13-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	40,369	26	2000/09	2003/08	СМ	DF
GLENNIE	1-13	13-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	126,153	58	2000/04	2003/08	СМ	DF
SANDRA	1-13	13-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	122,939	55	2000/04	2003/08	СМ	DF
MARBET LLC	31	14-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	77,214	108	2001/05	2003/07	C-2	
RAMSEY	1	14-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	19,129	0	1983/09		C-2	СМ
RAMSEY	1-14	14-5N-13E	HARTSHORNE ZONE	PINE HOLLOW SOUTH	9,631	0	1983/02	1983/08	C-2	
MARBET LLC 37	37	15-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	57,461	93		2003/08	C-2	
EGGLESTON	1-15			PINE HOLLOW SOUTH	674,126			2003/08		
EGGLESTON	1-13 1A	15-5N-13E		PINE HOLLOW SOUTH	286,095			2003/07		
UNIT 1-A				PINE HOLLOW SOUTH						
ROCK WP ROCK W P C NW	1	17-5N-13E		PINE HOLLOW	32,358	0		1989/07		
NW BOOK W/ P	2	17-5N-13E		SOUTH PINE HOLLOW	4,245,468	0		2003/02		
ROCK W P BRUCE ROBBINS	3-17	17-5N-13E		SOUTH PINE HOLLOW	1,170	1		2002/10		
UNIT	1	18-5N-13E	HARTSHORNE	SOUTH	6,535,822	128	1965/08	2003/09	IC-2	

Well Name	Well #	Location	Formation	Field Name	<u>Cumulative Gas (Mcf)</u>	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	<u>Secondary Facies</u>
UNIV OF TULSA	1	19-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	3,516,263	0	1970/04	1998/11	IC-2	
GRETA	1-21	21-5N-13E	HARTSHORNE	POSTLE	13,725	101	2002/12	2003/03	DF	
CRAWLEY	1-21	21-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	215,157	342	2001/07	2003/08	C-2	DMB
VIRGIL	1-22	22-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	226,545	446	2001/04	2003/01	СМ	DMB
MARBETT LLC	32	23-5N-13E		PINE HOLLOW SOUTH	17,246	19		2003/03	СМ	DMB
NELL MARY	4	24-5N-13E		PINE HOLLOW SOUTH	9,546	83		2003/08	СМ	DMB
DEER CREEK	1-24	24-5N-13E		PINE HOLLOW SOUTH	73,422	0		1989/10		2
				SHADY GROVE						
ECKLES	1-5	5-6N-11E	HARTSHORNE	SOUTH	85,551	13	1999/09	2003/09	DMB	C-1
TRUMBO	1	6-6N-11E	HARTSHORNE / BOOCH	SHADY GROVE SOUTH	597,243	4	1964/01	2003/07	DF	DMB
STEPHENS	1	6-6N-11E	HARTSHORNE / BOOCH	SHADY GROVE SOUTH	525,239	0	1964/01	2003/07	DF	
BOYD	1	7-6N-11E	HARTSHORNE / BOOCH	SHADY GROVE SOUTH	737,652	9	1964/01	2003/08	DF	
BOYD	2	7-6N-11E	HARTSHORNE	SHADY GROVE SOUTH	85,110	6		2003/08	DF	
BLACK #2	2	9-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	96,090	5	1993/06	2003/06	DMB	DF
BLACK #4	4	9-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	456,763	17	1993/11	2003/09	C-1	DMB
WARREN	1	9-6N-11E	HARTSHORNE	SHADY GROVE SOUTH	77,348	0	1969/09	1972/01	C-1	DMB
BLACK #3	3	10-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	467,630	22	1993/11	2003/09	DMB	
GENEVA	1-10	10-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	262,228	15	1995/07	2003/09	DMB	DF
GAYLER #1-10	1-10	10-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	852,326	69	1994/11	2003/09	C-1	DMB
MC DONALD #1- 10	1-10	10-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	132,555	0	1994/11	1999/07	C-1	DMB
HILL #1-11	1-11	11-6N-11E	HARTSHORNE	SHADY GROVE SOUTH	1,028,357	206	1994/11	2003/09	C-1	DMB
BLEVINS	2-12	12-6N-11E	HARTSHORNE	CABANISS NORTHWEST	569,027	64	1995/10	2003/09	C-1	
BALLINGER	3-13	13-6N-11E	HARTSHORNE	CABANISS NORTHWEST	1,412,822	42	1985/01	2003/08	DMB	C-1
PAUL BALLINGER 4-13	4-13	13-6N-11E	HARTSHORNE	CABANISS NORTHWEST	109,744	14	1992/05	2003/08	DMB	DF
HILL	4-14	14-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	124,168	23	1995/06	2003/09	DF	DMB

Well Name	Well #	Location	Formation	HADY GROVE	Cumulative Gas (Mcf <u>)</u>	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	Secondary Facies
HILL	2-15	15-6N-11E		SOUTHWEST	4,004	0	1995/06	1996/06	DF	DMB
LITTLE	1	19-6N-11E			2,857	0		1998/07	DMB	C-1
BLAYLOCK 1-19	1-19	19-6N-11E	HARTSHORNE	HILL TOP NORTH	19,043	2		2003/08	DF	
ROLAND ROLAND 1-20	1-20	20-6N-11E 20-6N-11E	HARTSHORNE HARTSHORNE	HILL TOP NORTH HILL TOP NORTH	101,522 9,809	21 0	1992/06	2003/08	DMB DMB	C-1 C-1
	1 20		HARTSHORNE		5,005	۲,	1002/04	100211	0.110	
LINDLEY	1-30C	30-6N-11E	/ BOOCH	HILL TOP NORTH	346,832	35	1987/12	2003/08	DF	СМ
BLEVINS	1-7	7-6N-12E	HARTSHORNE	CABANISS NORTHWEST	66,117	1	1980/08	2003/08	СМ	DF
	27	7 6N 40E			4 0 2 0	_	1005 (10	1004/04	~	
BLEVINS	2-7	7-6N-12E	HARTSHORNE	NORTHWEST CABANISS	4,030	0	1985/12	1994/01	СМ	DF
HILSEWECK W J HILSEWECK	1-8	8-6N-12E	HARTSHORNE	NORTHWEST CABANISS	95,547	8	1979/10	2003/01	СМ	DF
RANCH	2-8	8-6N-12E	HARTSHORNE	NORTHWEST	34,419	12	1994/03	2003/08	СМ	DF
HILSEWECK W J	1-9	9-6N-12E	HARTSHORNE	CABANISS NORTHWEST	246,534	34	1979/10	2003/08	СМ	DF
HILSEWECK W J	1-15	15-6N-12E	HARTSHORNE	CABANISS NORTHWEST	229,313	32	1979/10	2003/08	СМ	DF
HILSEWECK W J	1-16	16-6N-12E	HARTSHORNE	CABANISS NORTHWEST	317,359	39	1979/10	2003/08	СМ	DF
HILSENECK	2-16	16-6N-12E	HARTSHORNE	CABANISS NORTHWEST CABANISS	27,972	11	1999/01	2003/08	СМ	DF
HILSEWECK W J	1-17	17-6N-12E	HARTSHORNE	NORTHWEST	355,224	17	1979/10	2003/08	C-2	DMB
HILSEWECK	2-17	17-6N-12E		CABANISS NORTHWEST	657,365		1996/11	2003/08	C-2	
HILSWECK	3-17	17-6N-12E	HARTSHORNE	CABANISS NORTHWEST CABANISS	46,551	14	1997/09	2003/08	DMB	
BLIVENS	1-18	18-6N-12E	HARTSHORNE	CABANISS NORTHWEST CABANISS	191,738	0	1979/10	1997/10	СМ	DMB
BLEVINS	2-18	18-6N-12E	HARTSHORNE	NORTHWEST CABANISS	990,511	159	1995/06	2003/09	C-2	
BLEVINS	9-18	18-6N-12E	HARTSHORNE	NORTHWEST CABANISS	660,508	123	1996/12	2003/08	C-2	
HILSEWECK	1&3	20-6N-12E	HARTSHORNE	NORTHWEST	1,266,867	529	1996/03	2003/09	C-2	
JONES	2-25	25-6N-12E	HARTSHORNE	PINE HOLLOW SOUTH	7,264	30	2003/02	2003/08	DF	BAY
HILSEWICK	1-29	29-6N-12E	HARTSHORNE	CABANISS NORTHWEST	9,311	0	1981 <i>/</i> 06	1989/06	СМ	DF
HILSEWECK	1-29A	29-6N-12E	HARTSHORNE	CABANISS NORTHWEST	36,728	0	1982/02	1989/05	СМ	DF

Well Name	Well #	Location	Formation	Pield Name	Cumulative Gas (Mcf)	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	Secondary Facies
HARTSFIELD	1-35	35-6N-12E	HARTSHORNE	PINE HOLLOW SOUTH PINE HOLLOW	46,203	68	2002/02	2003/08	DF	
HARTSFIELD	1-36A	36-6N-12E	HARTSHORNE	SOUTH	128,207	151	2002/02	2003/08	DF	
CARTER 1-2	1-2	2-6N-13E	HARTSHORNE	REAMS NORTHWEST	933,438	106	1989/02	2003/08	IC-1	
HOLT	J2-3	3-6N-13E	HARTSHORNE	REAMS NORTHWEST	17	0	1988/08	1988/08	IC-1	
HOLT J	4-3	3-6N-13E	HARTSHORNE	REAMS NORTHWEST	94,298	23	1997/10	2003/08	IC-1	
HOLT J	1	3-6N-13E	HARTSHORNE	REAMS NORTHWEST	2,708,284	48	1985/05	2003/08	IC-1	
HOLT	ЗJ	3-6N-13E	HARTSHORNE	REAMS NORTHWEST	393,172	11	1990/01	2003/08	IC-1	
HOLT	1-4T	4-6N-13E	HARTSHORNE	REAMS NORTHWEST	902,526	97	1988/08	2003/08	IC-1	
WHATS IF	1-11	11-6N-13E	HARTSHORNE	ULAN SOUTH	42	1	2003/07	2003/07	DF	
LEO	1-25	25-6N-13E	HARTSHORNE	PINE HOLLOW SOUTH	207,738	22	1988/09	2003/07	IC-2	
BLEVINS	1	25-6N-13E	HARTSHORNE	PINE HOLLOW SOUTH	1,135,398	49	1968/05	2003/09	IC-2	
0.0.4.V		00 ON 405		PINE HOLLOW	0 40 707	440	1070/07	2002/00		
GRAY	1	26-6N-13E	HARTSHORNE HARTSHORNE	SOUTH PINE HOLLOW	842,707	118	1978/07	2003/09	IC-2	
GLEESE	1-27	27-6N-13E	/ BOOCH	SOUTH PINE HOLLOW	64,130	9	1989/07	2003/08	DF	
GLEESE	1-28	28-6N-13E	HARTSHORNE	SOUTH	58,494	10	1990/02	2003/08	DF	
FRANCES 1-29	1-11	29-6N-13E	HARTSHORNE	PINE HOLLOW SOUTH	75,528	33	1992/09	2003/08	DF	DMB
MCCARTY	2 22	22 6N 12E	HARTSHORNE	PINE HOLLOW SOUTH	205 274	175	1999/11	2003/08	10.0	
	3-32	32-6N-13E		PINE HOLLOW	305,371					
GLEESE J	1	33-6N-13E	HARTSHORNE	SOUTH PINE HOLLOW	674,747	19		2003/08		
GLEESE	2-33	33-6N-13E	HARTSHORNE	SOUTH PINE HOLLOW	180,921	62	1998/02	2003/08	IC-2	
HUNT-GARRETT NW SE SW	1	34-6N-13E	HARTSHORNE	SOUTH	4,041,853	123	1965/08	2003/09	IC-2	
DOMINIC NE NW SW	1	35-6N-13E	HARTSHORNE	PINE HOLLOW SOUTH	2,744,814	83	1965/07	2003/09	IC-2	
	2-35	35-6N-13E	HARTSHORNE	PINE HOLLOW SOUTH	149,749	31	1993/12	2003/09	IC-2	
LEFLORE SE SW NW	1	36-6N-13E	HARTSHORNE	PINE HOLLOW SOUTH	831,922	0	1965/07	1979/02	IC-2	
LEFLORE	1-36		HARTSHORNE	PINE HOLLOW SOUTH	59,148	10		2003/08		
KLENE UN	1	1-7N-11E	HARTSHORNE	LAMAR EAST	2,299,313	31	1961/08	2003/08	DMB	C-1
TURNER	5	6-7N-11E	HARTSHORNE / BOOCH	GREASY CREEK	42,702	14	1986/05	2003/06	DF	СМ

ameli Name Follansbe	- Well #	uo coation 12-7N-11E	Lot Hartshorne	end Bield Name LAMAR EAST	Cumulative Gas (Mcf) 218,512	o Current Production Rate (Mcfd)	Pirst Production Date 60/1961	Last Production Date	0 <mark>Facies</mark>	⊠ <mark>Secondary Facies</mark> ⊞
WHITE	13-1	13-7N-11E	HARTSHORNE	LAMAR EAST	242,776	13	1985/06	2003/08	C-2	DIVID
				HORNTOWN						
ANDERSON#1	1	17-7N-11E	HARTSHORNE	SOUTHEAST SHADY GROVE	293,933	10	1985/04	2002/10	DMB	
JACKSON	1	30-7N-11E	HARTSHORNE	SOUTH SHADY GROVE	419,823	0	1986/04	1992/01	DMB	
BE	1	31-7N-11E	HARTSHORNE	SOUTH	719,276	5	1985/01	2003/08	DMB	
KAMPERMAN	1	31-7N-11E	HARTSHORNE	SHADY GROVE WEST	137,116	14	1989/02	2003/08	DMB	DF
JOYCE	1	5-7N-12E	HARTSHORNE	LAMAR EAST	230,132	11	1981/04	2003/08	DF	СМ
DERRISAW	1	6-7N-12E	HARTSHORNE	LAMAR EAST	347,958	0	1964/02	1991/07	DF	BAY
SARKEY	1	7-7N-12E	HARTSHORNE	LAMAR EAST	2,333,208	17	1961/08	2003/08	C-1	DMB
BURLESON	1	8-7N-12E	HARTSHORNE	LAMAR EAST	287,131	21	1982/09	2003/08	C-1	DMB
SARKEYS	1	14-7N-12E	HARTSHORNE HARTSHORNE	SCIPIO NORTHWEST SCIPIO	557,943	17	1963/05	2003/08	C-1	DMB
MAD MAX	1-14	14-7N-12E	/ BOOCH	NORTHWEST	51,994	29	2000/07	2003/08	DF	BF
том	1-14	14-7N-12E	HARTSHORNE	SCIPIO NORTHWEST SCIPIO	54,194	55	2001/01	2003/08	DF	BF
MYERS	1	15-7N-12E	HARTSHORNE	NORTHWEST	426,770	12	1963/11	2003/08	DF	BF
MYERS	1	15-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	54,156	0	1964/01	1970/05	DF	BF
KLEINKE	2	15-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	467,401	0	1963/08	1970/05	C-1	DMB
GILCREASE	2	16-7N-12E		SCIPIO NORTHWEST	259,338	0		1986/07	DMB	
PERRY	1	17-7N-12E	HARTSHORNE	LAMAR EAST	289,538	17	1982/03	2003/08	DMB	C-1
GRIFFIN HEIRS	1-17	17-7N-12E	HARTSHORNE	LAMAR EAST	12,152	64	2003/03	2003/08	DMB	C-1
SARKEYS	1B	18-7N-12E	HARTSHORNE	LAMAR EAST	298,179	0	1964/03	1982/11	DMB	C-1
SARKEYS	1C	18-7N-12E	HARTSHORNE	LAMAR EAST	169,548	8	1964/02	2003/08	DMB	C-1
GILCREASE #1 #2	1	21-7N-12E		SCIPIO NORTHWEST	318,949	0	1964/12	1997/06	DMB	DF
FALCON CLUB	1-21	21-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	108,581	64	2000/08	2003/08	DF	
KERN	1-21	21-7N-12E	HARTSHORNE / SAVANNA	SCIPIO NORTHWEST	10,195	10	2001/08	2003/08	DF	
FALCON CLUB	2-21	21-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	136,167	56	2001/01	2003/08	DF	DMB
FALCON CLUB	3-21	21-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	146,922	123	2001/01	2003/08	DMB	DF
CLARKE	1	22-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	86,270	0	1964/12	1987/05	DMB	DF
CLARK	1	22-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	78,590	0	1964/12		DMB	DF

Well Name	Well #	Location	Formation	Field Name	Cumulative Gas (Mcf)	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	Secondary Facies
BRADSTREET	1	22-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	696,861	0	1963/02	1969/08	C-2	C-1
JONATHAN	1-22	22-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	31,129	12	2000/09	2003/08	DMB	DF
MELISSA	2-22	22-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	48,110	14	2000/12	2003/08	DF	DMB
MICHAEL	2-22	22-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	124,116	67	2001/04	2003/08	DMB	DF
SOUSEA	1	24-7N-12E		SCIPIO NORTHWEST	53,703	0	1968/07		DF	BF
MYERS-HOLT	1	24-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	92,080	12		2003/08	DF	BF
ROSS	1-24	24-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	14,240	0	2001/08	2003/06	DF	
STIPE	1-27	27-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	178,169	49	1997/09	2003/08	DF	DMB
MILLION	1-27	27-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	2,078	0	1983/01	1985/03	DF	DMB
STIPE	2-27	27-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	102,786	145	2001/07	2003/08	DF	DMB
STIPE	3-27	27-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	67,332	65	2001/10	2003/08	DF	DMB
STIPE	1-28	28-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	437,796	93	1996/10	2003/08	DMB	DF
MYERS	1-28	28-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	77,827	0	1980/08	1988/02	DF	DMB
STIPE	2-28	28-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	119,611	40	1997/09	2003/08	DMB	DF
WJHILSEWECK	1-29	29-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	142,605	24	1988/01	2003/08	DF	BAY
PUCKETT	1-32	32-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	57,410	0	1982/12	1996/11	DMB	
PUCKETT	2-32	32-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	23,495	10	1995/06	2003/08	DF	
DOSS	1-33	33-7N-12E	HARTSHORNE / BOOCH	CABANISS NORTHWEST	42,806	0	1982/12	1997/01	DMB	
OTHEL	1	1-7N-13E	HARTSHORNE	SCIPIO NORTHWEST	27,389	21	1998/11	2003/07	DF	BAY
HERMAN	1-12	12-7N-13E	HARTSHORNE	SCIPIO NORTHWEST	19,271	16	2000/12	2003/07	DMB	C-1
WARD WARD	1	13-7N-13E	HARTSHORNE HARTSHORNE	ULAN EAST ULAN EAST	204,197 164,754	39		2003/08 2003/08		C-1
DUNCAN #1	2-13 1	13-7N-13E		SCIPIO NORTHWEST	208,699	25 31		2003/08		C-1 DMB
MOONEYHAM	1-18	18-7N-13E	HARTSHORNE / SAVANNA	SCIPIO NORTHWEST	489,300	18		2003/06		DF

Well Name	Well #	Location	<u>Formation</u>	Field Name	Cumulative Gas (Mcf)	Current Production Rate (Mcfd)	First Production Date	Last Production Date	Facies	Secondary Facies
ROCKEY	1-18	18-7N-13E	HARTSHORNE / SAVANNA	SCIPIO NORTHWEST	88,122	о	1994/07	1999/11	DMB	DF
MOONEYHAM #1- 18	1-18	18-7N-13E	HARTSHORNE / SAVANNA	SCIPIO NORTHWEST	163,419	18	1994/02	2003/08	DMB	DF
HOOTERS	1-18	18-7N-13E	HARTSHORNE	SCIPIO NORTHWEST	19,936	45	2002/06	2003/08	DMB	DF
HILL #1-24	1-24	24-7N-13E	HARTSHORNE / BOOCH	ULAN EAST	299,375	12	1993/10	2003/08	DF	
KING	3-25	25-7N-13E	HARTSHORNE / BOOCH	REAMS NORTHWEST	369,985	50	1994/09	2003/08	DF	
KING	4-25	25-7N-13E	HARTSHORNE / BOOCH	REAMS NORTHWEST	103,446	62	2001/03	2003/08	DF	
LUCILLE	1-34	34-7N-13E	HARTSHORNE	REAMS NORTHWEST	1,046,508	52	1985/05	2003/08	IC-1	
STATE	1-35	35-7N-13E	HARTSHORNE	REAMS NORTHWEST	607,018	0	1980/10	1987/04	IC-1	
STATE	2-35	35-7N-13E	HARTSHORNE	REAMS NORTHWEST	1,200,399	221	1988/08	2003/08	IC-1	
SUNSHINE	1-36	36-7N-13E	HARTSHORNE	REAMS NORTHWEST	73,470	13	1996/05	2003/08	IC-1	
SHEENA #1-36	1-36	36-7N-13E	HARTSHORNE	REAMS NORTHWEST	342,580	70	1995/07	2003/08	IC-1	

Appendix B: Hartshorne Production Sorted By Field

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					e Ga	E E	nbei	Mcfo	Date	Date
b D		Ē	F	tion	ativ	ction (Mc	Nur	nt Ga ctior ate (por	por
Operator	¥el	Well Num	ocation	Formation	Cumulative Gas Production (Mcf	Gas Production_Latest Month (Mcf)	Active Number (Wells	Current Gas Production RateRate (Mcfd)	First Prod Date	ast Prod Date
ō	M	X	_	ية ISS NORTHWES		öł≥	Ă۶	2528	Ē	Ľ
ARKOMA GAS CO	BALLINGER	3-13	13-6N-11E	HARTSHORNE	1,412,822	1250	1	42	1985/01	2003/08
ARKOMA GAS CO	BLEVINS	1-7	7-6N-12E	HARTSHORNE	66 117	37	1	1	1980/08	2003/08
ARKOMA GAS CO XAE CORPORATION	BLEVINS BLEVINS	2-7 2-12	7-6N-12E 12-6N-11E	HARTSHORNE HARTSHORNE	4,030 569,027	1915	1	0 64	1985/12 1995/10	1994/01 2003/09
GULF PROD. CORP.	BLEVINS	2-18	18-6N-12E	HARTSHORNE	990,511	4770	1	159	1995/06	2003/09
GULF PROD. CORP.	BLEVINS	9-18	18-6N-12E	HARTSHORNE	660,508	3699	1	123	1996/12 1979/10	2003/08
ARKOMA GAS CO ARKOMA GAS CO	BLIVENS HILSENECK	1-18 2-16	18-6N-12E 16-6N-12E	HARTSHORNE HARTSHORNE	191,738 27,972	337	1	0 11	1979/10	1997/10 2003/08
ARKOMA GAS CO	HILSEWECK	2-17	17-6N-12E	HARTSHORNE	657,365	3023	1	101	1996/11	2003/08
GULF PROD. CORP. ARKOMA GAS CO	HILSEWECK	183	20-6N-12E	HARTSHORNE	1,266,867	15870	1	529	1996/03	2003/09
ARKUMA GAS CO	HILSEWECK HILSEWECK	1-29A	29-6N-12E	HARTSHORNE	36,728			0	1982/02	1989/05
ARKOMA GAS CO	RANCH	2-8	8-6N-12E	HARTSHORNE	34,419	352	1	12	1994/03	2003/08
ARKOMA GAS CO	HILSEWECK W J	1-8	8-6N-12E	HARTSHORNE	95,547	231	1	8	1979/10	2003/01
ARKOMA GAS CO	HILSEWECK W J	1-9	9-6N-12E	HARTSHORNE	246,534	1018	1	34	1979/10	2003/08
ARKOMA GAS CO	HILSEWECK W J	1-15	15-6N-12E	HARTSHORNE	229,313	957	1	32	1979/10	2003/08
ARKOMA GAS CO	HILSEWECK W J	1-16	16-6N-12E	HARTSHORNE	317,359	1171	1	39	1979/10	2003/08
ARKOMA GAS CO ARKOMA GAS CO	HILSEWECK W J HILSEWICK	1-17 1-29	17-6N-12E 29-6N-12E	HARTSHORNE HARTSHORNE	355,224 9,311	514	1	17 0	1979/10 1981/06	2003/08 1989/06
ARKOMA GAS CO	HILSWECK	3-17	17-6N-12E	HARTSHORNE	46,551	412	1	14	1997/09	2003/08
	PAUL BALLINGER									
ARKOMA GAS CO	4-13	4-13	13-6N-11E	HARTSHORNE	109,744 7,327,687	427 35,983	1	14 6 1,199	1992/05	2003/08
PA ENERGY	LYONS	1-6	6-5N-11E	IN SOUTHEAST HARTSHORNE	FIELD 46,254	76	1	3	1984/06	2003/08
FALINEROT	LIONS	1-0	0-JIN-TIL	HARTSHORNE	46,254	76		1 3	1504/00	2003/00
			GR	EASY CREEK FI HARTSHORNE /	ELD					
LOFTIS BOB L	TURNER	5	6-7N-11E	BOOCH	42,702	408	1	14	1986/05	2003/06
					42,702	408		1 14		
				HILL TOP FIELD	1					
DIAMOND HARRY H IN C.	ALTA #1	1	19-5N-11E	HARTSHORNE	299,093	246	1	8	1981/09	2003/08
DIAMOND HARRY H INC.	ARTHUR #1	1	19-5N-11E	HARTSHORNE	569,869	1040	1	35	1981/09	2003/08
T K DRILLING CORPORATION SOUTHERN RESOURCES	BAILEY BLACK	1 1-17	17-5N-11E 17-5N-11E	HARTSHORNE HARTSHORNE	131,633 245,241	691 881	1	23 29	1983/10 1988/11	2003/05 2003/08
T K DRILLING CORPORATION	BLACK J	1	20-5N-11E	HARTSHORNE	472,784	2165	1	72	1989/02	2003/09
TENNECO OIL COMPANY	CARTER C C	1	30-5N-11E	HARTSHORNE	251,921			0	1978/05	1980/12
SOUTHERN RESOURCES SOUTHERN RESOURCES	HUFFMAN MARK	1-32 1-32	32-5N-11E 32-5N-11E	HARTSHORNE HARTSHORNE	173,087 5,954	735	1	25 0	1990/01 1990/08	2003/08 1993/05
BONNELL FRANK A	MCDONALD	1-52	18-5N-11E	HARTSHORNE	401,182	808	1	27	1980/09	2003/08
DIAMOND HARRY H INC.	MOBIL #1	1	20-5N-11E	HARTSHORNE	544,250	1464	1	49	1988/07	2003/08
T K DRILLING CORPORATION T K DRILLING CORPORATION	PACE PLP CARTER	1 PLP2	18-5N-11E 30-5N-11E	HARTSHORNE HARTSHORNE	21,377 652,029			0	1975/09 1978/04	1978/07 1998/11
MARBET LLC	TRAVIS P	1L	21-5N-11E	HARTSHORNE	621,903	2252	1	75	1991/06	2003/01
SOUTHERN RESOURCES	VERNON	1-29	29-5N-11E	HARTSHORNE	98,612	361	1	12	1990/05	2003/08
SOUTHERN RESOURCES	VERNON PARK ESTATE	1-29	29-5N-11E	HARTSHORNE	160,930	230	1	8	1989/12	2003/08
000111211111200011020	LOWITE	1 20	20 014 112	That to horate	4,649,865	10,873	1 [.]		1000/12	2000/00
SOUTHERN RESOURCES	BLAYLOCK 1-19	1-19	HILL 19-6N-11E	- TOP NORTH FI HARTSHORNE	ELD 19,043	56	1	2	1991/03	2003/08
				HARTSHORNE /		00		2		2000/00
SOUTHERN RESOURCES	UNDLEY	1-30C	30-6N-11E	BOOCH	346,832	1042	1	35	1987/12	2003/08
SOUTHERN RESOURCES SOUTHERN RESOURCES	UTTLE ROLAND	1	19-6N-11E 20-6N-11E	HARTSHORNE HARTSHORNE	2,857 101,522	616	1	0 21	1993/02 1992/06	1998/07 2003/08
SOUTHERN RESOURCES	ROLAND 1-20	1-20		HARTSHORNE	9,809			0	1992/04	1992/11
					480,063	1,714	:	3 57		
			HORNTO	OWN SOUTHEAS	ST FIELD					
SWADLEY R W & J	ANDERSON#1	1	17 78 445	HARTSHORNE	293,933	303	1	10	1985/04	2002/10
SWADLEY K W & J	ANDERSUN#T	1	17-7N-11E	HARTONURNE	293,933 293,933	303 303		10 1 10	1900/04	2002/10
JAY PET. INC.	BURLESON	1	8-7N-12E	AMAR EAST FIE HARTSHORNE	LD 287,131	622	1	21	1982/09	2003/08
JAY PET. INC.	DERRISAW	1	6-7N-12E	HARTSHORNE	347,958	~~~		0	1964/02	1991/07
JAY PET. INC.	FOLLAN SBE	1 1-17	12-7N-11E 17-7N-12E	HARTSHORNE HARTSHORNE	218,512	1919	1	0 64	1961/09	1972/07
TILFORD PINSON EXPL.	GRIFFIN HEIRS	1-17	17-7N-12E	HARIOTURNE	12,152	1919	1	04	2003/03	2003/08

Bay Bay <th></th> <th></th> <th>_</th> <th></th> <th></th> <th></th> <th>st</th> <th>-</th> <th></th> <th></th> <th></th>			_				st	-			
JAV PET INC. JOYCE 1 5-74-TE MATEGRAPHIC 220,122 317 1 1 1 10106 200000 JAV PET INC. JEARNEY 1 1 7.74-TE MATEGRAPHIC 2.35,208 813 1 1 1 10106 200000 JAV PET INC. SARREY 1 1 1 1 1 10106 200000 JAV PET INC. SARREY 1 1 1 1 1 10106 200000 JAV PET INC. SARREY 1 1 1 1 1 1 10106 100000 1000000 1000000 10000000 1000000000000000000000000000000000000						Gas (Mcf)	, Lates	ber of	(cfd)	ate	ate
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JAV PET INC. JOYCE 1 5-74-TE MATEGRAPHIC 220,122 317 1 1 1 10106 200000 JAV PET INC. JEARNEY 1 1 7.74-TE MATEGRAPHIC 2.35,208 813 1 1 1 10106 200000 JAV PET INC. SARREY 1 1 1 1 1 10106 200000 JAV PET INC. SARREY 1 1 1 1 1 10106 200000 JAV PET INC. SARREY 1 1 1 1 1 1 10106 100000 1000000 1000000 10000000 1000000000000000000000000000000000000	ber at	<u>.</u>	el N	ocatic	ormat	nmula	as roduc flonth	ctive	urren roduc ateRa	irst P.	ast Pr
JAV PET INC SPERFY 1 177.11/2 HARTSHCREE 295/58 499 1 177 198/00 2000/00 JAV PET INC SARREYS 1 0 77.11/2 HARTSHCREE 295/58 203 1 177 198/00 2000/00 JAV PET INC SARREYS 10 157.11/2 HARTSHCREE 285/00 233 1 17 198/00 2000/00 JAV PET INC SARREYS 10 157.11/2 HARTSHCREE 285/00 673 1 20 198/00 2000/00 JAV SCHER.CO EETHEL 3 SARLE HARTSHCREE 285/00 673 1 20 198/00 2000/00 BAVKG OFER.CO EETHEL 3 SARLE HARTSHCREE 285/00 17 188/00 18 18 19 198/00 2000/00 BAVKG OFER.CO EERHEL 3 SARLE 14 95/10 14/10 19 91/10 10 95/10 11/10 11/10											
JAY PET INC. SARKEY 1 7.79/128 HATSHORE 2.38/28 513 1 0 19/08 000000 JAY PET INC. SARKEY 10											
JAY PET INC. SARIEY3 10 15-h12:E HATSHORE 28,179 10 18400 182h1 JAY PET INC. WITE 10 15-h12:E HATSHORE 28,174 30.48 2 10 10 10000 20000 DAVS OPER CO ADMS MW 11 16-h12:E HATSHORE 240,55 10 10 10000 20000 DAVS OPER CO ADMS MW 11 16-h12:E HATSHORE 240,55 11 0 19900 20000 DAVS OPER CO BLACK 3 S5-h12:E HATSHORE 10,16 17.72 0 199010 200000 200000 200000											
JAY PET.INC. WHTE 13-1 13-7-11E HARTSHORME 2427.47 76.01 19 198006 200309 DAVIS OFER CO DAVIS OFER CO BETHAL 2-9 9-9-11 HARTSHORME 116.20 9-90-12 9-						298,179					1982/11
UNIS OFER CO. ADAME J.W. 1/6											
DAVIS OPER CO ADAMS J.W 1-16 16-16-12 HARTSHORME 243,006 613 1 20 1998057 200308 DAVIS OPER CO BEHHAL 3 9-54-12 HARTSHORME 119,335 65 1 30 1998057 200306 200307 ROOWNEL DOL CO BLACK 1 29-54-12 HARTSHORME 1,252 144 17 1 49 1998057 200306 200307 DAVIS OPER CO BLACK 3.28 25-64-13E HARTSHORME 4,0343 2464 1 40 1998070 200306 DAVIS OPER CO BLACK 1 1 18-44-12 BANOFA 4,038 2466 1 2 200005 200308 DAVIS OPER CO COAPER 1 18-44-12 BANOFA 1,038 1 148 138 200102 200308 DAVIS OPER CO COAPER 1 18-44-12 18-44-13 38 200102 200308 DAVIS OPER CO COAPER	GATTELLING.	WINTE .	10-1	10-IN-ITE	Instruction					1000/00	2000/00
DAVIS OPER CO ADAMS J.W 1-16 16-16-12 HARTSHORME 243,006 613 1 20 1998057 200308 DAVIS OPER CO BEHHAL 3 9-54-12 HARTSHORME 119,335 65 1 30 1998057 200306 200307 ROOWNEL DOL CO BLACK 1 29-54-12 HARTSHORME 1,252 144 17 1 49 1998057 200306 200307 DAVIS OPER CO BLACK 3.28 25-64-13E HARTSHORME 4,0343 2464 1 40 1998070 200306 DAVIS OPER CO BLACK 1 1 18-44-12 BANOFA 4,038 2466 1 2 200005 200308 DAVIS OPER CO COAPER 1 18-44-12 BANOFA 1,038 1 148 138 200102 200308 DAVIS OPER CO COAPER 1 18-44-12 18-44-13 38 200102 200308 DAVIS OPER CO COAPER				PINE H	HOLLOW SOUTH	H FIELD					
DAVIS OPER CO BEHNEL 3 9.40122 HARTSHORNE 1.172 1 69 200005 200306 BRAVO BLACK 3.2 2.464.12 HARTSHORNE 1.172 1 69 109005 200306 DAVIS OPER CO BLAVIS 2.244.12 HARTSHORNE 1.163.93 1.171 1 69 200005 200306 DAVIS OPER CO BLAVIS OPER CO BLAVIS OPER CO 0 199003 11 1544.12 HARTSHORNE 4.0605 2465 1 12 200306 XTO UNIT 1 544.12 SENDAL 6.675 0 199008 200309 XTO UNIT 1 1644.12 BOOCH 778.566 4155 1 140 199008 200309 DAVIS OPER CO COOPER 1 1644.12 BOOCH 778.566 4155 1 140 290002 200309 TUCK STO DAVIS OPER CO COANUS PL 2.244.124 HARTSHORNE 157.61				16-5N-12E	HARTSHORNE	243,096		1			
PROCIWELL DRUG CO. BLACK 1 2094-128 HARTSHORNE 1,172 0 1980/2 1											
BRAVO WYTEX PROD DAVIS OFER CO BLACK BLEVINS 5.20 2 894-12 Seh1-32 BOCH HARTSHORME 4.20 (3.38) 1471 (4.1) 4.00 (4.1) 18000 (4.2) 20000 (4.2) DAVIS OFER CO BECVISS 1.01 15.44-12 1.25.44-12 1.42.7							1758	1			
WTEX PROD. BLEVINS 1 2-84-13E HARTSHORNE 1, 125,398 1471 49 186405 200308 DAVIS OPER CO BEOCKS 1-18 IBSN12E HARTSHORNE 16,675 0 194403 195401 XTO BUS ES WIK 1 8-8N-13E HARTSHORNE 6,665,272 3375 1 126 196403 200308 DAVIS OFER CO COPER 1 105N-12E HARTSHORNE 6,665,272 3375 1 126 196400 200308 DAVIS OFER CO COPER 1 105N-12E BOOCH 775,565 4195 1 140 196608 200308 VALE OLASSOC CRAWLEY 1 265-12 255-55 20000H 775,565 4195 1 140 196600 200308 UCKER ROLE SCOMPARY DEFORT 1 265-61-12 HARTSHORNE 765,65 4195 1 767 196607 2000070 2000070 2000070 2000070 2000070 2000070					HARTSHORNE /						
DAVIS OPER CO BLEVINS 9-9-N-12F HARTSHORNE 40.085 2466 1 6.2 202005 200308 DAVIS OPER CO BEDORS 11 18-N1-12 SENDRA/ 16.675 0 199403 199611 XTO BUSE SW NE 1 16-N1-12 SENDRA/ 6.535.22 3375 1 113 196608 200309 DAVIS OPER CO COOPER 1 10-N1-12 BOOCH 73.66 4196 1 140 199608 200309 VALE CIL ASSOC CRAWCRP 1 10-N1-12 BOOCH 73.66 4195 1 140 199608 200309 VALE CIL ASSOC CRAWCRP 1.21 25.49-12 HARTSHORNE 73.61.0 6223 1 342 200107 200308 VALE CIL ASSOC CRAWCRP 1.22 25.49-12 HARTSHORNE 74.42.1 1.31 110.0 19.9072 200309 1.30 1.31 1.30 1.30 1.30 1.30 1.30 1.30											
HARTSIORNE / DAVIS OPER CO BROOKS BRUCE RCEBINS NTO III III III IIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII			I								
BRUCE FLOGEINGS BUILOE FLOGEINGS Parts of the second seco					HARTSHORNE /						
XTO UNIT 1 16.94N-162 HARTSHORME 6.582.822 3375 1 128 196008 200309 DAVIS OPER. CO COOPER 1 10-94N-122 BOOCH 778,665 4195 1 140 199608 200309 DAVIS OPER. CO COOPER 1 10-94N-122 BOOCH 778,665 4195 1 40 199608 200309 VALE GLASSOC. CRAMLEY 1 10-94N-122 197007 100324 1 342 200107 200309 SAMSOM DELLIAH 1 23-64N-122 HARTSHORNE 7,660,105 52-83 1 175 198070 200309 SAMSOM DELLIAH 1 23-64N-12 HARTSHORNE 7,660,105 52-83 1 115 199011 200309 CHCKERAFAKE DONINA 1 15-64N-12 HARTSHORNE 140,149 9.23 1 1 199012 200309 UNCKER RON & COMPANY EDONINA 1 15-64N-12<	DAVIS OPER. CO		1-18	18-5N-12E	SENORA	16,675			0	1984/03	1996/11
DAXIS OPER: CO COOPER 1 10-8-172 BOCH 778,565 4195 1 140 195608 200308 DAVIS OPER: CO CRAWFORD 1 10-8-172 BOCH 778,565 4195 1 432 200107 200308 VALLE CIL ASSOC CRAWFORD 1-21 12-18-158 HARTSHORNE 7.66,102 5233 110 196012 200308 TUCKER T/O COMMANY DEBULAH 1 23-81-122 HARTSHORNE 2.66,151 1386 1 137 199011 200309 CHESAREAKE DEPOT 1 25-81-182 HARTSHORNE 2.66,151 1386 4.66 199011 200309 CHESAREAKE SW 1 56-81-182 HARTSHORNE 2.60,415 1386 1.465 199011 200309 199011 200307 CHESAREAKE SW 1 56-81-182 HARTSHORNE 2.744,814 2.433 1 8.3 199017 200307 DAVIS OPER CO DOMINIC<		UNIT									
DAVIS OPER. CO COOPER 1 10-NI-12E BOOCH 778,565 4195 1 140 1996/02 200308 DAVIS OPER. CO CRAWFORD 1 10-3N-12E BOOCH 121,377 1026 132 200107 200308 VALE OLL ASSOC DAVIS OPER. CO CRAWLEY 1 24-5N-12E HARTSHORNE 7,601,155 563 1 175 1986/01 200308 CMARDAM DAVIS OPER. CO DAVIS OPER. CO DAVIS OPER. CO 0 1986/01 200309 CHESAREAKE DEPOT 1 25-5N-12E HARTSHORNE 2,744,414 2433 1 63 1996/07 200309 CHESAREAKE DOMINA 1 16-5N-13E HARTSHORNE 2,744,414 2433 1 63 1996/07 200309 CHECKER COV DOMINA 1 16-5N-13E HARTSHORNE 2,74,212 293 1831 177 200309 200309 CHECKER COV EVELSTI 1 14-5M-15E HARTSHO	XTO	BUSE SW NE	1	8-5N-13E		6,868,237	3375	1	113	1965/08	2003/09
DAMS OPER.CO CRAWLEYOR 1 10-5N-12E BOOCH 122,37 1144 1 38 201/02 203308 XTO DAMS 1 22-5N-13E HARTSHORNE 27,567,10 10262 1 322 2001/02 203308 SAMSON DEER CREEK 1-24 24-N13E HARTSHORNE 73,422 0 1980010 203308 GM PROP & INVEST, INC DOMINIC NE BW 23 35-6K-12E HARTSHORNE 149,144 292 1 31 198010 203309 CHESAPEAKE DOMINIC NE BW 23 35-6K-12E HARTSHORNE 149,144 243 1 83 199012 203309 DAMS OFER.CO DONNA 1 15-5K-12E HARTSHORNE 244,144 243 1 83 199072 203309 DAMS OFER.CO EGLESTON UNIT 1 35-6K-12E HARTSHORNE 246,055 1056 1 35 199072 203307 DAMS OFER.CO ELIA BARTSHORNE 13-5K-12E	DAVIS OPER. CO	COOPER	1	10-5N-12E	BOOCH	778,565	4195	1	140	1996/08	2003/08
VALE OL. ASSOC. CRAMLEY 1-2 2-16-118 215,157 10262 1 342 200/07 200309 TUCKER RON & COMPANY DEER CREEK 1-2 24-59-12E HARTSHORNE 7,66,105 52.63 1 175 1965/05 1999/10 OLESAPEAKE DEENT 1 25-59-12E HARTSHORNE 1863,279 4098 1 31 1990/11 200309 OMESAPEAKE DEMNICE NEW 2-33 35-64-12E HARTSHORNE 126,141 243 31 1990/11 200309 OMESAPEAKE DEMNICE NEW 56-04-12E HARTSHORNE 27,443/14 249 21 31 1990/17 200309 OMESAPEAKE SOMPAR 1 15-64-13E HARTSHORNE 26,136 1066 1 35 1994/07 200308 TUCKER RON & COMPANY EVEBET1 1 3-54/12E HARTSHORNE 266,065 1066 1 35 1994/07 200308 TUCKER RON & COMPANY EVEBET1 1	DAVIS OPER CO	CRAWEORD	1	10-5N-12E		152 357	1144	1	38	2001/02	2003/08
TUCKER FON & COMPANY DEEL CREEK 1-24 24-SN-12E HARTSHORNE 173/22 0 198005 1989/10 200305 CHESAPEAKE DEFOT 1 25-SN-12E HARTSHORNE 200,11 2003059 GM PROP. & INVEST INC. DOMINIC NE NW 2-35 55-N-12E HARTSHORNE 200,11 201,12 2003059 DAVIS OPER. CO DOMINA 1 15-SN-12E HARTSHORNE 243,13 31 193012 2003059 TUCKER FON & COMPANY EGGLESTON UNIT 1-55 HARTSHORNE 443,611 5131 1.77 200009 200307 DAVIS OPER. CO DONNA 1 1-56N-12E HARTSHORNE 434,611 513 1940/07 200307 DAVIS OPER. CO ELLIS G.W 18 2-5N-12E HARTSHORNE 151,011 2468 1 62 191011 2003068 XTO FIREJOHER 1 1-56N-12E HARTSHORNE 275,023 1660 1 35 1940/07 200307 GM PROP.											
SAMSON DELUAH 1 23-SN-12E HARTSHORNE 1,880,215 336 1 137 1986/10 200309 GM PROP. 8, INVEST. INC. DOMINIC 2-35 55-SN-12E HARTSHORNE 149,749 9:33 1 31 1993/12 200309 CHESAPEAKE DOMINIC 2-35 55-SN-12E HARTSHORNE 2,744,84 2483 1 83 1985/07 200309 CHESAPEAKE DOMINA 1 55-N1-12E HARTSHORNE 2,744,84 2483 1 83 1986/07 200309 TUCKER RON & COMPARY EGGLESTON UNIT 1 55-N1-12E HARTSHORNE 143,611 236 12 201/11 200308 STOVER COMPARY EVERETIT 1 15-SN-12E HARTSHORNE 175,75 1 24 1965/08 2003/09 STOVER COMPARY EVERETIT 1 15-SN-12E HARTSHORNE 2,25,46 721 14 24 1965/08 2003/09 STOVER COMPARY FIRESTON							5263	1			
CHESAPEAKE DEPOT 1 25-SH-12E HARTSHORNE 149,749 933 1 381 1990/11 200309 CHESAPEAKE DOMINIC NE NW 35-SH-13E HARTSHORNE 243,749 933 1 183 169507 200309 DAMIS OFER.CO DOMNA 1 16-SH-12E HARTSHORNE 443,611 531 177 200009 200308 TUCKER ROK S COMPANY EGGLESTON UNIT 1 15-SH-13E HARTSHORNE 443,611 531 177 200009 200308 STOVE COMPANY 1-A 1 15-SH-13E HARTSHORNE 1511 2466 1 22 2001/11 200306 XTO FIELD HER 1 1-35N-12E HARTSHORNE 279,023 1666 1 21994/07 200307 GM PROP. & INVEST INC. FOOD SAN-12E HARTSHORNE 279,023 1666 1 21994/07 200309 AUTO FIELD HER 1 1-35N-12E HARTSHORNE 279,0366 171<							4098	1			
GM PROP. 8. INVEST. INC. DOMINIC 2-55 656-N3E HARTSHORNE 147,49 923 1 31 1930/12 2030/39 CHESAPEAKE SW 1 356-N-3E HARTSHORNE 2,74,814 2493 1 63 1965/07 2030/09 2033/08 TUCKER RON & COMPANY EGGLESTON 1-15 15-50-N3E HARTSHORNE 674,126 672 1 29 1984/12 2033/08 TUCKER RON & COMPANY EGGLESTON 1-15 15-50-N-12 HARTSHORNE 266/95 1056 1 35 1994/07 2003/07 DAVIS DPER. CO FILLD HEIR 1 3-6N-12E HARTSHORNE 276,768 721 1 24 1996/02 2003/09 UNOCAL FIRED HEIR 1 3-6N-13E HARTSHORNE 2,258,446 1199 1 40 1966/08 2003/09 DAVIS DPER. CO FRANCES 1-29 1-11 2-6N-12E HARTSHORNE 2,258,446 1199 1 40 1966/02 2003/09											
CHESAPEAKE SW 1 35-6N-13E HARTSHORNE 2,74,814 2433 1 83 196507 200338 TUCKER RON & COMPANY EGGLESTON 1-15 15-5N-13E HARTSHORNE 67,126 672 1 29 1984/12 200338 TUCKER RON & COMPANY EGGLESTON 1-15 15-5N-13E HARTSHORNE 280,95 1056 1 35 1994/07 20037 DAVIS OPER CO ELLIS GW 18 25-6N-12E HARTSHORNE 2750,168 1 62 1991/01 200308 TO FIELD HEIR 1 3-5N-12E HARTSHORNE 2,256,168 721 1 24 198500 200309 UNCCAL FIELD HEIR 1 3-5N-13E HARTSHORNE 2,256,168 1 59 195002 200309 DAVIS OPER CO FRANCES 1.29 1-1 2-5N-12E HARTSHORNE 2,256,168 1 19 1 40 196500 200309 DAVIS OPER CO FRANCES 1.29	GM PROP. & INVEST. INC.		2-35	35-6N-13E	HARTSHORNE	149,749	923	1	31	1993/12	2003/09
TUCKER RON & COMPANY EGGLESTON 1-15 1-5N-13E HARTSHORNE 674,126 872 1 29 198//12 200308 WHEELER ENERGY 1-A 1 5-N-13E HARTSHORNE 266,095 1056 1 35 199//12 2003/01 DAVIS OFER C.O. ELLIS G.W 18 2-SN-12E HARTSHORNE 270,023 1686 1 62 199//10 200308 STOVER COMPANY EVERETT 1 1 3-SN-13E HARTSHORNE 326,516 721 24 198/00 200309 UNOCAL FIRESTON 1 7-SN-13E HARTSHORNE 326,516 1759 1 59 198/00 200309 DAVIS OFER CO FOOD SE SW W 1 3-SN-13E HARTSHORNE 326,516 1759 1 0 198/00 200309 DAVIS OFER CO FRAM RESOURCES LLC GARETT 2-1 1-SN-12E HARTSHORNE 16,077 0 198/00 2000/10 2000/00 200308 SKELLY OLLOMONE	CHESAPEAKE		1	35-6N-13E	HARTSHORNE	2,744,814	2493	1	83	1965/07	2003/09
EGGLESTON UNIT VHEELER ENRERGY 1.4 1.4 1.5 1.5-0N-12E HARTSHORNE 26,095 10.56 1 3.55 1994/07 2003/07 DAVIS OPER-CO ELUIS G.W 18 22-001-12E HARTSHORNE 115,101 2469 1 82 2001/11 2003/08 STOVER COMPANY FUELD HEIR 1 3-5N-12E HARTSHORNE 32,265,168 721 1 24 1966/08 2003/08 MOCAL FIRESTON 1 7-9N-13E HARTSHORNE 32,65,76 1759 1 59 1996/02 2003/09 DAVIS OPER-CO FRANCES 1-29 1-11 29-6N-13E HARTSHORNE 32,65,76 1759 1 30 1992/09 2003/08 DAVIS OPER-CO GARRETT 2-1 1-11 29-6N-13E HARTSHORNE 10 176 1996/04 2003/08 TAG TEAM RESOURCES LLC GARRETT 2-2 1-9-11 29-6N-14 12 1-9-11 29-6N-24 299 1 1996/04											
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STOVER COMPANY EVERETT 1 1 3.5N-12E HARTSHORNE 2.79,023 1868 1 6.20 199/01 200309 UNOCAL FIRESTON 1 7.5N-13E HARTSHORNE 3.25,168 7.21 1 24 196708 197704 GM PROP.8 INVEST.INC. FOOD 2-3 3.5N-13E HARTSHORNE 345,576 1759 1 59 199502 200309 CHESAPEAKE FOOD SE SW NW 1 3.5N-13E HARTSHORNE 2,258,446 1199 1 40 196508 200309 TAG TEAM RESOURCES LLC GARRETT 2-21 21-5N-13E HARTSHORNE 8,259 1479 1 49 2000/07 200308 TAG TEAM RESOURCES LLC GARRETT 4-21 21-5N-12E HARTSHORNE 8,07 0 1999/09 200308 TAG TEAM RESOURCES LLC GARRETT 4-21 21-5N-12E HARTSHORNE 8,125 3576 1 19 2001/10 200308 SKELLY OL COMPANY GARRETT<		1-A									
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DAVIS OPER. CO FRANCES 1::29 1:11 29:01:29 1:21 21:01:12:14 HARTSHORNE 75:52:8 987 1 33 1992/09 2003/08 TAG TEAM RESOURCES LLC GARRETT 3:21 21:5N-12E HARTSHORNE 62:910 1479 1 49 2000/0 2003/08 TAG TEAM RESOURCES LLC GARRETT 4:21 21:5N-12E HARTSHORNE 81:325 3576 1 119 2001/0 2003/08 SKELLY OLLCOMPANY GARRETT 1 21:5N-12E HARTSHORNE 67:888 862 1 29 1966/04 ELLS H AJR ET AL GARRETT A 1 21:5N-12E HARTSHORNE 67:788 862 1 29 196/04 2003/08 VALE CIL ASSOC GIBSON WINNIE 1 4:5N-13E HARTSHORNE 77:78 567 1 20 199/02 2003/08 BROWER 0&G CO GLEESE 2:33 3:6N-13E HARTSHORNE 77:78 567 1 19 196/02 2003/08	GM PROP. & INVEST. INC.	FOOD	2-3	3-5N-13E	HARTSHORNE	345,576	1759	1	59	1995/02	2003/09
TAG TEAM RESOURCES LLC GARRETT 2-21 21-5N-12E HARTSHORNE 16,077 0 1990/09 2000/07 TAG TEAM RESOURCES LLC GARRETT 4-21 21-5N-12E HARTSHORNE 82,910 1479 1 49 2000/07 2003/08 SKELLY OIL COMPANY GARRETT 1-21 21-5N-12E HARTSHORNE 18,325 3576 1 119 2001/10 2003/08 YALE OLASSOC. GIBSON 10-1 10-5N-13E HARTSHORNE 16,077 0 1996/04 2003/08 YALE OLASSOC. GIBSON WINNIE 1 4-5N-13E HARTSHORNE 123,071 502 1 17 1990/08 2003/08 BROWER 0&G CO GIBSON WINNIE 2-4 4-5N-13E HARTSHORNE 77,786 587 1 20 1990/08 2003/08 BROWER 0&G CO GLEESE 2-33 33-6N-13E HARTSHORNE 77,786 587 1 20 1990/02 2003/08 DAVIS OPER.CO GLEESE 2-3 33-6N-13E HARTSHORNE 756.3 1 19 1966/04 2003/08 <td></td>											
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DAVIS OPER. CO GLEESE 28-6N-13E HARTSHORNE / HARTSHORNE / HARTSHORNE / BOOCH 58,494 299 1 10 199/02 2003/08 DAVIS OPER. CO GLEESE 1-27 27-6N-13E BOOCH 64,130 272 1 9 199/07 2003/08 BROWER 0.80.CO GLEESE 1 33-6N-13E HARTSHORNE 674,747 563 1 19 196/08 2003/08 TAG TEAM RESOURCES LLC GLENNIE 1-13 15-5N-12E HARTSHORNE 126,153 1753 1 6 1986/01 2003/08 DAVIS OPER. CO GODDE#I 1 16-5N-12E HARTSHORNE 426,707 3539 1 118 197/07 2003/08 DAVIS OPER. CO GRAY 1 24-5N-12E HARTSHORNE 432,727 3639 1 118 197/07 2003/08 VALE OL ASSOC. GRE TA 1-21 24-5N-12E HARTSHORNE 137,52 3043 1 101 200/07 2003/08 DAVIS OPER.											
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TAG TEAM RESOURCES LLC HOPKINS 1 13-5N-13E HARTSHORNE 295,379 1373 1 46 1981/09 2003/08 HUNT-GARRETT HUNT-GARRETT HARTSHORNE 4,041,853 3691 1 123 1965/08 2003/09 DAVIS OPER CO ISENHOWER 1.17 17-5N-12E HARTSHORNE 463,477 4427 1 148 1999/09 2003/03 WIMBERLY JAMES A JEFFERSON 1 12-5N-12E HARTSHORNE 258,557 1836 1 61 1996/08 2003/03 TAG TEAM RESOURCES LLC JENNIFER 1-21 21-5N-12E HARTSHORNE 258,557 1836 1 61 1996/08 2003/03											
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0 perator	Wei	Well Num	Location	ormation	Cumulative Gas Production (Mcf	Gas Production_Latest Month (Mcf)	Active Number of Wells	Current Gas Production RateRate (Mcfd)	First Prod Date	ast Prod Date
TAG TEAM RESOURCES LLC	≤ JOHNNY	1-16	16-5N-12E	HARTSHORNE	ت د 716,366	0 6 6 4413	₹ ≶	<u>ሪደድ</u> 147	1999/05	2003/08
TILFORD PINSON EXPL.	JONES	2-25	25-6N-12E	HARTSHORNE	7 264	902	1	30	2003/02	2003/08
TAG TEAM RESOURCES LLC DAVIS OPER. CO	JUANITA JUDY	1-13 1	13-5N-13E 15-5N-12E	HARTSHORNE HARTSHORNE	40,369 6,009	771 6009	1	26 200	2000/09 2003/07	2003/08 2003/07
TAG TEAM RESOURCES LLC	KRISTY LEE	1-17	17-5N-12E	HARTSHORNE	33,779	516	1	17	2000/07	2003/08
BROWER 0&G CO	LEFLORE	1-36	36-6N-13E	HARTSHORNE	59,148	290	1	10	1997/02	2003/08
BROWER 0&G CO	LEFLORE SE SW NW	1	36-6N-13E	HARTSHORNE	831,922			0	1965/07	1979/02
T K DRILLING CORPORATION	LEO	1-25	25-6N-13E	HARTSHORNE	207,738	664	1	22	1988/09	2003/07
	LINDSAY GIBSON									
CHESAPEAKE DAVIS OPER. CO	NE SW LOFTIS	1 1	4-5N-13E 8-5N-12E	HARTSHORNE HARTSHORNE	3,730,939 3,787			0 0	1965/07 2000/08	1990/04 2000/10
SAMSON	LOFTIS	2	23-5N-12E	HARTSHORNE	0,101			Ö	2000/00	2000/10
SAMSON	LOFTIS	2	23-5N-12E	HARTSHORNE	4,239,153			0	1968/10	1985/09
SAMSON	LOFTIS & DELILAH		23-5N-12E	HARTSHORNE	1,216,608			0	1985/10	1992/11
34113014			20-011-120	HARTSHORNE	1,210,000			0	1000/10	1552/11
SAMSON	LOFTIS AUSTIN E	E1	23-5N-12E	HARTSHORNE	892,201	2596	1	87	1985/10	2003/09
DAVIS OPER. CO	LOFTIS#1-30	1-30	30-5N-12E 1-5N-12E	HARTSHORNE	1,068,855	3654 4508	1	122 150	1986/10	2003/08
MARBET LLC SJM INCORPORATED	MARBET LLC MARBET	17	12-5N-12E	HARTSHORNE	199,182 254,191	4508	1	150	2000/04 2000/01	2003/03 2003/03
MARBET LLC	MARBET LLC	31	14-5N-13E	HARTSHORNE	77,214	3232	1	108	2001/05	2003/07
MARBET LLC	MARBET LLC 37	37	15-5N-13E	HARTSHORNE	57,461	2787	1	93	2001/10	2003/08
MARBET LLC	MARBETT LLC	32	23-5N-13E	HARTSHORNE	17,246	571	1	19	2001/10	2003/03
MARBET LLC MARBET LLC	MARVIN MARVIN	3 4	11-5N-12E 11-5N-12E	HARTSHORNE HARTSHORNE	495,062 26,210	6749	1	225 0	1999/10 1999/12	2003/06 2000/02
MARBET LLC	MARVIN	5	11-5N-12E	HARTSHORNE	1,227			0	2001/03	2000/02
MARBET LLC	MARVIN	6	11-5N-12E	HARTSHORNE	2,387	1245	1	42	2003/02	2003/03
DAVIS OPER. CO	MCCARTY	3-32	32-6N-13E	HARTSHORNE	305,371	5247	1	175	1999/11	2003/08
хто	MCDONALD SUSAN	1	35-5N-12E	HARTSHORNE	8,044,198	2352	1	78	1965/08	2003/09
DAVIS OPER. CO	MORAN S	1	22-5N-12E	HARTSHORNE	888,828	2469	1	82	1965/08	2003/09
XTO	MORRIS O	3-24	24-5N-12E	HARTSHORNE	46,175	1139	1	38	2000/11	2003/09
XTO	MORRIS OSSIE	1	24-5N-12E	HARTSHORNE	11,017,443	8293	1	276	1965/08	2003/09
TAG TEAM RESOURCES LLC DAVIS OPER. CO		4 2	24-5N-13E 22-5N-12E	HARTSHORNE	9,546	2475	1	83	2003/05	2003/08
TAG TEAM RESOURCES LLC	OTT OTT	4-22	22-5N-12E 22-5N-12E	HARTSHORNE HARTSHORNE	52,983 123,980	955 570	1	32 19	1999/10 2000/12	2003/08 2003/08
TEXAS EMPIRE EXPL.	RAMSEY	1	14-5N-13E	HARTSHORNE	19,129			0	1983/09	1985/12
TEXAS EMPIRE EXPL.	DAMOEN	1-14	14 EN 19E	HARTSHORNE	0.691			0	1000/00	1000/00
TREPCO PROD.	RAMSEY REYNOLDS	1-14	14-5N-13E 7-5N-13E	ZONE HARTSHORNE	9,631 2,161,911	2893	1	96	1983/02 1979/07	1983/08 2003/09
хто	ROCK W P	3-17	17-5N-13E	HARTSHORNE	1 170	18	1	1	2002/02	2002/10
VTO	ROCK W P C NW		47 EN 40E		4.045.400	9	4		1000/10	000000
XTO XTO	NW ROCK WP	2 1	17-5N-13E 17-5N-13E	HARTSHORNE HARTSHORNE	4,245,468 32,358	9	1	0	1968/10 1965/08	2003/02 1989/07
DAVIS OPER. CO	ROGERS 1-30	1-30	30-5N-12E	HARTSHORNE	746,296	1236	1	41	1978/06	2003/08
MUSTANG FUEL CORP.	ROSE	1-4	4-5N-12E	HARTSHORNE	110,079	1816	1	61	2001/02	2003/08
TAG TEAM RESOURCES LLC	SANDRA	1-13	13-5N-13E	HARTSHORNE	122,939	1647	1	55	2000/04	2003/08
MUSTANG FUEL CORP. STOVER COMPANY	SEMESKI SHERRILL	1-3 1	3-5N-12E 2-5N-12E	HARTSHORNE HARTSHORNE	217,786 166,008	4158 2180	1	139 73	2000/10 1997/01	2003/09 2003/08
BIOVERCOOMITANT	OTENNEL		2 014 126	HARTSHORNE /	100,000	2100			1001/01	2000/00
TILFORD PINSON EXPL.	SHERRILL	3-2	2-5N-12E	BOOCH	71,385	2314	1	77	2001/05	2003/08
DAVIS OPER. CO	SHIRLEY#1	1	36-5N-11E	HARTSHORNE	87,827	233		8	1986/04	2003/06
DAVIS OPER. CO TUCKER RON & COMPANY	STIPE THOMPSON	1-6 1	6-5N-13E 1-5N-13E	HARTSHORNE HARTSHORNE	83,798 304,160	947	1	0 32	1999/12 1984/10	2002/07 2003/08
	THORNTON SE									
CHESAPEAKE	NW SE	1	5-5N-13E	HARTSHORNE	1,508,564	1028	1	34	1965/08	2003/09
DAVIS OPER. CO DAVIS OPER. CO	TIM TRACEY	2-20 1	20-5N-12E 16-5N-12E	HARTSHORNE HARTSHORNE	10,003 53,744	451 2012	1	15 67	2002/08 2002/06	2003/08 2003/08
XTO	UNIV OF TULSA	1	19-5N-13E	HARTSHORNE	3,516,263	2012		0	1970/04	1998/11
TENNECO OIL COMPANY	USA #36	1	36-5N-12E	HARTSHORNE	864,986			0	1966/03	1983/11
CHESAPEAKE	VANDEVEER	1	19-5N-12E	HARTSHORNE / BOOCH	617 669	3784	1	126	1975/04	2003/09
CHESAPEAKE	VANDEVEER	2-19	19-5N-12E	HARTSHORNE	517,653 2,347	2347	1	78	2003/09	2003/09
YALE OIL ASSOC.	VIRGIL	1-22		HARTSHORNE	226,545	13373	1	446	2001/04	2003/01
DAVIS OPER. CO	WAGEMAN	1	14-5N-12E	HARTSHORNE	109,498	1648	1	55	1997/02	2003/08
DAVIS OPER. CO	WALLACE W C NE SW NW	182	9-5N-13E	HARTSHORNE	1,700,574	1688	1	56	1965/07	2003/08
COVE PET. CORP.	WATKINS	1	2-5N-13E	HARTSHORNE	793,928	1121	1	37	1975/09	2003/08
TAG TEAM RESOURCES LLC	WATKINS	1	11-5N-13E	HARTSHORNE	545,907	1889	1	63	1980/11	2003/08
TUCKER RON & COMPANY	WATKINS	1	12-5N-13E	HARTSHORNE	520,858	1994	1	66	1984/10	2003/08
DAVIS OPER. CO	WATKINS #1	1	10-5N-12E	HARTSHORNE	532,012	4568	1	152	1984/02	2003/08
DAVIS OPER. CO	WESTLAKE HEIRS	1-20	20-5N-12E	HARTSHORNE	177,031	789	1	26	1987/05	2003/08
DAVIS OPER. CO	WILCOX	1-15	15-5N-12E	HARTSHORNE	378,555	1671	1	56	2001/02	2003/08
DAVIS OPER. CO YALE OIL ASSOC.	WILLARD WINNIE	1-10 1	10-5N-12E 10-5N-13E	HARTSHORNE HARTSHORNE	722,003 101,532	3299 394	1	110	1999/02 1988/08	2003/08 2003/08
XTO	WORKING EE	1	25-5N-12E	HARTSHORNE	8,166,885	394 5414	1	13 180	1988/08	2003/08
					21.001000					

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					(Mc	D Lat	ber	s Acfd	Date	ate
5		Ę	Ę	ion	tion	(Mci	Mun	t Ga tion te (h	D po	D po
Op er at or	=	Well Num	ocation	Formation	Cumulative Gas Production (Mcf)	Gas Production_Latest Month (Mcf)	Active Number Wells	Current Gas Production RateRate (Mcfd)	First Prod Date	Last Prod Date
Ô	Well	We	Γŏ	For					Ë	Las
					112,734,683	118,325	44	3,944		
				IS NORTHWEST						
XTO XTO	CARTER 1-2 HOLT	1-2 1-4T	2-6N-13E 4-6N-13E	HARTSHORNE HARTSHORNE	933,438 902,526	3190 2897	1 1	106 97	1989/02 1988/08	2003/08 2003/08
XTO	HOLT	ЗJ	3-6N-13E	HARTSHORNE	393,172	340	1	11	1990/01	2003/08
SONAT XTO	HOLT HOLT J	J2-3 1	3-6N-13E 3-6N-13E	HARTSHORNE HARTSHORNE	17 2,708,284	1453	1	0 48	1988/08 1985/05	1988/08 2003/08
TAG TEAM RESOURCES LLC	HOLT J	4-3	3-6N-13E	HARTSHORNE	94,298	679	1	23	1997/10	2003/08
BROWER 0&G CO	KING	3-25	25-7N-13E	HARTSHORNE / BOOCH	369,985	1505	1	50	1994/09	2003/08
				HARTSHORNE /				00		
BROWER 0&G CO XTO	KING LUCILLE	4-25 1-34	25-7N-13E 34-7N-13E	BOOCH HARTSHORNE	103,446 1,046,508	1867 1561	1 1	62 52	2001/03 1985/05	2003/08 2003/08
BROWER 0&G CO	SHEENA #1-36	1-36	36-7N-13E	HARTSHORNE	342,580	2106	1	70	1995/07	2003/08
BROWER 0&G CO	STATE	1-35	35-7N-13E	HARTSHORNE	607,018			0	1980/10	1987/04
BROWER 0&G CO BROWER 0&G CO	STATE SUNSHINE	2-35 1-36	35-7N-13E 36-7N-13E	HARTSHORNE HARTSHORNE	1,200,399 73,470	6628 386	1 1	221 13	1988/08 1996/05	2003/08 2003/08
					8,775,141	22,612	11	754		
			SCIPI							
TAG TEAM RESOURCES LLC	BRADSTREET	1	22-7N-12E	HARTSHORNE	696,861			0	1963/02	1969/08
GRIMES OTHA H INC.	CLARK CLARKE	1 1	22-7N-12E 22-7N-12E	HARTSHORNE HARTSHORNE	78,590			0	1964/12	1987/05
DEISENROTH CRAIG M	CLARKE	1	22-71N-12E	HARTSHORNE /	86,270			U	1964/12	1907/00
ARKOMA GAS CO	DOSS	1-33	33-7N-12E	BOOCH	42,806			0	1982/12	1997/01
UNIT	DUNCAN #1	1	13-7N-13E	HARTSHORNE /	208,699	924	1	31	1995/12	2003/08
TILFORD PINSON EXPL.	FALCON CLUB	1-21	21-7N-12E	BOOCH	108,581	1932	1	64	2000/08	2003/08
TILFORD PINSON EXPL.	FALCON CLUB	2-21	21-7N-12E	HARTSHORNE / BOOCH	136,167	1690	1	56	2001/01	2003/08
TILFORD PINSON EXPL.	FALCON CLUB	3-21	21-7N-12E	HARTSHORNE	146,922	3704	1	123	2001/01	2003/08
DEISENROTH CRAIG M	GILCREASE	2	16-7N-12E	HARTSHORNE	259,338			0	1963/08	1986/07
DEISENROTH CRAIG M	GILCREASE #1 #2	1	21-7N-12E	HARTSHORNE	318,949			0	1964/12	1997/06
XAE CORPORATION	HERMAN	1-12	12-7N-13E	HARTSHORNE	19,271	492	1	16	2000/12	2003/07
TAG TEAM RESOURCES LLC TAG TEAM RESOURCES LLC	HOOTERS JONATHAN	1-18 1-22	18-7N-13E 22-7N-12E	HARTSHORNE HARTSHORNE	19,936 31,129	1346 356	1	45 12	2002/06 2000/09	2003/08 2003/08
				HARTSHORNE /						
TILFORD PINSON EXPL. DEISENROTH CRAIG M	KERN KLEINKE	1-21 2	21-7N-12E 15-7N-12E	SAVANNA HARTSHORNE	10,195 467,401	295	1	10 0	2001/08 1963/08	2003/08 1970/05
DEISENNOTTI CICAIO M	REENTRE			HARTSHORNE /	407,401					
TAG TEAM RESOURCES LLC	MAD MAX	1-14 2-22	14-7N-12E 22-7N-12E	BOOCH	51,994	873 414	1	29 14	2000/07	2003/08
TAG TEAM RESOURCES LLC TAG TEAM RESOURCES LLC	MELISSA MICHAEL	2-22	22-7N-12E	HARTSHORNE HARTSHORNE	48,110 124,116	2011	1	67	2000/12 2001/04	2003/08 2003/08
ARKOMA GAS CO	MILLION	1-27	27-7N-12E	HARTSHORNE	2,078			0	1983/01	1985/03
TAG TEAM RESOURCES LLC	MOONEYHAM	1-18	18-7N-13E	HARTSHORNE / SAVANNA	489,300	544	1	18	1994/07	2003/06
	MOONEYHAM #1-			HARTSHORNE /						
TAG TEAM RESOURCES LLC DEISENROTH CRAIG M	18 MYERS	1-18 1	18-7N-13E 15-7N-12E	SAVANNA HARTSHORNE	163,419 426,770	549 358	1 1	18 12	1994/02 1963/11	2003/08 2003/08
DEISENROTH CRAIG M	MYERS	1	15-7N-12E	HARTSHORNE	54,156	000		0	1964/01	1970/05
ARKOMA GAS CO	MYERS	1-28	28-7N-12E	HARTSHORNE / BOOCH	77,827			0	1980/08	1988/02
				HARTSHORNE /						
TILFORD PINSON EXPL. XAE CORPORATION	MYERS-HOLT OTHEL	1	24-7N-12E 1-7N-13E	BOOCH	92,080	353	1	12	1981/12	2003/08
ARKOMA GAS CO	PUCKETT	1 1-32	1-7N-13E 32-7N-12E	HARTSHORNE HARTSHORNE	27,389 57,410	633	1	21 0	1998/11 1982/12	2003/07 1996/11
ARKOMA GAS CO	PUCKETT	2-32	32-7N-12E	HARTSHORNE	23,495	295	1	10	1995/06	2003/08
TAG TEAM RESOURCES LLC	ROCKEY	1-18	18-7N-13E	HARTSHORNE / SAVANNA	88,122			0	1994/07	1999/11
				HARTSHORNE /						
TILFORD PINSON EXPL. TAG TEAM RESOURCES LLC	ROSS SARKEYS	1-24 1	24-7N-12E 14-7N-12E	BOOCH HARTSHORNE	14,240 557,943	2 509	1	0 17	2001/08 1963/05	2003/06 2003/08
MYERS C G	SOUSEA	1		HARTSHORNE	53,703			0	1968/07	
ARKOMA GAS CO	STIPE	1-27	27-7N-12E	HARTSHORNE / BOOCH	178,169	1455	1	49	1997/09	2003/08
ARKOMA GAS CO	STIPE	1-27	28-7N-12E	HARTSHORNE	437,796	2804	1	49 93	1996/10	2003/08
			07 7N 40E	HARTSHORNE /	102,786	4946	1	145	2004/07	2002/00
ARKOMA GAS CO	STIPE	2-27	27-7N-12E	BOOCH HARTSHORNE /	102,706	4346	'	145	2001/07	2003/08
ARKOMA GAS CO ARKOMA GAS CO	STIPE	2-28	28-7N-12E	BOOCH	119,611	1202	1	40	1997/09	2003/08
TILFORD PINSON EXPL.	STIPE TOM	3-27 1-14	27-7N-12E 14-7N-12E	HARTSHORNE HARTSHORNE	67,332 54,194	1963 1644	1 1	65 55	2001/10 2001/01	2003/08 2003/08
ARKOMA GAS CO	W J HILSEWECK	1-29		HARTSHORNE	142,605	713	1	24	1988/01	2003/08
ARNUMA GABILU	** 3 HILBEWEUK	1-29	20-114-12E	HARTONUKNE	6,085,760	713 31,407	26	24 1,047	1900/01	2003/00

0perator	Wei	Well Num	Location	Formation	Cumulative Gas Production (Mcf)	Gas Production_Latest Month (Mcf)	Active Number of Wells	Current Gas Production RateRate (Mcfd)	First Prod Date	Last Prod Date
	-	-		GROVE SOUT			~~		_	_
PRYOR VICTOR W JR	BE	1	31-7N-11E	HARTSHORNE	719.276	142	1	5	1985/01	2003/08
GLENN SUPPLY CO.	BLACK #2	2	9-6N-11E	HARTSHORNE	96.090	140	1	5	1993/06	2003/06
GLENN SUPPLY CO.	BLACK #3	3	10-6N-11E	HARTSHORNE	467,630	665	1	22	1993/11	2003/09
GLENN SUPPLY CO.	BLACK #4	4	9-6N-11E	HARTSHORNE	456,763	506	1	17	1993/11	2003/09
				HARTSHORNE /						
PRYOR VICTOR W JR	BOYD	1	7-6N-11E	BOOCH	737,652	271	1	9	1964/01	2003/08
PRYOR VICTOR W JR	BOYD	2	7-6N-11E	HARTSHORNE	85,110	166	1	6	1987/10	2003/08
ROBERSON OIL CO. INC.	ECKLES	1-5	5-6N-11E	HARTSHORNE	85,551	404	1	13	1999/09	2003/09
GLENN SUPPLY CO.	GAYLER #1-10	1-10	10-6N-11E	HARTSHORNE	852,326	2082	1	69	1994/11	2003/09
GLENN SUPPLY CO.	GENEVA	1-10	10-6N-11E	HARTSHORNE	262,228	453	1	15	1995/07	2003/09
GULF PROD. CORP.	HILL	2-15	15-6N-11E	HARTSHORNE	4,004			0	1995/06	1996/06
GULF PROD. CORP.	HILL	4-14	14-6N-11E	HARTSHORNE	124,168	694	1	23	1995/06	2003/09
GLENN SUPPLY CO.	HILL #1-11	1-11	11-6N-11E	HARTSHORNE	1,028,357	6175	1	206	1994/11	2003/09
WILLIAMS REID OPER.	JACKSON	1	30-7N-11E	HARTSHORNE	419,823			0	1986/04	1992/01
SOUTHERN RESOURCES	KAMPERMAN	1	31-7N-11E	HARTSHORNE	137,116	406	1	14	1989/02	2003/08
GLENN SUPPLY CO.	MC DONALD #1-10	1-10	10-6N-11E	HARTSHORNE HARTSHORNE /	132,555			0	1994/11	1999/07
PRYOR VICTOR W JR	STEPHENS	1	6-6N-11E	BOOCH HARTSHORNE /	525,239	1	1	0	1964/01	2003/07
PRYOR VICTOR W JR	TRUMBO	1	6-6N-11E	BOOCH	597,243	116	1	4	1964/01	2003/07
LUBELL OIL COMPANY	WARREN	1	9-6N-11E	HARTSHORNE	77,348			ń	1969/09	1972/01
					6,808,479	12,221	14	407		
					-,,	,				
			STUAR	RT SOUTHWEST	FIELD					
BELL O&G	DUNCAN	1	23-5N-11E	HARTSHORNE HARTSHORNE /	83,900			0	1961/01	
MARBET LLC	HERRING D	1-C	28-5N-11E	JEFFERSON	1,032,069	4088	1	136	1989/02	2003/03
LUBELL OIL COMPANY	KINCADE	1	26-5N-11E	HARTSHORNE	97,600			0	1964/04	1968/03
CENTRAL OKLA O&G	LACKEY C S 2 NE	1	27-5N-11E	HARTSHORNE	4,249,974			0	1960/12	1994/01
T K DRILLING CORPORATION	WALKER HEIRS	1	27-5N-11E	HARTSHORNE	1,306,286	448	1	15	1970/03	2003/09
	WALKER HEIRS 27-									
T K DRILLING CORPORATION	2	27-2	27-5N-11E	HARTSHORNE	290,973	1647	1	55	1992/08	2003/05
HUTTON GAS OPER.	WOODFORK	1	26-5N-11E	HARTSHORNE	5,413,737			0	1960/12	1988/11
					12,474,539	6,183	3	206		
					-					
			ι	JLAN EAST FIEL	.D					
				HARTSHORNE /						
BROWER 0&G CO	HILL #1-24	1-24	24-7N-13E	BOOCH	299,375	370	1	12	1993/10	2003/08
NADEL & GUSSMAN	WARD	1	13-7N-13E	HARTSHORNE	204,197	1160	1	39	1994/03	2003/08
NADEL & GUSSMAN	WARD	2-13	13-7N-13E	HARTSHORNE	164,754	735	1	25	1993/01	2003/08
TAG TEAM RESOURCES LLC	WHATS IF	1-11	11-6N-13E	HARTSHORNE	42	42	1	1 _	2003/07	2003/07
					668,368	2,307	4	π		

<u>Appendix C</u>: Hartshorne Production Sorted By Facies Interpretation

Well	Well Num	Location	Formation	Field Name	Cumulative Gas Production (Mcf)	Current Gas ProductionRate (Mcfd)	First Prod Date	Last Prod Date	Facies	Secondary Facies
BLACK #4	4	9-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	456,763	17	1993/11	2003/09	C-1	DMB
WARREN	1	9-6N-11E	HARTSHORNE	SHADY GROVE SOUTH	77,348	0	1969/09	1972/01	C-1	DMB
GAYLER #1-10	1-10	10-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	852,326	69	1994/11	2003/09	C-1	DMB
MC DONALD #1-10	1-10	10-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST	132,555	0	1994/11	1999/07	C-1	DMB
HILL #1-11	1-11	11-6N-11E	HARTSHORNE	SHADY GROVE SOUTH	1,028,357	206	1994/11	2003/09	C-1	DMB
BLEVINS	2-12	12-6N-11E	HARTSHORNE	CABANISS NORTHWEST	569,027	64	1995/10	2003/09	C-1	
SARKEY	1	7-7N-12E	HARTSHORNE	LAMAR EAST	2,333,208	17	1961/08	2003/08	C-1	DMB
BURLESON	1	8-7N-12E	HARTSHORNE	LAMAR EAST HORN TOWN	287,131	21	1982/09	2003/08	C-1	DMB
AN DERSON#1	1	17-7N-11E	HARTSHORNE	SOUTHEAST	293,933	10	1985/04	2002/10	DMB	
SARKEYS	1	14-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	557,943	17	1963/05	2003/08	C-1	DMB
KLEINKE	2	15-7N-12E	HARTSHORNE	SCIPIO NORTHWEST SCIPIO	467,401	0	1963/08	1970/05	C-1	DMB
DUNCAN #1	1	13-7N-13E	HARTSHORNE	NORTHWEST	208,699	31	1995/12	2003/08	C-1	DMB
					7,264,691	660,426				
RAMSEY	1-14	14-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	9,631	0	1983/02	1983/08	C-2	
RAMSEY	1	14-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	19,129	0	1983/09	1985/12	C-2	СМ
KRISTY LEE	1-17	17-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	33,779	17	2000/07	2003/08	C-2	СМ
BLEVINS		9-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	40,085	82	2002/05	2003/08	C-2	
ОТТ	2	22-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	52,983	32	1999/10	2003/08	C-2	
TRACEY	1	16-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	53,744	67	2002/06	2003/08	C-2	СМ
MARBET LLC 37	37	15-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	57,461	93	2001/10	2003/08	C-2	
DEER CREEK	1-24	24-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	73,422	0	1985/05	1989/10	C-2	
MARBET LLC	31	14-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	77,214	108	2001/05	2003/07	C-2	
BETHAL	2-9	9-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	118,352	30	1999/05	2003/08	C-2	
CRAWFORD	1	10-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	152,357	38	2001/02	2003/08	C-2	СМ
BETHEL	3	9-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	154,148	59	2000/05	2003/08	C-2	CM
				PINE HOLLOW						0111
WESTLAKE HEIRS	1-20	20-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	177,031	26	1987/05	2003/08	C-2	
CRAWLEY WHITE	1-21 13-1	21-5N-13E 13-7N-11E	HARTSHORNE HARTSHORNE	SOUTH LAMAR EAST	215,157 242,776	342 13	2001/07 1985/06	2003/08	C-2 C-2	DMB
ADAMS J W	1-16	16-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	242,776	20	1998/07	2003/08	C-2	
EGGLESTON UNIT 1-A	14 1A	15-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	243,095	35	1994/07	2003/07	C-2	
HOPKINS	1	13-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	295,379	46	1981/09	2003/07	C-2	СМ
				PINE HOLLOW						
THOMPSON	1	1-5N-13E	HARTSHORNE	SOUTH CABANISS	304,160	32	1984/10	2003/08	C-2	CM
HILSEWECK W J	1-17	17-6N-12E	HARTSHORNE	NORTHWEST PINE HOLLOW	355,224	17	1979/10	2003/08	C-2	DMB
WILCOX	1-15	15-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	378,555	56	2001/02	2003/08	C-2	
HALL	1	31-5N-12E	HARTSHORNE HARTSHORNE /	SOUTH PINE HOLLOW	428,728	19	1981/12	2003/08	C-2	
BLACK	3-28	28-5N-12E	BOOCH	SOUTH PINE HOLLOW	429,743	80	1993/08	2003/06	C-2	CM
DONNA	1	16-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	434,511	177	2000/09	2003/08	C-2	
GOODE#1	1	16-5N-12E	HARTSHORNE	SOUTH	456,606	6	1985/01	2003/08	C-2	CM

Well	Well Num	Location	Formation	Field Name	Cumulative Gas Production (Mcf)	Current Gas ProductionRate (Mcfd)	First Prod Date	Last Prod Date	Facies	Secondary Facies
ISENHOWER	1-17	17-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	463,477	148	1999/09	2003/08	C-2	
HALL	1	32-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	470,147	O	1966/11	2000/10	C-2	
HALL	1	29-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	519,302	43	1981/07	2003/09	C-2	СМ
WATKINS	1	12-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	520,858	66	1984/10	2003/08	C-2	
WATKINS #1	1	10-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	532,012	152	1984/02	2003/08	C-2	СМ
WATKINS	1	11-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	545,907	63	1980/11	2003/08	C-2	СМ
HILSEWECK	2-17	17-6N-12E	HARTSHORNE	CABANISS	657,365	101	1996/11	2003/08	C-2	011
BLEVINS	9-18	18-6N-12E	HARTSHORNE	CABANISS	660,508	123	1996/12	2003/08	C-2	
			HARTSHORNE	PINE HOLLOW		29				
EGGLESTON	1-15	15-5N-13E		SOUTH	674,126		1984/12	2003/08	C-2	
BRADSTREET	1	22-7N-12E	HARTSHORNE	NORTHWEST PINE HOLLOW	696,861	0	1963/02	1969/08	C-2	C-1
JOHNNY	1-16	16-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	716,366	147	1999/05	2003/08	C-2	CM
WILLARD	1-10	10-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	722,003	110	1999/02	2003/08	C-2	
ROGERS	1-30	30-5N-12E	HARTSHORNE HARTSHORNE /	SOUTH PINE HOLLOW	746,296	41	1978/06	2003/08	C-2	
COOPER	1	10-5N-12E	BOOCH	SOUTH PINE HOLLOW	778,565	140	1996/08	2003/08	C-2	CM
MORAN S	1	22-5N-12E	HARTSHORNE	SOUTH CABANISS	888,828	82	1965/08	2003/08	C-2	
BLEVINS	2-18	18-6N-12E	HARTSHORNE	NORTHWEST PINE HOLLOW	990,511	159	1995/06	2003/09	C-2	
LOFTIS	1-30	30-5N-12E	HARTSHORNE	SOUTH CABANISS	1,068,855	122	1986/10	2003/08	C-2	
HILSEWECK	1&3	20-6N-12E	HARTSHORNE	NORTHWEST	1,266,867	529	1996/03	2003/09	C-2	
					18,008,220	418,796				
SEMESKI	1-3	3-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	217,786	139	2000/10	2003/09	СМ	DF
EVERETT 1	1	3-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	279,023	62	1991/01	2003/08	СМ	DF
ROSE	1-4	4-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	110,079	61	2001/02	2003/08	СМ	DF
MARVIN	3	11-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	495,062	225	1999/10	2003/06	СМ	DMB
MARVIN	4	11-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	26,210	0	1999/12	2000/02	СМ	DMB
MARVIN	5	11-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	1,227	O	2001/03	2001/03	СМ	DMB
MARVIN	6	11-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	2,387	42	2003/02	2003/03	СМ	DMB
WAGEMAN	1	14-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	109,498	55	1997/02	2003/08	СМ	DF
VANDEVEER	1	19-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	517,653	126	1975/04	2003/09	СМ	DF
		19-5N-12E		PINE HOLLOW						
VAN DEVEER	2-19		HARTSHORNE	SOUTH PINE HOLLOW	2,347	78	2003/09	2003/09	CM	DF
TIM	2-20	20-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	10,003	15	2002/08	2003/08	СМ	C-2
GARRETT	1-A	21-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	178,807	0	1966/04		СМ	DF
GARRETT	2-21	21-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	16,077	0	1999/09	2000/10	СМ	DF
JENNIFER	2-21	21-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	17,529	17	2002/02	2003/08	СМ	DF
GARRETT	3-21	21-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	82,910	49	2000/07	2003/08	СМ	DF
GARRETT	4-21	21-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	81,325	119	2001/10	2003/08	СМ	DF
ELLIS G W	1B	22-5N-12E	HARTSHORNE	SOUTH	115,101	82	2001/11	2003/08	СМ	

Well	Well Num	Location	Formation	Field Name	Cumulative Gas Production (Mcf)	Current Gas ProductionRate (Mcfd)	First Prod Date	Last Prod Date	Facies	Secondary Facies
OTT	4-22	22-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	123,980	19	2000/12	2003/08	СМ	DF
WINNIE	1	10-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	101,532	13	1988/08	2003/08	СМ	DF
JUANITA	1-13	13-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	40,369	26	2000/09	2003/08	СМ	DF
GLENNIE	1-13	13-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	126,153	58	2000/04	2003/08	СМ	DF
SANDRA	1-13	13-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	122,939	55	2000/04	2003/08	СМ	DF
VIRGIL	1-22	22-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	226,545	446	2001/04	2003/01	СМ	DMB
				PINE HOLLOW						
MARBETT LLC	32	23-5N-13E	HARTSHORNE	SOUTH PINE HOLLOW	17,246	19	2001/10	2003/03	СМ	DMB
NELL MARY	4	24-5N-13E	HARTSHORNE	SOUTH CABANISS	9,546	83	2003/05	2003/08	СМ	DMB
BLEVINS	1-7	7-6N-12E	HARTSHORNE	NORTHWEST CABANISS	66,117	1	1980/08	2003/08	СМ	DF
BLEVINS	2-7	7-6N-12E	HARTSHORNE	NORTHWEST CABANISS	4,030	0	1985/12	1994/01	СМ	DF
HILSEWECK W J	1-8	8-6N-12E	HARTSHORNE	NORTHWEST CABANISS	95,547	8	1979/10	2003/01	СМ	DF
HILSEWECK RANCH	2-8	8-6N-12E	HARTSHORNE	NORTHWEST CABANISS	34,419	12	1994/03	2003/08	СМ	DF
HILSEWECK W J	1-9	9-6N-12E	HARTSHORNE	NORTHWEST CABANISS	246,534	34	1979/10	2003/08	СМ	DF
HILSEWECK W J	1-15	15-6N-12E	HARTSHORNE	NORTHWEST	229,313	32	1979/10	2003/08	СМ	DF
HILSEWECK W J	1-16	16-6N-12E	HARTSHORNE	CABANISS NORTHWEST	317,359	39	1979/10	2003/08	СМ	DF
HILSENECK	2-16	16-6N-12E	HARTSHORNE	CABANISS NORTHWEST	27,972	11	1999/01	2003/08	СМ	DF
BLIVENS	1-18	18-6N-12E	HARTSHORNE	CABANISS NORTHWEST	191,738	0	1979/10	1997/10	СМ	DMB
HILSEWICK	1-29	29-6N-12E	HARTSHORNE	CABANISS NORTHWEST	9,311	0	1981/06	1989/06	СМ	DF
HILSEWECK	1-29A	29-6N-12E	HARTSHORNE	CABANISS NORTHWEST	36,728	0	1982/02	1989/05	СМ	DF
FOLLANSBE	1	12-7N-11E	HARTSHORNE	LAMAR EAST	218,512 4,508,914	0 121,863	1961/09	1972/07	СМ	DMB
				0.412/11	4,000,014	121,000				
LYONS	1-6	6-5N-11E	HARTSHORNE	CALVIN SOUTHEAST	46,254	3	1984/06	2003/08	DF	
BAILEY MCDONALD	1	17-5N-11E 18-5N-11E	HARTSHORNE HARTSHORNE	HILL TOP HILL TOP	131,633 401,182	23 27	1983/10 1980/09	2003/05 2003/08	DF	
VERNON	1-29	29-5N-11E	HARTSHORNE	HILL TOP	98,612	12	1990/05	2003/08	DF	
VERNON PARK ESTATE	1-29	29-5N-11E	HARTSHORNE	HILL TOP	160,930	8	1989/12	2003/08	DF	
CARTER C C	1	30-5N-11E	HARTSHORNE	HILL TOP SOUTHWEST	251,921	0	1978/05	1980/12	DF	BF
MARK	1-32	32-5N-11E	HARTSHORNE	HILL TOP SOUTHWEST	5,954	O	1990/08	1993/05	DF	
SHIRLEY#1	1	36-5N-11E	HARTSHORNE	PINE HOLLOW SOUTH	87,827	8	1986/04	2003/06	DF	СМ
MARBET LLC		1-5N-12E	HARTSHORNE	REAMS NORTHWEST	199,182	150	2000/04	2003/03	DF	DMB
SHERRILL	1	2-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	166,008	73	1997/01	2003/08	DF	DMB
SHERRILL	3-2	2-5N-12E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	71,385	77	2001/05	2003/08	DF	DMB
MARBET	17	12-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	254,191	152	2000/01	2003/03	DF	СМ
JUDY	1		HARTSHORNE	PINE HOLLOW SOUTH	6,009	200	2003/07	2003/03	DF	CM
		15-5N-12E		PINE HOLLOW						
BLACK	1	20-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	1,572	0	1980/12	1982/07	DF	DMB
GARRETT A	1	21-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	637,888	29	1966/04	2003/08	DF	CM
JENNIFER	1-21	21-5N-12E	HARTSHORNE	SOUTH PINE HOLLOW	45,011	52	2001/12	2003/08	DF	CM
STIPE	1-6	6-5N-13E	HARTSHORNE	SOUTH PINE HOLLOW	83,798	0	1999/12	2002/07	DF	CM
GIBSON	10-1	10-5N-13E	HARTSHORNE	SOUTH	123,071	17	1985/01	2003/08	DF	СМ

Well	Well Num	Location	Formation	Field Name	Cumulative Gas Production (Mcf)	Current Gas ProductionRate (Mcfd)	First Prod Date	Last Prod Date	Facies	Secondary Facies
GRETA	1-21	21-5N-13E	HARTSHORNE	PINE HOLLOW SOUTH	13,725	101	2002/12	2003/03	DF	
TRUMBO	1	6-6N-11E	HARTSHORNE / BOOCH	SHADY GROVE SOU TH	597,243	4	1964/01	2003/07	DF	DMB
STEPHENS		6-6N-11E	HARTSHORNE / BOOCH	SHADY GROVE SOUTH		0	1964/01	2003/07	DF	DINID
			HARTSHORNE /	SHADY GROVE	525,239					
BOYD	1	7-6N-11E	BOOCH	SOUTH SHADY GROVE	737,652	9	1964/01	2003/08	DF	
BOYD	2	7-6N-11E	HARTSHORNE	SOUTH SHADY GROVE	85,110	6	1987/10	2003/08	DF	
HILL	4-14	14-6N-11E	HARTSHORNE	SOUTHWEST SHADY GROVE	124,168	23	1995/06	2003/09	DF	DMB
HILL BLAYLOCK 1-19	2-15 1-19	15-6N-11E 19-6N-11E	HARTSHORNE HARTSHORNE	SOUTHWEST HILL TOP NORTH	4,004 19,043	2	1995/06 1991/03	1996/06 2003/08	DF	DMB
LINDLEY	1-30C	30-6N-11E	HARTSHORNE / BOOCH	HILL TOP NORTH	346,832	35	1987/12	2003/08	DF	СМ
JONES				PINE HOLLOW						
	2-25	25-6N-12E	HARTSHORNE	SOUTH PINE HOLLOW	7,264	30	2003/02	2003/08	DF	BAY
HARTSFIELD	1-35	35-6N-12E	HARTSHORNE	SOUTH PINE HOLLOW	46,203	68	2002/02	2003/08	DF	
HARTSFIELD WHATS IF	1-36A 1-11	36-6N-12E 11-6N-13E	HARTSHORNE HARTSHORNE	SOUTH ULAN SOUTH	128,207 42	151	2002/02 2003/07	2003/08 2003/07	DF	
GLEESE	1-27	27-6N-13E	HARTSHORNE / BOOCH	PINE HOLLOW SOUTH	64,130	9	1989/07	2003/08	DF	
GLEESE	1-28	28-6N-13E	HARTSHORNE	PINE HOLLOW SOUTH	58,494	10	1990/02	2003/08	DF	
FRANCES 1-29				PINE HOLLOW SOUTH	75,528			2003/08		DMB
	1-11	29-6N-13E	HARTSHORNE /			33	1992/09		DF	DMB
TURNER JOYCE	5	6-7N-11E 5-7N-12E	BOOCH HARTSHORNE	GREASY CREEK LAMAR EAST	42,702 230,132	14	1986/05 1981/04	2003/06 2003/08	DF DF	CM CM
DERRISAW	1	6-7N-12E	HARTSHORNE	LAMAR EAST	347,958	0	1964/02	1991/07	DF	BAY
MAD MAX	1-14	14-7N-12E	HARTSHORNE/ BOOCH	SCIPIO NORTHWEST	51,994	29	2000/07	2003/08	DF	BF
том	1-14	14-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	54,194	55	2001/01	2003/08	DF	BF
MYERS	1	15-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	426,770	12	1963/11	2003/08	DF	BF
MYERS	1	15-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	54,156	0	1964/01	1970/05	DF	BF
FALCON CLUB	1-21	21-7N-12E	HARTSHORNE / BOOCH	SCIPIO	108,581	64	2000/08	2003/08	DF	5.
			HARTSHORNE /	SCIPIO						
KERN	1-21	21-7N-12E	SAVANNA HARTSHORNE /	NORTHWEST SCIPIO	10,195	10	2001/08	2003/08	DF	
FALCON CLUB	2-21	21-7N-12E	BOOCH	NORTHWEST SCIPIO	136,167	56	2001/01	2003/08	DF	DMB
MELISSA	2-22	22-7N-12E	HARTSHORNE	NORTHWEST SCIPIO	48,110	14	2000/12	2003/08	DF	DMB
SOUSEA	1	24-7N-12E	HARTSHORNE HARTSHORNE /	NORTHWEST SCIPIO	53,703	0	1968/07		DF	BF
MYERS-HOLT	1	24-7N-12E	BOOCH HARTSHORNE /	NORTHWEST	92,080	12	1981/12	2003/08	DF	BF
ROSS	1-24	24-7N-12E	BOOCH	NORTHWEST	14,240	0	2001/08	2003/06	DF	
STIPE	1-27	27-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	178,169	49	1997/09	2003/08	DF	DMB
MILLION	1-27	27-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	2,078	0	1983/01	1985/03	DF	DMB
STIPE	2-27	27-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	102,786	145	2001/07	2003/08	DF	DMB
STIPE	3-27	27-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	67,332	65	2001/10	2003/08	DF	DMB
MYERS	1-28	28-7N-12E	HARTSHORNE / BOOCH	SCIPIO	77,827	0	1980/08	1988/02	DF	DMB
				SCIPIO						
W J HILSEWECK	1-29	29-7N-12E	HARTSHORNE	NORTHWEST	142,605	24	1988/01	2003/08	DF	BAY
PUCKETT	2-32	32-7N-12E	HARTSHORNE	NORTHWEST SCIPIO	23,495	10	1995/06	2003/08	DF	
OTHEL	1	1-7N-13E	HARTSHORNE	NORTHWEST	27,389	21	1998/11	2003/07	DF	BAY

Weil	Well Num	Location	Formation	Field Name	Cumulative Gas Production (Mcf)	Current Gas ProductionRate (Mcfd)	First Prod Date	Last Prod Date	Facies	Secondary Facies
HILL #1-24	1-24	24-7N-13E	HARTSHORNE / BOOCH	ULAN EAST	299,375	12	1993/10	2003/08	DF	
KING	3-25	25-7N-13E	HARTSHORNE / BOOCH	REAMS NORTHWEST		50	1994/09	2003/08	DF	
			HARTSHORNE /	REAMS	369,985					
KING	4-25	25-7N-13E	BOOCH	NORTHWEST	103,446 8,670,781	62 146,962	2001/03	2003/08	DF	
DI 4 01/					0.15.0.11		1000111			
BLACK ARTHUR #1	1-17	17-5N-11E 19-5N-11E	HARTSHORNE HARTSHORNE	HILL TOP HILL TOP	245,241 569,869	29 35	1988/11 1981/09	2003/08 2003/08	DMB DMB	
ALTA #1		19-5N-11E	HARTSHORNE	HILL TOP	299,093	8	1981/09	2003/08	DMB	
MOBIL #1	1 1	20-5N-11E	HARTSHORNE	HILL TOP	544,250	49	1988/07	2003/08	DMB	
BLACK J	1	20-5N-11E	HARTSHORNE	HILL TOP	472,784	72	1989/02	2003/09	DMB	
TRAVIS P	1L	21-5N-11E	HARTSHORNE	HILL TOP	621,903	75	1991/06	2003/01	DMB	C-1
HUFFMAN	1-32	32-5N-11E	HARTSHORNE	HILL TOP SOUTHWEST	173,087	25	1990/01	2003/08	DMB	
JEFFERSON	1	12-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH SHADY GROVE	258,557	61	1996/08	2003/03	DMB	DF
ECKLES	1-5	5-6N-11E	HARTSHORNE	SOUTH SHADY GROVE	85,551	13	1999/09	2003/09	DMB	C-1
BLACK #2	2	9-6N-11E	HARTSHORNE	SOUTHWEST SHADY GROVE	96,090	5	1993/06	2003/06	DMB	DF
BLACK #3	3	10-6N-11E	HARTSHORNE	SOUTHWEST	467,630	22	1993/11	2003/09	DMB	
GENEVA	1-10	10-6N-11E	HARTSHORNE	SHADY GROVE SOUTHWEST CABANISS	262,228	15	1995/07	2003/09	DMB	DF
BALLINGER	3-13	13-6N-11E	HARTSHORNE	NORTHWEST	1,412,822	42	1985/01	2003/08	DMB	C-1
PAUL BALLINGER 4-13	4-13	13-6N-11E	HARTSHORNE	CABANISS NORTHWEST	109,744	14	1992/05	2003/08	DMB	DF
LITTLE	1	19-6N-11E	HARTSHORNE	HILL TOP NORTH	2,857	0	1993/02	1998/07	DMB	C-1
ROLAND	1	20-6N-11E	HARTSHORNE	HILL TOP NORTH	101,522	21	1992/06	2003/08	DMB	C-1
ROLAND 1-20	1-20	20-6N-11E	HARTSHORNE	HILL TOP NORTH CABANISS	9,809	0	1992/04	1992/11	DMB	C-1
HILSWECK	3-17	17-6N-12E	HARTSHORNE	NORTHWEST	46,551	14	1997/09	2003/08	DMB	
KLENE UN	1	1-7N-11E	HARTSHORNE	LAMAR EAST	2,299,313	31	1961/08	2003/08	DMB	C-1
JACKSON	1	30-7N-11E	HARTSHORNE	SHADY GROVE SOUTH	419,823	0	1986/04	1992/01	DMB	
BE	1	31-7N-11E	HARTSHORNE	SHADY GROVE SOUTH	719,276	5	1985/01	2003/08	DMB	
KAMPERMAN	1	31-7N-11E	HARTSHORNE	SHADY GROVE WEST	137,116	14	1989/02	2003/08	DMB	DF
				SCIPIO						
GILCREASE PERRY	2	16-7N-12E 17-7N-12E	HARTSHORNE HARTSHORNE	NORTHWEST LAMAR EAST	259,338 289,538	0	1963/08 1982/03	1986/07 2003/08	DMB DMB	C-1
GRIFFIN HEIRS	1-17	17-7N-12E	HARTSHORNE	LAMAR EAST	12,152	64	2003/03	2003/08	DMB	C-1
SARKEYS	18	18-7N-12E	HARTSHORNE	LAMAR EAST	298,179	0	1964/03	1982/11	DMB	C-1
SARKEYS	10	18-7N-12E	HARTSHORNE	LAMAR EAST	169,548	8	1964/02	2003/08	DMB	C-1
GILCREASE #1 #2	1	21-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	318,949	0	1964/12	1997/06	DMB	DF
FALCON CLUB	3-21	21-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	146,922	123	2001/01	2003/08	DMB	DF
CLARKE	1	22-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	86,270	0	1964/12	1987/05	DMB	DF
CLARK	1	22-7N-12E	HARTSHORNE	SCIPIO NORTHWEST SCIPIO	78,590	0	1964/12		DMB	DF
JONATHAN	1-22	22-7N-12E	HARTSHORNE	NORTHWEST	31,129	12	2000/09	2003/08	DMB	DF
MICHAEL	2-22	22-7N-12E	HARTSHORNE	NORTHWEST	124,116	67	2001/04	2003/08	DMB	DF
STIPE	1-28	28-7N-12E	HARTSHORNE	NORTHWEST	437,796	93	1996/10	2003/08	DMB	DF
STIPE	2-28	28-7N-12E	HARTSHORNE / BOOCH	SCIPIO NORTHWEST	119,611	40	1997/09	2003/08	DMB	DF
PUCKETT	1-32	32-7N-12E	HARTSHORNE	SCIPIO NORTHWEST	57,410	0	1982/12	1996/11	DMB	
DOSS	1-33	33-7N-12E	HARTSHORNE / BOOCH	CABANISS NORTHWEST	42,806	0	1982/12	1997/01	DMB	
HERMAN	1-12	12-7N-13E		SCIPIO NORTHWEST	19,271	16 39	2000/12	2003/07	DMB	C-1
WARD WARD	2-13	13-7N-13E 13-7N-13E	HARTSHORNE HARTSHORNE	ULAN EAST ULAN EAST	204,197 164,754	39 25	1994/03 1993/01	2003/08 2003/08		C-1 C-1

Well	Well Num	Location	Formation	Field Name	C umulative Gas Production (Mcf)	Current Gas ProductionRate (Mcfd)	First Prod Date	Last Prod Date	Facies	Secondary Facies
MOONEYHAM	1-18	18-7N-13E	HARTSHORNE / SAVANNA	SCIPIO NORTHWEST	489,300	18	1994/07	2003/06	DMB	DF
ROCKEY	1-18	18-7N-13E	HARTSHORNE / SAVANNA	SCIPIO NORTHWEST	88,122	0	1994/07	1999/11	DMB	DF
MOONEYHAM #1-18	1-18	18-7N-13E	HARTSHORNE / SAVANNA	SCIPIO NORTHWEST	163,419	18	1994/02	2003/08	DMB	DF
HOOTERS	1-18	18-7N-13E	HARTSHORNE	SCIPIO NORTHWEST	19,936	45	2002/06	2003/08	DMB	DF
					12,976,469	288,366				
DUNCAN	1	23-5N-11E	HARTSHORNE	STUART SOUTHWEST	83,900	0	1961/01		IC-1	
WOODFORK	1	26-5N-11E	HARTSHORNE	STUART	5,413,737	0	1960/12	1988/11	IC-1	
				STUART						
KINCADE	1	26-5N-11E	HARTSHORNE	SOUTHWEST STUART	97,600	0	1964/04	1968/03	IC-1	
LACKEY C S 2 NE	1	27-5N-11E	HARTSHORNE	SOUTHWEST	4,249,974	0	1960/12	1994/01	IC-1	
WALKER HEIRS	1	27-5N-11E	HARTSHORNE	SOUTHWEST STUART	1,306,286	15	1970/03	2003/09	IC-1	
WALKER HEIRS 27-2	27-2	27-5N-11E	HARTSHORNE HARTSHORNE /	SOUTHWEST STUART	290,973	55	1992/08	2003/05	IC-1	
HERRING D	1-C	28-5N-11E	JEFFERSON	SOUTHWEST PINE HOLLOW	1,032,069	136	1989/02	2003/03	IC-1	
LOFTIS	1	8-5N-12E	HARTSHORNE HARTSHORNE /	SOUTH PINE HOLLOW	3,787	0	2000/08	2000/10	IC-1	
BROOKS	1-18	18-5N-12E	SENORA	SOUTH PINE HOLLOW	16,675	0	1984/03	1996/11	IC-1	
HARRISON	1-18	18-5N-12E	HARTSHORNE	SOUTH REAMS	281,510	157	1999/10	2003/08	IC-1	
CARTER 1-2	1-2	2-6N-13E	HARTSHORNE	NORTHWEST REAMS	933,438	106	1989/02	2003/08	IC-1	
HOLT	J2-3	3-6N-13E	HARTSHORNE	NORTHWEST	17	0	1988/08	1988/08	IC-1	
HOLTJ	4-3	3-6N-13E	HARTSHORNE	NORTHWEST	94,298	23	1997/10	2003/08	IC-1	
HOLT J	1	3-6N-13E	HARTSHORNE	REAMS NORTHWEST	2,708,284	48	1985/05	2003/08	IC-1	
HOLT	ЗJ	3-6N-13E	HARTSHORNE	REAMS NORTHWEST	393,172	11	1990/01	2003/08	IC-1	
HOLT	1-4T	4-6N-13E	HARTSHORNE	REAMS NORTHWEST	902,526	97	1988/08	2003/08	IC-1	
LUCILLE	1-34	34-7N-13E	HARTSHORNE	REAMS NORTHWEST	1,046,508	52	1985/05	2003/08	IC-1	
STATE	1-35	35-7N-13E	HARTSHORNE	REAMS NORTHWEST	607,018	0	1980/10	1987/04	IC-1	
STATE	2-35	35-7N-13E	HARTSHORNE	REAMS NORTHWEST	1,200,399	221	1988/08	2003/08	IC-1	
SUNSHINE	1-36	36-7N-13E	HARTSHORNE	REAMS NORTHWEST	73,470	13	1996/05	2003/08	IC-1	
SHEENA #1-36	1-36	36-7N-13E	HARTSHORNE	REAMS NORTHWEST	342,580	70	1995/07	2003/08	IC-1	
					21,078,221	1,003,725				
FIELD HEIR	1	13-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	3,255,168	24	1965/08	2003/09	IC-2	
DELILAH	1	23-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	1,693,279	137	1985/10	2003/09	IC-2	
LOFTIS	2	23-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	4,239,153	0	1968/10	1985/09	IC-2	
LOFTIS AUSTIN E	1	23-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	892,201	87	1985/10	2003/09	IC-2	
LOFTIS & DELILAH		23-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	1,216,608	0	1985/10	1992/11	IC-2	
MORRIS OSSIE	1	24-5N-12E	HARTSHORNE	PINE HOLLOW SOUTH	11,017,443	276	1965/08	2003/09	IC-2	
		24-5N-12E		PINE HOLLOW						
MORRIS O	3-24		HARTSHORNE	SOUTH PINE HOLLOW SOUTH	46,175	38	2000/11	2003/09	IC-2	
DEPOT		25-5N-12E	HARISHURNE	PINE HOLLOW	260,615	46	1990/11	2003/09	10-2	

Net Image Sector											
DAVIS 1 265N-126 HARTSHORKE SOUTH 7,680,05 175 1965/0 20309 1-2 MCDONALD SUSAN 1 355N-126 HARTSHORKE SOUTH 864,966 0 1966/03 1983/11 1-2 USA#36 1 365N-126 HARTSHORKE SOUTH 783,922 37 1975/03 20309 1-2 WATKINS 1 3-SN-136 HARTSHORKE SOUTH 733,923 37 1975/03 20309 1-2 FOOD SSWW 1 3-SN-136 HARTSHORKE SOUTH 345,576 59 1999/03 20309 1-2 GIBSON WINNE 2.4 4-SN-136 HARTSHORKE SOUTH 345,576 59 1990/4 1-2 GIBSON WINNE 1 4-SN-136 HARTSHORKE SOUTH 343,576 59 1990/4 1-2 GIBSON WINNE 1 4-SN-136 HARTSHORKE SOUTH 373,339 0 1965/07 1990/4 1-2 LINDSAY GIBSON	Well	Well Num	Location	Formation	Field Name	Cumulative Gas Production (Mcf)	Current Gas ProductionRate (Mcfd)	First Prod Date	Last Prod Date	Facies	
MCDONALD SUBAN 1 35.8N-12E HARTSHORKE SOUTH 8.0.44,198 78 196.90 20.309 1.2 WATKINS 1 2-6N-12E HARTSHORKE PRE FOLLOW 864,966 0 196.03 196.11 1.2 WATKINS 1 2-9N-18E HARTSHORKE PRE FOLLOW 864,966 0 196.03 203.09 1.2 FOOD SE SW NW 1 3-9N-18E HARTSHORKE SOUTH 228,446 40 196.00 203.09 1.2 FOOD SE SW NW 1 4-9N-18E HARTSHORKE SOUTH 345.76 6.9 199.00 203.09 1.2 GIBSON WINNE 2.4 4-9N-18E HARTSHORKE SOUTH 345.76 6.9 199.00 203.09 1.2 GIBSON WINNE 1 4-SN-13E HARTSHORKE SOUTH 378.39 0 196.00 1.090.00 1.2 HORNTON SE WYSE 1 5-SN-13E HARTSHORKE SOUTH 3.78.39 0 196.00 203.0	DAVIS	1	26-5N-12E	HARTSHORNE		7,660,105	175	1965/10	2003/09	IC-2	
USA #36 1 366/11/26 HARTSHORNE SOUTH 864,896 0 196603 1993/11 102 WATKINS 1 2-91-126 HARTSHORNE PINE HOLLOW 733,928 37 1975/09 2003/09 10-2 FOOD SE SW NW 1 3-90-136 HARTSHORNE PINE HOLLOW 2258,446 4.0 1965/08 2003/09 10-2 GIBSON WINNIE 2.4 4-5N-136 HARTSHORNE FINE HOLLOW 948,223 16.4 1990/02 2003/09 10-2 GIBSON WINNIE 1 4-5N-136 HARTSHORNE FINE HOLLOW 977,738 20 1990/02 2003/09 10-2 GIBSON WINNIE 1 4-5N-136 HARTSHORNE FINE HOLLOW 3,730,39 0 1966/07 1990/04 10-2 LINDSAY GIBSON WE SW 1 5-5N-136 HARTSHORNE SOUTH 5,730,393 0 1966/07 1990/01 1-2 LINDSAY GIBSON WE SW NE 1 5-5N-136 HARTSHORNE SOUTH 1,506,564	MCDONALD SUSAN	1	35-5N-12E	HARTSHORNE	SOUTH		78	1965/08	2003/09	IC-2	
WATKINS 1 2-SH-13E HARTSHORNE SOUTH 793.928 37 197.69 20.030 1c.2 FOOD SESW NW 1 3-SH-13E HARTSHORNE SOUTH 2.258.46 4.0 196.06 200.09 1c.2 FOOD 2.3 3-SH-13E HARTSHORNE SOUTH 345,576 59 199.02 200.09 1c.2 GIBSON WINNIE 2.4 4-SH-13E HARTSHORNE FNIE HOLLOW 77.738 20 199.06 2003.08 1c.2 GIBSON WINNIE 1 4-SH-13E HARTSHORNE SOUTH 370.939 0 199.06 2003.09 1c.2 LINDSAY GIBSON NESW 1 4-SH-13E HARTSHORNE SOUTH 3.709.939 0 199.07 2003.09 1c.2 THORNTON SE NW SE 1 7-SH-13E HARTSHORNE SOUTH 3.708.93 0 196.061 197.04 1c.2 REVNOLDS 1 7-SH-13E HARTSHORNE SOUTH 3.108.64 34 196.660 103.030 <td>USA #36</td> <td>1</td> <td>36-5N-12E</td> <td>HARTSHORNE</td> <td></td> <td>864,986</td> <td>0</td> <td>1966/03</td> <td>1983/11</td> <td>IC-2</td> <td></td>	USA #36	1	36-5N-12E	HARTSHORNE		864,986	0	1966/03	1983/11	IC-2	
FOOD SE SW NW 1 3-SN-13E HARTSHORNE PINE HOLLOW SUTH 2,285,46 4.0 1965/08 2003/08 1C-2 GIBSON WINNIE 2.4 4-SN-13E HARTSHORNE PINE HOLLOW 345,576 59 1996/02 2003/08 IC-2 GIBSON WINNIE 2.4 4-SN-13E HARTSHORNE PINE HOLLOW 345,576 59 1996/02 2003/08 IC-2 GIBSON WINNIE 1 4-SN-13E HARTSHORNE PINE HOLLOW 346,576 59 1996/07 2003/08 IC-2 GIBSON WINNIE 1 4-SN-13E HARTSHORNE SOUTH 340,223 164 1990/06 2003/08 IC-2 LUNDSAY GIBSON NE SW 1 4-SN-13E HARTSHORNE SOUTH 1,266,54 34 1956/08 2003/08 IC-2 REYNOLDS 1 7-SN-13E HARTSHORNE SOUTH 2,161,911 96 196/07 2003/08 IC-2 BUSE SW NE 1 8-SN-13E HARTSHORNE SOUTH 32,386	WATKINS	1	2-5N-13E	HARTSHORNE		793,928	37	1975/09	2003/09	IC-2	
FOOD 23 3-5N-13E HARTSHORNE SOUTH 345,576 59 199/02 202309 1C-2 GIBSON WINNIE 24 4-5N-13E HARTSHORNE SOUTH 7,7,38 20 199/02 200308 1C-2 GIBSON WINNIE 1 4-5N-13E HARTSHORNE PINE MOLLOW 948,223 164 19900 200308 1C-2 LINDSAY GIBSON NES 1 4-5N-13E HARTSHORNE PINE MOLLOW 3,730,99 0 196004 1C-2 THOR NON SE NW SE 1 5-5N-13E HARTSHORNE SOUTH 678,618 34 196604 177.0 REYNOLDS 1 7-5N-13E HARTSHORNE SOUTH 678,618 0 196604 1C-2 BUSE SW NE 1 8-5N-13E HARTSHORNE SOUTH 63,63,27 113 196,008 109,007 1C-2 WALLACE W C NE SW NW 12 7-5N-13E HARTSHORNE SOUTH 10,700,574 56 196,070 1C-2 ROCK W P C	FOOD SE SW NW	1	3-5N-13E	HARTSHORNE		2,258,446	40	1965/08	2003/09		
GIBON WINNE 24 4-8N-13E HARTSHORNE SOUTH 77,738 20 1990/18 200300 IC-2 GIBON WINNE 1 4-8N-13E HARTSHORNE SOUTH 948,223 164 1990/08 200309 IC-2 LINDSAY GIBSON NE SW 1 4-8N-13E HARTSHORNE SOUTH 3,70,939 0 1965/07 1990/08 IC-2 THORNTON SE NW SE 1 5-8N-13E HARTSHORNE PINE MOLLOW 1,089,664 34 1965/07 200309 IC-2 REVNOLDS 1 7-5N-13E HARTSHORNE PINE MOLLOW 2,161,911 96 1970/07 200309 IC-2 BUSE SW NE 1 5-8N-13E HARTSHORNE PINE MOLLOW 66,68,237 113 1966/07 200309 IC-2 WALLACE W C NE SW NW 12 5-8N-13E HARTSHORNE PINE MOLLOW 1,700,574 66 1966/07 200309 IC-2 ROCK WP 1 17-5N-13E HARTSHORNE PINE MOLLOW 1,205,62	FOOD	2-3	3-5N-13E	HARTSHORNE		345,576	59	1995/02	2003/09	IC-2	
GIBON WINNE 1 4-SN-13E HARTSHORNE SOUTH 94.82.3 164 1990.00 10.2 LINDBAY GIBON NESW 1 4-SN-13E HARTSHORNE NUM 3,730.393 0 1956.07 196.07 100.07 THORNTON SE NW SE 1 5-SN-13E HARTSHORNE NUM 1,008.64 3.4 195.06 203.09 IC-2 REVNOLDS 1 7-SN-13E HARTSHORNE NUM 2,161.911 96 197.07 203.09 IC-2 BUSE SW NE 1 8-SN-13E HARTSHORNE NUM 6,86.237 113 196.56 100.09 1.2 WALLACE W C NE SW NW 182 9-SN-13E HARTSHORNE NUM 1,00.74 6.6 198.07 200.08 IC-2 ROCK WP C NW NW 1 1.5-SN-13E HARTSHORNE NUM 1,00.574 6.6 198.07 20.09 IC-2 ROCK WP C NW NW 2 1.7-SN-13E HARTSHORNE NUM 1,00.74 6.53.582 10.8 198.0	GIBSON WINNIE	2-4	4-5N-13E	HARTSHORNE		77,738	20	1999/08	2003/08	IC-2	
LINDSAY GIBSON NE SW 1 4 -5N-13E HARTSHORNE SOUTH 3,739,939 0 1950/7 1990/4 IC-2 THORNTON SE NW SE 1 5-5N-13E HARTSHORNE SOUTH 1,068,564 34 1950/8 2003/9 IC-2 REYNOLDS 1 7-5N-13E HARTSHORNE SOUTH 2,161,911 96 1970/7 2003/9 IC-2 BUSE SW NE 1 8-5N-13E HARTSHORNE PINE HOLLOW 6,868,237 113 1950/8 2003/9 IC-2 WALLACE W.C NE SW NW 182 9-5N-13E HARTSHORNE PINE HOLLOW 700,774 56 1965/07 2003/08 IC-2 WALLACE W.C NE SW NW 182 9-5N-13E HARTSHORNE PINE HOLLOW 700,774 56 1965/07 2003/08 IC-2 ROCK WP 1 17-5N-13E HARTSHORNE PINE HOLLOW 700,774 56 1960/07 1C-2 BUCE ROBBINS UNIT 1 16-5N-13E HARTSHORNE SOUTH 4,535,628 0	GIBSON WINNIE	1	4-5N-13E	HARTSHORNE		948,223	164	1990/06	2003/09	IC-2	
THORNTON SE NW SE 1 5-5N-13E HARTSHORNE SOUTH 1,508,564 34 1955/08 203/09 1/2 REYNOLDS 1 7-5N-13E HARTSHORNE SOUTH 2,161,911 96 197,07 203,09 1/2 1/2 REYNOLDS 1 7-5N-13E HARTSHORNE SOUTH 678,818 0 196,004 197,04 1/2 1/2 BUSE SW NE 1 8-5N-13E HARTSHORNE SOUTH 6,669,237 113 1965/08 203,09 1/2 WALLACE W C NE SW NW 182 9-5N-13E HARTSHORNE SOUTH 1,700,574 56 1965/07 203,08 1/2 ROCK WP 1 17-5N-13E HARTSHORNE SOUTH 1,201,74 56 1968/10 203,09 1/2 ROCK WP 3-17 17-5N-13E HARTSHORNE SOUTH 2,455,682 1 196,08 203,09 1/2 ROCK WP 3-11 1-58,173E HARTSHORNE SOUTH 1,178 1/2 </td <td>LINDSAY GIBSON NE SW</td> <td>1</td> <td>4-5N-13E</td> <td>HARTSHORNE</td> <td></td> <td>3,730,939</td> <td>0</td> <td>1965/07</td> <td>1990/04</td> <td>IC-2</td> <td></td>	LINDSAY GIBSON NE SW	1	4-5N-13E	HARTSHORNE		3,730,939	0	1965/07	1990/04	IC-2	
REYNOLDS 1 7-5N-13E HARTSHORNE SOUTH 2,161,911 96 197907 200308 10-2 FIRESTON 1 7-5N-13E HARTSHORNE SOUTH 6,868,237 113 196604 197704 10-2 BUSE SW NE 1 8-5N-13E HARTSHORNE SOUTH 6,868,237 113 196508 200309 1C-2 WALLACE W C NE SW NW 18.2 9-5N-13E HARTSHORNE SOUTH 32,356 0 196507 200308 1C-2 ROCK WP 1 17-5N-13E HARTSHORNE SOUTH 32,356 0 196507 200300 1C-2 ROCK WP C NW NW 2 17-5N-13E HARTSHORNE SOUTH 4,245,466 0 196907 200307 1C-2 ROCK WP C NW NW 2 17-5N-13E HARTSHORNE SOUTH 1,1070 1 200202 200210 1C-2 ROCK WP C NW NW 3.1 19-5N-13E HARTSHORNE SOUTH 1,1070 1 200202	THORN TON SE NW SE	1	5-5N-13E	HARTSHORNE			34	1965/08	2003/09	IC-2	
FIRESTON 1 7-5N-13E HARTSHORNE SOUTH PINE HOLLOW 678,818 0 196,604 197704 16-2 BUSE SW NE 1 8-5N-13E HARTSHORNE SOUTH 6,868,237 113 196,008 203,008 1C-2 WALLACE W C NE SW NW 182 9-5N-13E HARTSHORNE SOUTH 1,700,574 56 196,070 203,080 1C-2 ROCK WP 1 17-5N-13E HARTSHORNE SOUTH 12,358 0 196,070 109,070 1C-2 ROCK WP C NW NW 2 17-5N-13E HARTSHORNE SOUTH 4,245,466 0 196,070 100,070 1C-2 ROCK WP C NW NW 1 155N-13E HARTSHORNE SOUTH 6,535,822 128 196,070 200,010 1C-2 BRUCE ROBBINS UNIT 1 165N-13E HARTSHORNE SOUTH 3,516,263 0 199,01 200,000 1C-2 UNIV OF TULSA 1 155N-13E HARTSHORNE SOUTH 3,516,263 0 <td>REYNOLDS</td> <td>1</td> <td>7-5N-13E</td> <td>HARTSHORNE</td> <td></td> <td>2,161,911</td> <td>96</td> <td>1979/07</td> <td>2003/09</td> <td>IC-2</td> <td></td>	REYNOLDS	1	7-5N-13E	HARTSHORNE		2,161,911	96	1979/07	2003/09	IC-2	
BUSE SW NE 1 8-5N-13E HARTSHORNE SOUTH 6,868,237 113 196/08 203/08 IC-2 WALLACE W C NE SW NW 182 9-5N-13E HARTSHORNE SOUTH 1,700,574 56 1965/07 203/08 IC-2 ROCK WP 1 17-5N-13E HARTSHORNE PINE HOLLOW 32,368 0 1965/07 203/07 IC-2 ROCK WP C NW NW 2 17-5N-13E HARTSHORNE PINE HOLLOW 4,245,468 0 1966/07 203/07 IC-2 ROCK WP C NW NW 2 17-5N-13E HARTSHORNE SOUTH 4,245,468 0 1966/07 203/07 IC-2 BRUCE ROBBINS UNIT 1 16-5N-13E HARTSHORNE SOUTH 1,170 1 200/07 IC-2 UNIV OF TULSA 1 19-5N-13E HARTSHORNE SOUTH 3,516,263 0 197/04 199/11 IC-2 LEO 1/25 2-6N-13E HARTSHORNE SOUTH 3,516,263 0 197/04 <	FIRESTON	1	7-5N-13E	HARTSHORNE		678,818	0	1966/04	1977/04	IC-2	
WALLACE W C NE SW NW 182 9-5N-13E HARTSHORNE SOUTH 1,700,574 56 1965/07 2003/08 IC-2 ROCK WP 1 17-5N-13E HARTSHORNE SOUTH 32,358 0 1965/08 1989/07 IC-2 ROCK WP C NW NW 2 17-5N-13E HARTSHORNE PINE HOLLOW 1 1968/01 2003/02 IC-2 ROCK WP C NW NW 2 17-5N-13E HARTSHORNE PINE HOLLOW 1 1968/01 2003/02 IC-2 BRUCE ROBBINS UNIT 1 18-5N-13E HARTSHORNE PINE HOLLOW 1 1968/01 2003/02 IC-2 UNIV OF TULSA 1 195N-13E HARTSHORNE SOUTH 3,516,263 0 1970/04 198/11 IC-2 LEO 1.2 25-6N-13E HARTSHORNE SOUTH 207,738 2.2 198/05 2003/07 IC-2 GRAY 1 26-6N-13E HARTSHORNE SOUTH 11,15,398 4.9 1966/05 2003/08 IC-2 </td <td>BUSE SW NE</td> <td>1</td> <td>8-5N-13E</td> <td>HARTSHORNE</td> <td></td> <td>6,868,237</td> <td>113</td> <td>1965/08</td> <td>2003/09</td> <td>IC-2</td> <td></td>	BUSE SW NE	1	8-5N-13E	HARTSHORNE		6,868,237	113	1965/08	2003/09	IC-2	
ROCK WP 1 17-5N-13E HARTSHORNE SOUTH 32,358 0 1965/08 1989/07 1C-2 ROCK W P C NW NW 2 17-5N-13E HARTSHORNE SOUTH 4,245,468 0 1968/10 2003/02 1C-2 ROCK W P C NW NW 3 17-5N-13E HARTSHORNE SOUTH 4,245,468 0 1968/10 2003/02 1C-2 ROCK W P 3-17 17-5N-13E HARTSHORNE PINE HOLLOW 10.00 2002/00 1C-2 10.00 1C-2 BRUCE ROBBINS UNIT 1 185N-13E HARTSHORNE SOUTH 6,535,622 1128 1965/05 2003/07 1C-2 UNIV OF TULSA 1 195N-13E HARTSHORNE SOUTH 3,516,263 0 170/41 1981/1 1C-2 LEO 1.2 25-6N-13E HARTSHORNE SOUTH 3,516,263 0 1968/05 2003/07 1C-2 GRAY 1 26-6N-13E HARTSHORNE SOUTH 11,15,393 19 1968/05<	WALLACE W C NE SW NW	18.2	9-5N-13E	HARTSHORNE		1,700,574	56	1965/07	2003/08	IC-2	
ROCK W P C NW NW 2 17-5N-13E HARTSHORNE SOUTH 4,245,468 0 1968/10 2003/02 1c-2 ROCK W P 3-17 17-5N-13E HARTSHORNE SOUTH 1,170 1 2002/02 2002/10 1c-2 BRUCE ROBBINS UNIT 1 15-5N-13E HARTSHORNE SOUTH 6,535,822 128 1965/08 203/09 1c-2 BRUCE ROBBINS UNIT 1 19-5N-13E HARTSHORNE SOUTH 6,535,822 128 1965/08 203/09 1c-2 UNIV OF TULSA 1 19-5N-13E HARTSHORNE PINE HOLLOW 1000000000000000000000000000000000000	ROCK WP	1	17-5N-13E	HARTSHORNE	SOUTH	32,358	0	1965/08	1989/07	IC-2	
ROCK WP 3-17 17-5N-13E HARTSHORNE SOUTH 1,170 1 2002/02 2002/10 1C-2 BRUCE ROBBINS UNIT 1 18-5N-13E HARTSHORNE SOUTH 6,535,822 128 1965/08 2003/09 1C-2 UNIV OF TULSA 1 19-5N-13E HARTSHORNE SOUTH 3,516,263 0 1970/04 1980/10 1C-2 LEO 1-25 25-6N-13E HARTSHORNE SOUTH 207,738 22 1980/09 2003/07 1C-2 BLEVINS 1 25-6N-13E HARTSHORNE SOUTH 101,53,98 49 1968/05 2003/09 1C-2 GRAY 1 26-6N-13E HARTSHORNE SOUTH 11,155,398 49 1968/05 2003/09 1C-2 MCCARTY 1 26-6N-13E HARTSHORNE SOUTH 305,371 175 199/10 203/08 1C-2 GLEESE 1 3-6N-13E HARTSHORNE SOUTH 305,371 175 199/10 203/08	ROCK W P C NW NW	2	17-5N-13E	HARTSHORNE	SOUTH	4,245,468	0	1968/10	2003/02	IC-2	
BRUCE ROBBINS UNIT 1 18-5N-13E HARTSHORNE SOUTH 6,535,822 128 1965/08 2003/09 1C-2 UNIV OF TULSA 1 19-5N-13E HARTSHORNE SOUTH 3,516,263 0 1970/04 1980/10 1092/01 10-2 LEO 10 25-6N-13E HARTSHORNE SOUTH 207,738 22 1980/09 2030/07 1C-2 BLEVINS 1 25-6N-13E HARTSHORNE SOUTH 207,738 49 1960/05 2030/07 1C-2 GRAY 1 26-6N-13E HARTSHORNE SOUTH 1135,398 49 1960/05 2030/07 1C-2 MCCARTY 3 23-6N-13E HARTSHORNE SOUTH 305,371 118 1978/07 2030/05 1C-2 MCCARTY 3 23-6N-13E HARTSHORNE SOUTH 305,371 115 1990/11 203/08 1C-2 GLEESE J 1 33-6N-13E HARTSHORNE SOUTH 1067/24 199 203/08	ROCK W P	3-17	17-5N-13E	HARTSHORNE		1,170	1	2002/02	2002/10	IC-2	
UNIV OF TULSA 1 19-5N-13E HARTSHORNE SOUTH 3,516,263 0 1970/04 1998/11 1C-2 LEO 1-25 25-6N-12E HARTSHORNE SOUTH 207,738 22 1988/09 2030/07 1C-2 BLEVINS 1 25-6N-12E HARTSHORNE PINE HOLLOW 1,135,398 4.9 1968/05 2030/09 1C-2 GRAY 1 25-6N-13E HARTSHORNE SOUTH 842,707 118 1978/07 2030/05 1C-2 MCCARTY 3-32 32-6N-13E HARTSHORNE SOUTH 305,371 175 199/11 203.08 1C-2 MCCARTY 3-32 32-6N-13E HARTSHORNE SOUTH 305,371 175 199/11 203.08 1C-2 MCCARTY 3-33 3-6N-13E HARTSHORNE SOUTH 305,371 199/10 203.08 1C-2 GLEESE 1 3-6N-13E HARTSHORNE SOUTH 160.02 196.08 203.09 1C-2	BRUCE ROBBINS UNIT	1	18-5N-13E	HARTSHORNE		6,535,822	128	1965/08	2003/09	IC-2	
LEO 1-25 25-6N-13E HARTSHORNE SOUTH 207,788 22 1988/09 2003/07 1C-2 BLEVINS 1 25-6N-13E HARTSHORNE SOUTH 1,135,398 Ag 1968/05 2030/07 1C-2 GRAY 1 26-6N-13E HARTSHORNE SOUTH 842,707 118 1968/05 2030/08 1C-2 MCCARTY 32 32-6N-13E HARTSHORNE SOUTH 842,707 118 1968/05 203/08 1C-2 MCCARTY 32 32-6N-13E HARTSHORNE SOUTH 842,707 118 196/05 203/08 1C-2 GLEESE 1 32-6N-13E HARTSHORNE SOUTH 667,474 19 196/05 203/08 1C-2 GLEESE 1 34-6N-13E HARTSHORNE SOUTH 1604,174 19 196/08 203/08 1C-2 HUNT-GARRETT NV SE 1 34-6N-13E HARTSHORNE SOUTH 4,041,83 123 196/08 203/08	UNIV OF TULSA	1	19-5N-13E	HARTSHORNE	SOUTH	3,516,263	0	1970/04	1998/11	IC-2	
BLEVINS 1 25-6N-13E HARTSHORNE SOUTH 1,135,398 49 1968/05 2003/09 1C-2 GRAY 1 26-6N-13E HARTSHORNE SOUTH 842,707 118 1978/07 2003/09 1C-2 MCCARTY 32 32-6N-13E HARTSHORNE SOUTH 842,707 118 1978/07 2003/08 1C-2 MCCARTY 32 32-6N-13E HARTSHORNE SOUTH 305,371 175 199/11 203/08 1C-2 GLEESE 1 33-6N-13E HARTSHORNE PINE HOLLOW 1667/47 199 196/08 203/08 1C-2 HUNT-GARRETT NW SES 1 34-6N-13E HARTSHORNE PINE HOLLOW 1660/2 199/02 2003/08 1C-2 HUNT-GARRETT NW SES 1 34-6N-13E HARTSHORNE SOUTH 4,041,853 162 203/09 1C-2 DOMINIC NE NW SE 1 35-6N-13E HARTSHORNE SOUTH 4,041,853 165.07 203/09 1C-2	LEO	1-25	25-6N-13E	HARTSHORNE	SOUTH	207,738	22	1988/09	2003/07	IC-2	
GRAY 1 26-6N-13E HARTSHORNE SOUTH 842,707 118 1978/07 2003/09 1C-2 MCCARTY 3-3 32-6N-12 HARTSHORNE SOUTH 305,371 175 199/11 2003/08 IC-2 GLEESE J 1 3-80-13E HARTSHORNE PINE HOLLOW 175 199/11 2003/08 IC-2 GLEESE J 1 3-6N-13E HARTSHORNE PINE HOLLOW 674,747 19 196/08 2003/08 IC-2 HUNT-GARRETT NW SES 1 3-6N-13E HARTSHORNE SOUTH 180,921 62 196/08 2003/08 IC-2 HUNT-GARRETT NW SES 1 3-6N-13E HARTSHORNE SOUTH 4,041,853 123 196/08 2003/08 IC-2 DOMINIC NE NW SES 1 3-6N-13E HARTSHORNE SOUTH 2,744,814 83 196/07 2003/08 IC-2 DOMINIC NE NW SES 1 3-6N-13E HARTSHORNE SOUTH 149,749 31 196/07 <td< td=""><td>BLEVINS</td><td>1</td><td>25-6N-13E</td><td>HARTSHORNE</td><td>SOUTH</td><td>1,135,398</td><td>49</td><td>1968/05</td><td>2003/09</td><td>IC-2</td><td></td></td<>	BLEVINS	1	25-6N-13E	HARTSHORNE	SOUTH	1,135,398	49	1968/05	2003/09	IC-2	
MCCARTY 3-32 3-26-N-13E HARTSHORNE SOUTH 305,371 175 199/11 2003/08 1C-2 GLEESE J 1 3-6N-12E HARTSHORNE SOUTH 674,747 199 1965/08 203/08 1C-2 GLEESE J 1 3-6N-12E HARTSHORNE SOUTH 674,747 199 1965/08 203/08 1C-2 GLEESE J 3 3-6N-13E HARTSHORNE SOUTH 674,747 199 1965/08 203/08 1C-2 HUNT-GARRETT NWSES 1 3-6N-13E HARTSHORNE SOUTH 4,041,853 123 1965/08 203/08 1C-2 DOMINIC NE NWSW 1 3-6N-13E HARTSHORNE SOUTH 2,744,814 B0 1965/07 203/09 1C-2 DOMINIC NE NWSW 1 3-6N-13E HARTSHORNE SOUTH 2,744,814 B1 196,707 203/09 1C-2 LEFLORE SE SW NW 1 3-6N-13E HARTSHORNE SOUTH 149,749 31 196,707 <td>GRAY</td> <td>1</td> <td>26-6N-13E</td> <td>HARTSHORNE</td> <td>SOUTH</td> <td>842,707</td> <td>118</td> <td>1978/07</td> <td>2003/09</td> <td>IC-2</td> <td></td>	GRAY	1	26-6N-13E	HARTSHORNE	SOUTH	842,707	118	1978/07	2003/09	IC-2	
GLEESE J 1 33-6N-13E HARTSHORNE SOUTH 674,747 19 196,708 200,708 1C-2 GLEESE 33-6N-13E HARTSHORNE SOUTH 180,921 G.2 200,708 IC-2 HUNT-GARRETT NW SES 1 34-6N-13E HARTSHORNE SOUTH 180,921 G.2 198,002 200,708 IC-2 DOMINIC NE NW SW 1 34-6N-13E HARTSHORNE SOUTH 4,041,853 103.05 105,007 200,709 IC-2 DOMINIC NE NW SW 1 35-6N-13E HARTSHORNE SOUTH 2,744,814 83 196,707 200,709 IC-2 DOMINIC NE NW SW 1 35-6N-13E HARTSHORNE SOUTH 149,749 193,712 200,709 IC-2 DOMINIC NE NW SW 1 35-6N-13E HARTSHORNE SOUTH 149,749 193,712 200,709 IC-2 LEFLORE SSW NW 1 36-6N-13E HARTSHORNE SOUTH 149,749 100 199,702 200,709 IC-2 <td>MCCARTY</td> <td>3-32</td> <td>32-6N-13E</td> <td>HARTSHORNE</td> <td>SOUTH</td> <td>305,371</td> <td>175</td> <td>1999/11</td> <td>2003/08</td> <td>IC-2</td> <td></td>	MCCARTY	3-32	32-6N-13E	HARTSHORNE	SOUTH	305,371	175	1999/11	2003/08	IC-2	
GLEESE 2-33 33-6N-13E HARTSHORNE SOUTH 180,921 62 1998/02 2003/08 1C-2 HUNT-GARRETT NW SESW 1 34-6N-13E HARTSHORNE SOUTH 4,041,853 Call 1965/08 2003/08 1C-2 DOMINIC NE NW SESW 1 35-6N-13E HARTSHORNE PINE HOLLOW 2003/09 1C-2 2003/09 1C-2 DOMINIC NE NW SESW 1 35-6N-13E HARTSHORNE SOUTH 2,744,814 83 1965/07 2003/09 1C-2 DOMINIC NE NW SESW 1 35-6N-13E HARTSHORNE SOUTH 149,749 31 1993/02 2003/09 1C-2 LEFLORE SESW NW 1 36-6N-13E HARTSHORNE SOUTH 149,749 31 1997/02 1C-2 1C-2 LEFLORE SESW NW 1 36-6N-13E HARTSHORNE SOUTH 831,922 0 1965/07 1979/02 1C-2 LEFLORE 1.36 36-6N-13E HARTSHORNE SOUTH 59,148 10 <td< td=""><td>GLEESE J</td><td>1</td><td>33-6N-13E</td><td>HARTSHORNE</td><td>SOUTH</td><td>674,747</td><td>19</td><td>1965/08</td><td>2003/08</td><td>IC-2</td><td></td></td<>	GLEESE J	1	33-6N-13E	HARTSHORNE	SOUTH	674,747	19	1965/08	2003/08	IC-2	
HUNT-GARRETT NW SE SW 1 34-6N-13E HARTSHORNE SOUTH 4,041,853 123 1965/08 2003/09 IC-2 DOMINIC NE NW SW 1 35-6N-13E HARTSHORNE SOUTH 2,744,814 A83 1965/07 2003/09 IC-2 DOMINIC NE NW SW 1 35-6N-13E HARTSHORNE PINE HOLLOW 2,744,814 A83 1995/07 2003/09 IC-2 LEFLORE SE SW NW 1 36-6N-13E HARTSHORNE SOUTH 149,749 31 1993/12 2003/09 IC-2 LEFLORE SE SW NW 1 36-6N-13E HARTSHORNE SOUTH 831,922 0 1965/07 1970/02 IC-2 LEFLORE 1.36 36-6N-13E HARTSHORNE SOUTH 831,922 0 1965/07 1970/02 IC-2	GLEESE	2-33	33-6N-13E	HARTSHORNE	SOUTH	180,921	62	1998/02	2003/08	IC-2	
DOMINIC NE NW SW 1 35-6N-13E HARTSHORNE SOUTH 2,744,814 83 1965/07 2003/09 IC-2 DOMINIC 2-35 35-6N-13E HARTSHORNE SOUTH 149,749 31 1993/12 2003/09 IC-2 LEFLORE SE SW NW 1 36-6N-13E HARTSHORNE PINE HOLLOW SOUTH 831,922 0 1905/07 1970/02 IC-2 LEFLORE SE SW NW 1 36-6N-13E HARTSHORNE SOUTH 831,922 0 1965/07 1970/02 IC-2 LEFLORE 1-36 36-6N-13E HARTSHORNE SOUTH 59,148 10 1997/02 2003/08 IC-2	HUNT-GARRETT NW SE SW	1	34-6N-13E	HARTSHORNE	SOUTH	4,041,853	123	1965/08	2003/09	IC-2	
DOMINIC 2-35 35-6N-13E HARTSHORNE SOUTH 149,749 31 1993/12 2003/09 IC-2 LEFLORE SE SW NW 1 36-6N-13E HARTSHORNE SOUTH 831,922 0 1965/07 1979/02 IC-2 LEFLORE 1.36 36-6N-13E HARTSHORNE SOUTH 831,922 0 1965/07 1979/02 IC-2	DOMINIC NE NW SW	1	35-6N-13E	HARTSHORNE	SOUTH	2,744,814	83	1965/07	2003/09	IC-2	
LEFLORE SE SW NW 1 36-6N-13E HARTSHORNE SOUTH 831,922 0 1965/07 1979/02 1C-2 LEFLORE 1-36 36-6N-13E HARTSHORNE SOUTH 59,148 10 1997/02 203/08 1C-2	DOMINIC	2-35	35-6N-13E	HARTSHORNE	SOUTH	149,749	31	1993/12	2003/09	IC-2	
LEFLORE 1-36 36-6N-13E HARTSHORNE SOUTH 59,148 10 1997/02 2003/08 IC-2	LEFLORE SE SW NW	1	36-6N-13E	HARTSHORNE	SOUTH	831,922	0	1965/07	1979/02	IC-2	
	LEFLORE	1-36	36-6N-13E	HARTSHORNE				1997/02	2003/08	IC-2	

Appendix D: Hartshorne Isopach Values

Vell	ocation	Gross Sand U HRSR (GR)	vet Sand U HRSR (>8%/>12%)	let Pay U HRSR (>8%/>12%)	Vet Sand L HRSR (>8%/>12%)	let Pay L HRSR (>8%/>12%)	Gross Sand (LHRSR1)	Gross Sand (UHRSR1)	Gross Sand (LHRSR2)	Gross Sand (HRSR Undiff)	Vet Sand U HRSR Inc Val ⊳8%/>12%)	Vet Pay U HRSR Inc Val ⊳8%/>12%)	let Sand L HRSR1 (>8%/>12%)	let Pay L HRSR1 (>8%/>12%)	√et Sand HRSR Undiff >8%/>12%)	√et Pay HRSR Undiff1 >8%/>12%)	let Sand L HRSR2 (>8%/>12%)	Vet Pay L HRSR2 (>8%/>12%)
Wildhorse #1	1-5N-11E	0	0	0	7'/3'	7'/3'	8	0	8	0	64	69		6	64	64		6
Oliver #1-3	3-5N-11E	0		0	2%	2'/0'	8		8	0								
Cities#1	4-5N-11E	0		_		NPLA												
Lyons #1-6	6-5N-11E		NPLA	NPLA	NPLA	NPLA												\square
Wirick #1 S&P 15-7	7-5N-11E 7-5N-11E	0		0	U 7'/0'	U 7'/0'	5		5	0								\vdash
Bivings#1-9	9-5N-11E	0				6'/2'	5		5	0								H
Newby 1-9	9-5N-11E	Ŭ				571	8		8	Ō								\square
Kenny 1-10	10-5N-11E	Ō					6		6	0								Н
Evans #1	10-5N-11E	0					5		5	0								
Jones #1	12-5N-11E	0				7'/2'	11		11	0								\square
Wallace Fargo #1	12-5N-11E	0				0	<u> </u>	\vdash										\square
Stuart 1-13 Anderson #1	13-5N-11E 14-5N-11E	0	0	0	NPLA 337/16	0	31		31	0								\vdash
Anderson #1 Null 1-14	14-5N-11E 14-5N-11E	0			33716 44'/32'		46	\vdash	31 46	0								+
Ellis#1	15-5N-11E	0				14'/3'	40		τU	0								H
Ellis#1	16-5N-11E	0				0	20		20	0								Н
Pearson #2	16-5N-11E	0	0	0	470	4'/0	1		1	0								
McKoy Heirs #2	16-5N-11E	0				NPLA												
McKoy Heirs #1	16-5N-11E	0				NPLA				_								Ш
Cathy #1	16-5N-11E	0				U	25 0		25	0								\vdash
Bailey #1 Artur #1	17-5N-11E 19-5N-11E	0	0		7'/3' 7'/2'	7'/3' 7'/2'	21		0 21	0								\square
Black J #1	20-5N-11E	0				8'/0'	10		10	0								H
Mobil #1	20-5N-11E	Ō				8'/6'	11		11	Ō								Н
Patterson #1	21-5N-11E	0	0	0	NPLA	NPLA												
Hickory Hills #1	21-5N-11E	0					6		6	0								
Hickory Hills A #1	21-5N-11E	0				6'/1'	9		9	0								
Travis P #1	21-5N-11E	0				1175	15		15	0								\square
Berman 1-22 Adams N #1	22-5N-11E 22-5N-11E	0				0 6'/2'	23 14		23 14	0								\vdash
Martin Unit #1	22-5N-11E	0		0	072	072	14		14	U								\vdash
Duncan #1-A	23-5N-11E	Ō		0	NPLA	0												\square
Duncan Unit #1	23-5N-11E	0		0		0												H
Somerville 2-23	23-5N-11E	0				0	12		12	0								
Somerville #1	23-5N-11E	0	0		NPLA	NPLA												
Fern A #1	24-5N-11E	0				0	30		30	0								\square
Loftis Unit #1 Loftis 1-25	24-5N-11E 25-5N-11E	0				U 0	9		9	0								\vdash
Loftis #1-25	25-5N-11E	0	0		>52'/30'	24'/16'	88		88	0								\vdash
Newton 1-25	25-5N-11E	0			14'/3'	1473	28		28	0								H
Loftis #1 "O"	26-5N-11E	0	0	0	NPLA	0												
Woodford #1	26-5N-11E	0				NPLA												
Lackey #1	27-5N-11E	0				NPLA												\square
Holly B Trimm 1-27	27-5N-11E	0			71/21	71/21	7		7	0								Н
Leon Adams 1-27 Walker Heirs #1	27-5N-11E 27-5N-11E	0				11'/0' NPLA	16		16	0								\vdash
Walker Heirs 27-2	27-5N-11E	0				13/2'	18		18	0								H
Herring D-1	28-5N-11E	Ū				NPLA	13		13	0								\square
Herring #2	28-5N-11E	0	0	0	6'/0'	6'/0'	17		17	0								
Trimm#1	28-5N-11E	0				14'/4'	21		21	0								
Wilbanks #1	29-5N-11E	0				NPLA												Щ
Parks Estate 1-29 Versen 1-29	29-5N-11E 29-5N-11E	0				6'/0' 8'/0'	8		8	0								\vdash
Vernon 1-29 C.C. Carter #1	29-5N-11E 30-5N-11E	0				070	0	\vdash	d	U								H
Derrick 1-30	30-5N-11E	0			8'/0'	8'/0'	0	\vdash	0	0								H
Wilbanks 3-30	30-5N-11E	Ő			8'/3'	8'/3'	10		10	Ő								
Huffman 1-32	32-5N-11E	0	0	0	12'/9'	12791	12		12	0								
Mark 1-32	32-5N-11E	0		0	NPLA	NPLA												
Norvell 32-1	32-5N-11E	0			0.101	0.1101												Ц
Loftis 33-1	33-5N-11E	0			6'/0'	6'/0'												Ш
Loftis 1-33 (Formor Op) Martin 1-33	33-5N-11E 33-5N-11E	0				1070' 1170'	2		2	0								H
Martin 1-33 Lackey B Unit #1	33-5N-11E 34-5N-11E	0				0			10	U								H
Lackey Unit #1	34-5N-11E	0																+
Hall E #1	35-5N-11E	Ū				Ö			132	0								\square
	36-5N-11E	0				1072	24		24	0								

Vell	ocation	Gross Sand U HRSR (GR)	let Sand U HRSR (>8%/>12%)	let Pay U HRSR (>8%/>12%)	let Sand L HRSR (>8%/>12%)	let Pay L HRSR (>8%/>12%)	Gross Sand (LHRSR1)	Gross Sand (UHRSR1)	Gross Sand (LHRSR2)	Gross Sand (HRSR Undiff)	Vet Sand U HRSR Inc Val ⊳8%/>12%)	vet Pay U HRSR Inc Val ≻8%/>12%)	let Sand L HRSR1 (>8%/>12%)	let Pay L HRSR1 (>8%/>12%)	√et Sand HRSR Undiff >8%/>12%)	vet Pay HRSR Undiff1 ≻8%/≻12%)	let Sand L HRSR2 (>8%/>12%)	let Pay L HRSR2 (>8%/>12%)
> Shirley #1 (Viking Pet)	36-5N-11E	0	0	6	10%	10%	6	0	6	0	20	20	6		20	20		6
Marbet #19	1-5N-12E	0			6'/0'	6'/0'	17		17	0								
Sherrill 3-2	2-5N-12E	0		0	8'/2'	8'/2'	10		10	0								
Sherrill #1	2-5N-12E	0																Ш
Semeski 1-3	3-5N-12E	0			26'/3'	2673	18		18	0								\square
Everett #1 Gwinn 1-5	3-5N-12E 5-5N-12E	0		0	14'/3' 10'/2'	14'/3' 10'/2'	23 8		23 8	0								\vdash
Thelma Lee 1-6	6-5N-12E	0		0	1072	1072 N	60		60	0								\vdash
Bethel #1	9-5N-12E	Ö			8'/2'	8'/2'	11		11	Ū								Н
Bethel #3-9	9-5N-12E	0			16'/0'	16%	31		31	0								
Crawford 1-10	10-5N-12E	0		0	8'/6'	8'/6'	19		19	0							-	
Watkins#1	10-5N-12E	0			12'/4'	1274	21		21	0								\square
Willard 1-10	10-5N-12E	0			231/21	23'/2'	22		22	0								\square
Cooper#1 Mapyin #1	10-5N-12E 11-5N-12E	0	NPLA	NPLA	NPLA	NPLA	24 8		24 8	0								\vdash
Marvin #1 Orr B #1	11-5N-12E 11-5N-12E	0		NELA	NPLA N	NPLA N	8 20		8 20	0								+
Marvin #4	11-5N-12E	0			0		12		12	0								+
Marvin #5	11-5N-12E	0			14'/0'	14'/0'	5		5	0								H
Watt #1	12-5N-12E		NPLA	NPLA	NPLA	NPLA												
Owen "B" #1	12-5N-12E	21	0	0	14'/4'	14'/4'	37		37	0								
Marbet #17	12-5N-12E	8	0	0	2'/0'	2'/0'	16		16	0								
Mcauley #2-14	14-5N-12E		NPLA	NPLA	NPLA	NPLA	0		0	0								
Valente #1	14-5N-12E 14-5N-12E	0		NPLA	NPLA 21/17'	NPLA 21/17'	0 18		0 18	0								\vdash
Wageman #1 Wilcox 1-15	14-5N-12E	U	0	U	41/32	41/32'	58		58	0								\vdash
Rheinhart #1	15-5N-12E	-	NPLA	NPLA	NPLA	NPLA	30		30	0								H
Vaughn #1	15-5N-12E		0		6'/0'	6'/0'	8		8	Ō								Н
J.W. Adams #1-16	16-5N-12E				357/21	35721	38		38	0								Н
Goode #1	16-5N-12E				14'/4'	14'/4'	15		15	0								
Donna #1-16	16-5N-12E				32'/32'	32'/32'	51		51	0								
Black 1-16	16-5N-12E				0	0	0		0	0								Ш
Kristy Lee 1-17 Brown 1-17	17-5N-12E 17-5N-12E				17'/8' 23'/0'	17'/8' 23'/0'	31 0		31 0	0								\vdash
John Black G #1	17-5N-12E				2370 N	2370 N	32		32	0								+
Tag Team Brown 1-17	17-5N-12E				0		27		27	0								\vdash
Black #1	20-5N-12E		0	0	4'/0'	4'/0'	7		7	Ū								Н
Tim #1-20	20-5N-12E				14%	14'/6'	25		25	0								П
Gattet 4-21	21-5N-12E		0	0	6'/2'	6'/2'	10		10	0								
Jennifer 2-21	21-5N-12E		0	0	6'/3'	6'/3'	12		12	0								
Gattett 3-21?	21-5N-12E		<u> </u>		4.01/01	1.01/01	16		16	0								\square
Ott 4-22	22-5N-12E 22-5N-12E		<u> </u>		16'/8' 18'/2'	16'/8' 18'/2'	22 34		22 34	0								\vdash
Ott 2-22 Loftis #1	22-5N-12E 23-5N-12E		NPLA	NPLA	1872 NPLA	1872 NPLA	34		34	U								+
Ossie Morris #1	23-5N-12E 24-5N-12E		INFLA 0	INFLA 0	NPLA	NPLA	49	74	0	123								+
O. Morris 3-24	24-5N-12E		Ö	Ö	58'/52'	58'/52'	48	64	Ū	112		207/17	207/17	20717				Η
E.E. Working Unit #1	25-5N-12E		0		NPLA	NPLA	39	57	0	96								
Davis Unit #1	26-5N-12E		0		NPLA	NPLA	50	75	0	125								Г
Garrett "A" Unit #1	27-5N-12E		NPLA	NPLA	NPLA	NPLA	10		10									\square
Black A #3 Black A #5	27-5N-12E		NPLA	NPLA	NPLA 30%10'	NPLA 30'/10'	12 22		12	0								\vdash
A.B. Capp #1	27-5N-12E 28-5N-12E		NPLA	NPLA	NPLA	NPLA	15		15	0								+
Black 3-28	28-5N-12E		<u> </u>		1878	1878	32		32	0								\vdash
Trimm#1	29-5N-12E		i i		8'/0'	8'/0'	26		26	Ū								Н
Hall #1	29-5N-12E				121/21	12//2'	12		12	0								
Rogers 1-30	30-5N-12E				10%	10%)	38		38	0								
Hall #1	31-5N-12E			NPLA	NPLA	NPLA	31		31	0								Ц
Bennet Hall #1 J.W. Hall Unit #1	32-5N-12E 32-5N-12E			NPLA NPLA	NPLA NPLA	NPLA NPLA	29 4		29 4	0								\vdash
J.VV. Hall Unit #1 Reed #1	32-5N-12E 33-5N-12E		INPLA 0	INPLA 0	NPLA 4'/0'	NPLA 4'/0'	4		4	0								\vdash
Trapp #1-33	33-5N-12E		l	- ⁻	470 2%	470 2'/0'	4		4	0								+
Trapp Unit #1	33-5N-12E		NPLA	NPLA	NPLA	NPLA	16		16	0								H
	34-5N-12E		0	0	NPLA	NPLA	30		30	0								
Apache Paschall #1						_		-			_					_	_	
Apache Paschall #1 Wright-Wood Unit #1	34-5N-12E						9		9	0								
Apache Paschall #1 Wright-Wood Unit #1 Davis Paschall #1	34-5N-12E 34-5N-12E						16		16	0								
Apache Paschall #1 Wright-Wood Unit #1	34-5N-12E		0	0	84'/55' 38'/10'	84'/55' 38'/10'		37 38				34'/22' 20'/6'	50'/33' 18'/4'	50'/33' 18'/4'				

Well	Location	Gross Sand U HRSR (GR)	Net Sand U HRSR (>8%/>12%)	Net Pay U HRSR (>8%/>12%)	Net Sand L HRSR (>8%/>12%)	Net Pay L HRSR (>8%/>12%)	Gross Sand (LHRSR1)	Gross Sand (UHRSR1)	Gross Sand (LHRSR2)	Gross Sand (HRSR Undiff)	Net Sand U HRSR Inc Val (>8%/>12%)	Net Pay U HRSR Inc Val (>8%/>12%)	Net Sand L HRSR1 (>8%/>12%)	Net Pay L HRSR1 (>8%/>12%)	Net Sand HRSR Undiff (>8%/>12%)	Net Pay HRSR Undiff1 (>8%/>12%)	Net Sand L HRSR2 (>8%/>12%)	Net Pay L HRSR2 (>8%/>12%)
Watkins#2	2-5N-13E	0		370	1701	1701	6		6	6								
Food #2	3-5N-13E	36			44'/14'	44'/14'	18	56	0	74		34'/14'	10'/0'	10%				
Food Unit #1 Peters #1	3-5N-13E 3-5N-13E	ngr	0	0	NPLA	NPLA	60 34	40	0	100 34								\vdash
Gibson-Lindsey Unit #1	4-5N-13E			0	NPLA	NPLA	87	43	Ō	130								\square
Thornton #1	5-5N-13E		0			52'/14'		78	0	78		52'/14'	NDE	NDE				
Stipe #1-6	6-5N-13E	5	1701	0		11/4	2		2	0								\square
Stipe #1 Reynolds #1	6-5N-13E 7-5N-13E					4'/0' 92'/55'	12 104	48	12 0	0 152		28'/17'	64'/38'	64'/38'				\vdash
Firestone Unit #1	7-5N-13E					48'/14'	104	58	0	58		48'/14'	NDE	NDE				\square
Buse 1	8-5N-13E		0	0	NPLA	NPLA	8	92	0	100								
W.C. Wallace Unit #1	9-5N-13E		0		68'/18'	68'/18'	32	52	0	84		42'/11'	26'/7'	26'/7'				
Wallance #2	9-5N-13E		0		48'/6'	48%	49	39	0	88		26'/4'	22'/2'	22'/2'				\square
Winnie #1 Gibson 1-10	10-5N-13E 10-5N-13E					28'/0' 3'/0'	2	26	0	28 0		26'/0'	2'/0'	2'/0'				\vdash
Grant 1-10	10-5N-13E				0	0,0	9		9	0								\vdash
Watkins #1	11-5N-13E		2'/0'	2'/0'	20%	20%0'	41		41	0								
Core Energy Watkins #1	12-5N-13E		0			12'/0'	32		32	0								
Watson #1	13-5N-13E		NPLA	NPLA	NPLA	NPLA	65		65	0								\square
Glennie #1-13 Field Heirs #1	13-5N-13E 13-5N-12E	ngr				12'/2' NPLA	15 14	51	15 14	0								\square
Sandra #1-13	13-5N-13E	ngi	<u> </u>	-			14	01	14	0								\square
Ramsey #1	14-5N-13E		0	0	7 '/0'	7'/0'	21		21	0								
Marbet #31	14-5N-13E		0	0	2'/0'	2'/0'	21		21	0								
Watkins 114	14-5N-13E		3'/3'	3'/3'	12'/4'	12'/4'	17		17	0								
Mason 1-15 Investors Royalty	15-5N-13E 15-5N-13E		NPLA 2'/0'	NPLA 0	NPLA 14'/3'	NPLA 14'/3'	28 44		28 44	0								\square
Eggleston 1-15	15-5N-13E		270			22/2	21		21	0								\vdash
Marbet #37	15-5N-13E				6'/0'	6'/0'	29		29	0								\square
L.W. Chandler #1-1	16-5N-13E		0			4'/0'	13		13	0								
W.P. Rock #2	17-5N-13E		0			56'/15'	65	45	65	110		30'/8'	26'/7'	26'/7'	NOD			\square
W.P. Rock #1 Robbins Unit #1	17-5N-13E 18-5N-13E				NPLA	NPLA	62	92	0	154					NGR			\vdash
Hazelwood #1	19-5N-13E		<u> </u>	<u> </u>			4	02	4	0								\square
Crawley #1-21	21-5N-13E		0	0	7'/0'	7 '/0'	52		52	0								
Virgil 1-22	22-5N-13E		0			8'/0'	21		21	0								
Marbet #25	23-5N-13E		2'/0'	2'/0'	14'/8'	14%	40		4.0									\square
Marbet #32 Deer Creek #1	23-5N-13E 24-5N-13E		1'/0'	1'/0'	13'/2' 24'/10'	13'/2' 24'/10'	19 38		19 38	0								$ \square$
Parks 1	1-6N-10E		170	170	4'/3'	4'/3'	6		6	0								
Parks 2	1-6N-10E	0			2'/0'	2 '/0'	0		0	0								
Lytal #1	11-6N-10E	0			1701	170	3		3	0								
Degraffenried #1	12-6N-10E 13-6N-10E	0			6'/0'	6'/0'	3		3	0								\vdash
Cecil Gumm Warren 1	4-6N-11E	0	0	0	670' 570'	670° 570'	8		8	0								\vdash
Eckles 1-5	5-6N-11E	0	0			8'/7'	9		9	0								
Walter 1-5	5-6N-11E	0			6'/2'	6'/2'	10		10	0								
Boyd #1	7-6N-11E	0					10		19	0								\square
Herrod #1 Boyd 2	7-6N-11E 7-6N-11E	0			4'/0'	4'/0'	19 3		19 3	0								\vdash
	9-6N-11E	0			17/12	17/12	18		18	0								Η
Black #2						6'/0'	4		4	0								
Black #2 Black #1	9-6N-11E	0							30	0								
Black #2 Black #1 Black 4	9-6N-11E	0	0	0	23714	23'/14'	30											—
Black #2 Black #1 Black 4 Black #3	9-6N-11E 10-6N-11E	0	0	0	23'/14' 18'/16'	23'/14' 18'/16'	18		18	0								\square
Black #2 Black #1 Black 4 Black #3 Gayler 1-10	9-6N-11E 10-6N-11E 10-6N-11E	0 0 0	0	0	23'/14' 18'/16' 28'/22'	23'/14' 18'/16' 28'/22'	18 31		18 31	0 0								
Black #2 Black #1 Black 4 Black #3	9-6N-11E 10-6N-11E	0			23'/14' 18'/16'	23'/14' 18'/16'	18		18	0								
Black #2 Black #1 Black 4 Black #3 Gayler 1-10 Geneva 1-10 McDonald 1-10 Hill 1-11	9-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 11-6N-11E	0 0 0 0			23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7'	23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7'	18 31 20 16 22		18 31 20 16 22	0 0 0 0 0								
Black #2 Black #1 Black 4 Black #3 Gayler 1-10 Geneva 1-10 McDonald 1-10 Hill 1-11 Gill 1	9-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 11-6N-11E 12-6N-11E				23/14' 18/16' 28/22' 17/12' 10/6' 11/7' NPLA	23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7' NPLA	18 31 20 16 22 3		18 31 20 16 22 3									
Black #2 Black #1 Black 4 Black 4 Black #3 Gayler 1-10 Geneva 1-10 McDonald 1-10 Hill 1-11 Gill 1 Blevins 1-12	9-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 11-6N-11E 12-6N-11E 12-6N-11E	0 0 0 0 0			23/14' 18/16' 28/22' 17/12' 10/6' 11'/7' NPLA 0	23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7'	18 31 20 16 22 3 3		18 31 20 16 22 3 3									
Black #2 Black #1 Black 4 Black 4 Black #3 Gayler 1-10 Geneva 1-10 McDonald 1-10 Hill 1-11 Gill 1 Blevins 1-12 Ballinger 1-13	9-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 11-6N-11E 12-6N-11E				23/14' 18/16' 28/22' 17/12' 10/6' 11/7' NPLA 0	23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7' NPLA 0	18 31 20 16 22 3 3 13		18 31 20 16 22 3 3 3 13									
Black #2 Black #1 Black 4 Black 4 Black #3 Gayler 1-10 Geneva 1-10 McDonald 1-10 Hill 1-11 Gill 1 Blevins 1-12	9-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 11-6N-11E 12-6N-11E 12-6N-11E 13-6N-11E 13-6N-11E 13-6N-11E	0 0 0 0 0 0			23/14' 18/16' 28/22' 17/12' 10/6' 11/7' NPLA 0 17//12'	23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7' NPLA	18 31 20 16 22 3 3		18 31 20 16 22 3 3									
Black #2 Black #1 Black 4 Black #3 Gayler 1-10 Geneva 1-10 McDonald 1-10 Hill 1-11 Gill 1 Blailinger 1-13 Ballinger 1-13 Ballinger 4-13 Blevins 1-13-C	9-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 11-6N-11E 12-6N-11E 13-6N-11E 13-6N-11E 13-6N-11E 13-6N-11E				23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7' NPLA 0 17'/12' 0 2'/0'	23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7' NPLA 0 17'/12' 0 2'/0'	18 31 20 16 22 3 3 13 26 14 5		18 31 20 16 22 3 3 13 26 14 5									
Black #2 Black #1 Black 4 Black 4 Black #3 Gayler 1-10 Geneva 1-10 McDonald 1-10 Mill 1-11 Blevins 1-12 Ballinger 1-13 Ballinger 4-13	9-6N-11E 10-6N-11E 10-6N-11E 10-6N-11E 11-6N-11E 12-6N-11E 12-6N-11E 13-6N-11E 13-6N-11E 13-6N-11E				23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7' NPLA 0 17'/12' 0 2'/0' 3'/1'	23'/14' 18'/16' 28'/22' 17'/12' 10'/6' 11'/7' NPLA 0 17'/12' 0	18 31 20 16 22 3 3 13 26 14		18 31 20 16 22 3 3 13 26 14									

Vell	ocation	Gross Sand U HRSR (GR)	let Sand U HRSR (>8%/>12%)	let Pay U HRSR (>8%/>12%)	let Sand L HRSR (>8%/>12%)	let Pay L HRSR (>8%/>12%)	Gross Sand (LHRSR1)	Gross Sand (UHRSR1)	Gross Sand (LHRSR2)	Gross Sand (HRSR Undiff)	Vet Sand U HRSR Inc Val ⊳8%/>12%)	Vet Pay U HRSR Inc Val ⊳8%/>12%)	let Sand L HRSR1 (>8%/>12%)	det Pay L HRSR1 (>8%/>12%)	√et Sand HRSR Undiff >8%/>12%)	√et Pay HRSR Undiff1 >8%/>12%)	let Sand L HRSR2 (>8%/>12%)	Vet Pay L HRSR2 (>8%/>12%)
Hill 2-15	15-6N-11E	0	0	- 0	7'/0'	7'/0'	11	0	11	0	64	69		6	29	64		6
Smoker 1-17	17-6N-11E	0			5'/2'	5'/2'	4		4	0								
Aldridge 1-18	18-6N-11E	0	0		0	-	3		3	0								
Nail 1-18	18-6N-11E	0	0	0		471	14		14	0								\square
Rahhal A-1 Smoke 1-18	18-6N-11E 18-6N-11E	0	0	0	6'/0' 3'/0'	6'/0' 3'/0'	16 9		16 9	0								+
Ellen 1-19	19-6N-11E	0	0		570	5'/0'	3		3	0								+
Blaylock 1-19	19-6N-11E	Ū	Ŭ		6'/4'	6'/4'	5		5	Ū								Н
Little 1-19	19-6N-11E	0	0	0	5'/2'	5'/2'	6		6	0								
Robertson 1-19	19-6N-11E	0	0	0	NPLA	NPLA	1		1	0								
Roland 1-20 Rioving 'R' 1-24	20-6N-11E 24-6N-11E	0	0	0	7'/4' 3'/1'	7'/4' 3'/1'	11 0	\vdash	11 0	0								+
Blevins 'B' 1-24 Smith 1-28	24-6N-11E 28-6N-11E	U 0	0		371' 8'/0'	371' 870'	0	\vdash	0	U O								+
Vernon Smith 1-28	28-6N-11E	0	0	0	2'/0'	2'/0'	2		2	0								+
McKee 1-29	29-6N-11E	0	0	0	2,0	0	2		2	Ū								Н
Derrick 1-29	29-6N-11E	0	0		0	0	0		0	0								
Lindley 1-30	30-6N-11E	0	0			8'/4'	8	\square	8	0								Ш
Lindley 2-30 McKee 3-32	30-6N-11E 32-6N-11E	0	0	0	0 6'/1'	U 6'/1'	0 4		0 4	0								\vdash
Richardson 1	33-6N-11E	0	0	0	071	071	4		4	U								+
Blevins 1-7	7-6N-12E	Ŭ	0	0	4'/0'	4'/0'	0		0	0								\square
Hilseweck 1-8	8-6N-12E	0	0	0	7'/2'	7'/2'	6		6	0								
Hilseweck 2-8	8-6N-12E	0	0	0	6'/2'	8'/2'	3		3	0								
Hilseweck 1-9	9-6N-12E 11-6N-12E	0	0	0	772'	7'/2' NPLA	4		4	0								\vdash
Garrett 1-11 Loftis 1-13	13-6N-12E	U 0	0		NPLA 3'/0'	NPLA 3'/0'	0		0	0								\vdash
Hilseweck 1-15	15-6N-12E	Ū	Ő		5'/0'	5'/0'	5		5	Ō								\square
Hilsewck 1-16	16-6N-12E	0	0	0	6'/0'	6'/0'	4		4	0								
Hilseweck 2-17	17-6N-12E	0	0		24'/16'	24'/16'	35		35	0								
Hilseweck 3-17 Blevins 1-18	17-6N-12E 18-6N-12E	0	0		6'/0' 12'/6'	6'/0' 12'/6'	7		7	0								\vdash
Blevins 2-18	18-6N-12E	0	0		34'/30'	34'/30'	42		42	0								\vdash
Blevins 9-18	18-6N-12E	Ū	0		21'/4'	2174	44		44	Ō								\square
Blevins 1-19	19-6N-12E	0	0		NDE					0								
Hilseweck 1-20	20-6N-12E	0	0	0	24'/6'	24'/6'	41		41	0								\square
Hilseweck 3-20 Hilseweck 5-21	20-6N-12E 21-6N-12E	0	0	0	7'/4' 2'/0'	2'/0'	21		21	0								\vdash
Hilseweck Ranch 1-21	21-6N-12E	0	0	0	24/17	2,0	34		34	0								\square
William G. Jones #1	22-6N-12E	0	0		NPLA	NPLA	95		95	0								Н
Lubell 1-23	23-6N-12E	0	0	0	28'/12'	0	56		56	0								
Smalley 1	26-6N-12E	0	0		NPLA	NPLA	0	\vdash	0	0								\square
Hilseweck 1-29 Durant 1-1	29-6N-12E 1-6N-13E	0	0		NPLA	NPLA	74	\vdash	74	0								H
Ashley 1-1	1-6N-13E	0	0		62718	0	102		102	0								H
McKay 1-1	1-6N-13E		0	0	17'/4'	17'/4'	35		35	0								
Brown Estate 1-2	2-6N-13E		0	0	57'/28'	0	86		86	0								Г
Carter 1-2 Jaynelle #1	2-6N-13E 3-6N-13E	0	0			35'/34' 0	145 105	\vdash	145 105	0								+
Holt J #2	3-6N-13E		0		92'/82'	0 51/46'	148		148	0								+
Holt J #1	3-6N-13E	0	Ő	Ŭ	122//114	56'/56'	174		174	Ő								
Holt 1-4	4-6N-13E		0	0		28'24'	121		121	0								
Jessie 1-5	5-6N-13E							Ц	9.4									Ш
Gillin #1 Capps Day 1-8	6-6N-13E 8-6N-13E		0	0	73'/44'	0	34 140	\vdash	34 140	0								+
Arpoika #1-9	9-6N-13E				. 3/44	<u> </u>	140	\square	140									⊢
Banks Estate #1	10-6N-13E		0		16%	1670	19		19	0								
Minter #1-10	10-6N-13E		0	0	22'/3'	22'/3'	37		37	0								
Menefee #1	11-6N-13E				41001	41/01		\square										Ш
Minter #2-11 Warren #1-11	11-6N-13E 11-6N-13E		0	0		4'/0' 24'/8'	4 34	\vdash	4	0								+
J.N. Miller #1 (12)	12-6N-13E		0			2478 NPLA	34 44	\vdash	34 44	0								H
J.N. Miller #2-12	12-6N-13E		0		7'/2'	7'/2'	2		2	0								Н
McAlester #1	12-6N-13E		0	0	1370'	1370'	19		19	0								
Bryant #1	13-6N-13E		0	0	0	0	5		5	0								\square
Miller "AG" #1 Sittel #1-13	13-6N-13E 13-6N-13E	0	0	0	18'/0'	18%	32 37	\vdash	32 37	0								+
		0	0		NPLA	NPLA	20		20	0								-

Vell	Location	Gross Sand U HRSR (GR)	Net Sand U HRSR (>8%/>12%)	Net Pay U HRSR (>8%/>12%)	Net Sand L HRSR (>8%/>12%)	Net Pay L HRSR (>8%/>12%)	Gross Sand (LHRSR1)	Gross Sand (UHRSR1)	Gross Sand (LHRSR2)	Gross Sand (HRSR Undiff)	Net Sand U HRSR Inc Val (>8%/>12%)	Net Pay U HRSR Inc Val (>8%/>12%)	Net Sand L HRSR1 (>8%/>12%)	Net Pay L HRSR1 (>8%/>12%)	Net Sand HRSR Undiff (>8%/>12%)	Net Pay HRSR Undiff1 (>8%/>12%)	Net Sand L HRSR2 (>8%/>12%)	Net Pay L HRSR2 (>8%/>12%)
Gaddy 1-15	15-6N-13E								_									
Phoebe #2 Phoebe #1	23-6N-13E 23-6N-13E		0	0	0 5'/0'	0 5'/0'	2		2	0								
Crawford 1-24	23-6N-13E	0	0	0	24/5	2475	12	52	0	64		0						
Powell 1-24	24-6N-13E	8	0			1173	17		0	0								
Leo #1	25-6N-13E		0		46'/0'	46'/0'	66	36	0	102		22'/0'	24'/0'	24'/0'				
Frank Blevins Unit #1 Gray #1	25-6N-13E 26-6N-13E		0	0	48'/18' 55'/4'	48'/18' 55'/4'	72	26 26	0	98 147		14'/6' 0	34'/12' 72'/23'	34'/12' 72'/23'				+
Archer Unit #1	20-0N-13E		0	0	NPLA	NPLA	34	73	0	147		U	12123	12123				
Gleese 1-27	27-6N-13E		0	0	5'/0'	5'/0'	12		12	0								
Steed 27-1	27-6N-13E		0		6'/0'	6'/0'	0	8	0	8		6'/0'	0	0				
Gleese A #1-28 Erangia 1, 28 (112)	28-6N-13E		0			10%	8	\vdash	8	0								\vdash
Francis 1-29 (11?) West #2	29-6N-13E 29-6N-13E				19%	1976	11		11	0								+
Roberts #1	31-6N-13E		0	0	2'/0'	2'/0'	2		2	0								
White #1-31	31-6N-13E		0	0	0	0	6		6	0								
Gleese Unit #1	33-6N-13E		0	0		NPLA												\square
Buddy #1-X Hunt Garret Unit #1	34-6N-13E 34-6N-13E		0	0	NPLA NPLA	NPLA NPLA	92	62	0	154								\vdash
Dominic Unit #1	35-6N-13E		0	0		NPLA	92 68	92	0	160								\vdash
LeFlore #1	36-6N-13E		0	0		NPLA		73	Ō	73								
LeFlore 1-36	36-6N-13E		0	0				_	_									
Engleman 1-36 Howell #1	36-6N-13E 36-6N-13E	26					8	8 24	0	16 24								+
Kleine Unit #1	1-7N-11E	20	0	0	NPLA	NPLA	12	24	12	0								+
Bob #1	1-7N-11E	Ū	0			1 '/0'	6		6	0								
Jeremy D #1	1-7N-11E	0	0			9'/8'	8		8	0								
West Unit #1 Eckles Unit 1	1-7N-11E 2-7N-11E	0	0	0	NPLA NPLA	NPLA NPLA	12 0		12 0	0								+
Huff 1-2	2-7N-11E	0	0	0	NI LA O		0		0	0								+
George #1	2-7N-11E	0			1 70'	1'/0'	0		0	0								
D. Harris#1	3-7N-11E	0	0	0	NPLA	NPLA	1		1	0								
Cowart #1 Nancy Harjo 1	3-7N-11E 4-7N-11E	0	0	0	NPLA	NPLA	6 6		6 6	0								-
Sarah #1-4	4-7N-11E	0	0			NPLA	2		2	0								+
Thompson 1	4-7N-11E	Ū	Ū.			NPLA	Ũ		0	Ũ								
Lee Epps #1	4-7N-11E	0	0	0	NPLA	NPLA	6		6	0								
Turner 1	5-7N-11E	0	0	0		NPLA	0		0	0								\square
Turner Ranch 1 Oliver 1	5-7N-11E 6-7N-11E	0	0	0	7'/4' NPLA	7'/4' NPLA	7		7	0								+
George Turner 2	6-7N-11E	0			571'	571'	8		8	0								\square
B. Bear 1	6-7N-11E	0	0	0	5'/3'	5'/3'	9		9	0								
Turner 5	6-7N-11E	0			8'/4'	8'/4'	6		6	0								\square
Lankford 3 Thomas 1	7-7N-11E 7-7N-11E	0			0 3'/0'	0 3'/0'	2		2	0								\vdash
Lankford 2	7-7N-11E	0			371	371	2		2	0								\square
Lee 1	7-7N-11E	0	0	0	NPLA	NPLA	1		1	0								
George 7-1 Vereeleeki #1	7-7N-11E	0	0		NPLA	NPLA	0	\square	0	0								\square
Yaroslaski #1 Turner	8-7N-11E 8-7N-11E	0	0		2'/0' N	2'/0' N	2	\vdash	2	0								\vdash
Welch 1-8	8-7N-11E	0	0	0	NPLA	NPLA	0		0	0								
Lamar Mt. #1	9-7N-11E	0	0	0	NPLA	NPLA	0		0	0								
Baca #1-10	10-7N-11E	0			8'/8'		14		14	0								
Freeman 1 Miller #1	11-7N-11E 11-7N-11E	0	0			NPLA 0	5 17	\vdash	5 17	0								\vdash
Upchurch #1	11-7N-11E	0	0			0			14	0								H
Beck #1	12-7N-11E	0			973	9'/3'	9		9	0								
Follansbee #2	12-7N-11E	0	0			17/17	17		17	0								
M.B. White #1 White #13-1	13-7N-11E 13-7N-11E	0	0		3'/2' 12'/9'	3'/2' 12'/9'	5 18		5 18	0								\vdash
Vvnite #13-1 Neal #1-14	13-7N-11E 14-7N-11E	U 0		0	1279° 6'/0'	1279 670	18		9	0								H
Neal #2	14-7N-11E	0	0		8'/4'	8'/4'	6		6	0								
Lamar #15	15-7N-11E	0	0	0		0	8		8	0								
Anderson #1	16-7N-11E	0	0	0		0	14		14	0								\square
Anderson 1-16	16-7N-11E 16-7N-11E	0	0	0	4'/2' 7'/0'	4'/2' 7'/0'	8 13	+	8 13	0			<u> </u>					+
Adamas #1																		

Weil	ocation	Gross Sand U HRSR (GR)	vet Sand U HRSR (>8%/>12%)	let Pay U HRSR (>8%/>12%)	let Sand L HRSR (>8%/>12%)	let Pay L HRSR (>8%/>12%)	Gross Sand (LHRSR1)	Gross Sand (UHRSR1)	Gross Sand (LHRSR2)	Gross Sand (HRSR Undiff)	vet Sand U HRSR Inc Val ≻8%/≻12%)	Vet Pay U HRSR Inc Val ⊳8%/>12%)	let Sand L HRSR1 (>8%/>12%)	let Pay L HRSR1 (>8%/>12%)	√et Sand HRSR Undiff >8%/>12%)	√et Pay HRSR Undiff1 >8%/>12%)	vet Sand L HRSR2 (>8%/>12%)	Vet Pay L HRSR2 (>8%/>12%)
Anderson "Q" #1	17-7N-11E	0		6	8'/0'	8'/0'	2		2	0	4 4	20	6	6	27	6 9		6
Jerry #1	17-7N-11E		NPLA	NPLA	NPLA	NPLA	3		3	0								
Anderson No. 1	17-7N-11E	0		0	8'/6'	8'/6'	14		14	0								
Anderson 2-17	17-7N-11E	0			7'/0' NPLA	7'/0'	11		11	0								\vdash
Bolt #1 Bolt #2	18-7N-11E 18-7N-11E	0	NPLA	NPLA	NFLA 2'/0'	NPLA 2'/0'	2		2	0								\vdash
Coats 1-18	18-7N-11E		NPLA	NPLA	NPLA	270	15		15	0								-
Shields #1	18-7N-11E	Ō		0	170	1'/0'	8		8	Ũ								-
Lee #2	18-7N-11E	0	NPLA	NPLA	NPLA	NPLA	2		2	0								П
Paula #1	19-7N-11E	0		0	6'/1'	6'/1'	6		6	0								
Backus #1	19-7N-11E		NPLA	NPLA	NPLA	NPLA	5	\square	5	0								\square
Anita 1-20	20-7N-11E	0			5'/0'	5'/0' NDLA	17	\vdash	17	0								\square
Eckles A-1 Schilling #1-20	20-7N-11E 20-7N-11E	0	NPLA	NPLA	NPLA 8'/3'	NPLA 8'/3'	5 10	\vdash	5 10	0								\vdash
Farris#1	20-7N-11E 20-7N-11E		INPLA	NPLA	873 NPLA	873 NPLA	8		8	0								H
Factor #1	22-7N-11E		NPLA	NPLA	NPLA	NPLA	Ō		0	0								\square
Weston 1	23-7N-11E	0		0	2'/0'	2'/0'	5		5	0								Н
Rosa #1	24-7N-11E	0			0	0	6		6	0								
Chapman #1	24-7N-11E	0				0	3		3	0								
Kamperman 1-24	24-7N-11E		NPLA	NPLA	NPLA	NPLA	6		6	0								
Bob #1	25-7N-11E	0				8'/0' 2'/0'	0		0	0								\square
Chapman 1-26 Eckles 1-26	26-7N-11E 26-7N-11E	0			2'/0' 3'/1'	270 3711	6 7		6 7	0								\vdash
Kamperman 1-27	27-7N-11E	0			572	5'/2'	6		6	0								H
Sultan Oil Lott #1-28	28-7N-11E	Ō				2'/0'	-		-	Ū								
Eckles #1	29-7N-11E	0			2'/0'	2'/0'	0		0	0								
Kamperman 1-29	29-7N-11E	0			0	0	4		4	0								
Douglass #1	29-7N-11E			NPLA	NPLA	NPLA	0		0	0								
Jackson #1	30-7N-11E	0				9'/6' 21/01	15		15	0								\square
Kamperman 1-30 Thompson 1-30	30-7N-11E 30-7N-11E	0			2'/0' 0	2'/0'	0		0 3	0								\vdash
Eckles 3-31	31-7N-11E	0		0	0/0	0/0	3		3	0								\vdash
Eckles #1	31-7N-11E	Ō		0		6'/3'	10		10	Ō								
Kamperman 1	31-7N-11E	0	0	0	7'/4'	7'/4'	2		2	0								
Anita #1	31-7N-11E	0			0'/0'	0'/0'	4		4	0								
Showalter #1	31-7N-11E		NPLA	NPLA	NPLA	NPLA			-	0								
B.E. #1	31-7N-11E	0			7 75	7'/5'	8		8	0								\square
B.E.#2 Kamperman 1-32	31-7N-11E 32-7N-11E	0			<mark>0'/0'</mark> 10'/2'	<mark>0'/0'</mark> 10'/2'	2		2	0								\vdash
Riley #1	32-7N-11E	0		0	NPLA	NPLA	12		12	0								\vdash
Rogers#1	32-7N-11E	0			7'/0'	7'/0'	7		7	0								\square
Charles 1-33	33-7N-11E	0	0	0	NPLA	NPLA	2		2	0								
Benham 1	35-7N-11E	0				8'/4'	2		2	0								
Lott 1	2-7N-12E	0				4'/0'	7		7	0								\square
Patsy 1-3	3-7N-12E	0				0 81/11	3	\vdash	3	0								\vdash
Wagoner #1 Carpenter #1	4-7N-12E 5-7N-12E	0				6'/1' 3'/0'	1	\vdash	1	0								+
Shields #1	6-7N-12E	0				0	21		21	0								H
Sarkeys #2	7-7N-12E	0			8'/4'	0				0								
Sanders #2	7-7N-12E	0	0	0	13751	13751	16		16	0								
Sarkey Unit #1	7-7N-12E	0				NPLA	14		14	0								
Sanders #1	7-7N-12E	0				NPLA	14		14	0								\square
Burleson #1 Cotton-Eckles #1	8-7N-12E 8-7N-12E	0			9'/3' NPLA	9'/3' NPLA	12	\vdash	12	0								\vdash
Cotton-Eckles #1 McAfee 1-12	12-7N-12E	0			NPLA 10%	NPLA 1070	10		10	0								\vdash
McAfee 1-13	13-7N-12E	0			5'/0'	5'/0'	<u> </u>	\square		Ő								Н
W.C. Ratledge #1	13-7N-12E	0			NPLA	NPLA	2		2	0								
McAfee #1	13-7N-12E	0				NPLA	4		4	0								
State #1	13-7N-12E	0				0	2		2	0								П
Owen #1-14 Sorkovo #1	14-7N-12E	0				9'/4' NDLA	8	\vdash	8	0								\vdash
Sarkeys #1 Mad Max 1-14	14-7N-12E 14-7N-12E	0			NPLA 6'/3'	NPLA 6'/3'	5 10	\vdash	5 10	0								H
Thunderdome 1-14	14-7N-12E	0			673 570'	573 570'	8		8	0								H
Sarkey #1	14-7N-12E	0				NPLA	۲Ť			0								\square
Theel #1	14-7N-12E	Ő			NPLA	NPLA	1		1	Ū								
Tom 2-14	14-7N-12E	Ō	0	0		6'/0'	6		6	0								
10/11/2 111	15-7N-12E		0		8'/4'	2'/0'	7		7	0								

Vell	ocation	Gross Sand U HRSR (GR)	let Sand U HRSR (>8%/>12%)	let Pay U HRSR (>8%/>12%)	vet Sand L HRSR (>8%/>12%)	let Pay L HRSR (>8%/>12%)	Gross Sand (LHRSR1)	Gross Sand (UHRSR1)	Gross Sand (LHRSR2)	Gross Sand (HRSR Undiff)	Vet Sand U HRSR Inc Val ⊳8%/>12%)	Vet Pay U HRSR Inc Val ⊳8%/>12%)	let Sand L HRSR1 (>8%/>12%)	let Pay L HRSR1 (>8%/>12%)	Vet Sand HRSR Undiff ≻8%/≻12%)	vet Pay HRSR Undiff1 (>8%/>12%)	vet Sand L HRSR2 (>8%/>12%)	Vet Pay L HRSR2 (>8%/>12%)
Kleinke 4	15-7N-12E	0	0	0		NPLA	26		26	0	2 9	29	6	6	~~~	69		6
Lott 1-15	15-7N-12E	0	0			17/3'	9		9	0								
Kleinke #2	15-7N-12E	0	0			NPLA	31		31	0								
Myers 1	15-7N-12E 16-7N-12E	0	0			0	19		19	0								\square
Hoehne 1-16 Addington 1	16-7N-12E	0	0		NPLA	NPLA	9		9	0								\vdash
Gilcrease 3	16-7N-12E	Ū	0	0		NPLA	28		28	Ō								-
Gilcrease 1	16-7N-12E	0								0								
Perry 1	17-7N-12E	0	0			10%	9		9	0								
Sarkeys B-1	18-7N-12E	0	0	0	NPLA	NPLA	0	\vdash	0	0								\square
Sarkeys C-1 Shirley Jean	18-7N-12E 19-7N-12E	0	0			NPLA 6'/3'	10	\vdash	10 2	0								⊢-1
McCoy 1	20-7N-12E	0	0			2'/0'	8		- 2	0								H
Kern 1-21	21-7N-12E	0	0	0	14'/2'	14'/2'	14		14	0								
Falcon Club 1-21	21-7N-12E	0	0	0	4'/0'	4'/0'	8		8	0								
Falcon Club 2-21	21-7N-12E	0	0	0		9'/7'				0								П
Falcon Club 3-21	21-7N-12E	0	0			1375	15	\vdash	15	0								\vdash
Jonathan 1-22 Michael 2-22	22-7N-12E 22-7N-12E	0	0	0		8'/4' 8'/6'	15 13	\vdash	15 13	0								⊢-1
Melissa 2-22	22-7N-12E	0	0	0		8'/8'	16		16	0								\square
Broadstreet 1	22-7N-12E	0	0	0	NPLA	NPLA	23		23	0								
C.G. Myers et al #1	22-7N-12E	0	0			NPLA	0		0	0								
Jackie Holt 2-23	23-7N-12E 23-7N-12E	0	0	0	20'/8'	2078	20		20	0								
Upchurch 1 Mamie Sousea 1	23-7N-12E 24-7N-12E	0	0		NPLA NPLA	NPLA NPLA	11		11	0								\vdash
Soused 3	24-7N-12E	0	0			NPLA			_	0								Н
Holt 3-24	24-7N-12E	0	0			12%	8		8	0								
Anderson 1-24	24-7N-12E	0	0			9'/2'	7		7	0								
Holt 1	24-7N-12E	0	0	0		NPLA	8		8	0								\square
Rabke 1-24 Ross 1-24	24-7N-12E 24-7N-12E	0	0			15'/4' 11'/2'	14 7		14 7	0								\square
Bruno 3-25	25-7N-12E	0	0			2'/0'	ŕ		ſ	0								Н
Whitney Heirs 1-26	26-7N-12E	0	0			0	20		20	0								
Million 1-27	27-7N-12E	0	0			6'/2'	14		14	0								
Stipe 2-27	27-7N-12E	0	0			1274	20		20	0								\square
Stipe 1-27 Hilseweck A-1-29	27-7N-12E 29-7N-12E	0	0	0	13'/6' NPLA	13'/6' NPLA	12 2		12 2	0								\vdash
Stipe 1-29	29-7N-12E	0	0	0		1 '/0'	5		5	0								
Be Ann Puckett 1-32	32-7N-12E	0	0			11/2'	12		12	0								
Myers B-1	32-7N-12E	0	0			NPLA	2		2	0								
Puckett 2-32 Stipe 1-33	32-7N-12E	0	0	0	5'/0'	5'/0' 5'/0'	0		0	0								\square
Doss Royalty 1-33	33-7N-12E 33-7N-12E	0	0	0	5'/0' 10'/4'	570 1074	10		10 12	0								\vdash
Gladstein 1-34	34-7N-12E	0	0			4'/0'	8		8	0								\square
Stacy 1	35-7N-12E	0	0	0	0	0				0								
Richison 1	36-7N-12E	0	0	0		NPLA	41		41	0								
Casey 1-36 Brow 2-2	36-7N-12E 2-7N-13E	0	0			0 1170'	13 7	\vdash	13 7	0								\vdash
Brow 2-2 Vaughan 2-2 B	2-7N-13E 2-7N-13E	0	0			NPLA	2		2	0								⊢-1
Howard 1-3	3-7N-13E	0	0			4'/0'	8		8	Ő								
Lee #1	6-7N-13E	0	0	0	NPLA	0	7		7	0								
Proctor #1	7-7N-13E	0	0		NPLA	NPLA	5		5	0								
Watkins 1-7 Reed 1-7	7-7N-13E 7-7N-13E	0	0			8'/0' 10'/2'	11 11	\vdash	11 11	0								\vdash
Wade 2-10	10-7N-13E	0	0		6'/0'	6'/0'	9	\vdash	9	0								H
Wadley 1-11	11-7N-13E	Ū	Ő			NPLA	10		10	Ő								
Herman #1-12	12-7N-13E	0	0			0	43		43	0								
Wadley 1-12	12-7N-13E	0	0			NPLA			4.0	0								Г
Ward 2-13 Duncan #3	13-7N-13E 13-7N-13E	0	0	0		4'/0' 7'/2'	12 3	\vdash	12 3	0								\vdash
Ward #1-13	13-7N-13E	0	0			9/2	3		3	0								\vdash
Duncan #1	13-7N-13E	0					25		25	0								\square
Graham #3	14-7N-13E	0	0	0	0	0	2		2	0								
Graham #1	14-7N-13E	0	0	0		21/0	4		4	0								Г
Graham #2	14-7N-13E 15-7N-13E	0	0	0		5'/2' 5'/1'	6		6	0								\vdash
Graham C #2																		

Tandell #1-18	pccation 18-7N-13E	Gross Sand U HRSR (GR)		Net Pay U HRSR (>8%/>12%)	Net Sand L HRSR (>8%/>12%)	Net Pay L HRSR (>8%/>12%)	Gross Sand (LHRSR1)	Gross Sand (UHRSR1)	Gross Sand (LHRSR2)	 Gross Sand (HRSR Undiff) 	Net Sand U HRSR Inc Val (>8%/>12%)	Net Pay U HRSR Inc Val (>8%/>12%)	Net Sand L HRSR1 (>8%/>12%)	Net Pay LHRSR1 (>8%/>12%)	Net Sand HRSR Undiff (>8%/>12%)	Net Pay HRSR Undiff1 (>8%/>12%)	Net Sand L HRSR2 (>8%/>12%)	Net Pay LHRSR2 (>8%/>12%)
Crandell #1	18-7N-13E	0	0		8'/3'	772 873	10		17	0								\vdash
Mooneyham 1-18	18-7N-13E	0	0		873 1273	873 1273	15		15	0								\vdash
Rockey #2-18	18-7N-13E	0	0		14/7	14/7	21		21	0								\vdash
Bush 1-19	19-7N-13E	0	0		7'/2'	7'/2'	10	-	10	0	<u> </u>							\vdash
Stergios #1-20	20-7N-13E	0	0		10/2	112		-	21	0	<u> </u>							\vdash
Graham #1	20-7N-13E	0	0		NPLA	U NPLA	0		0	0								⊢
Pedersen #2	23-7N-13E	0	0		4'/0'	4'/0'	8		8	0								\vdash
Pederson #1	23-7N-13E	0			NPLA	NPLA	11		11	0								\vdash
Hitchcock 1-24	24-7N-13E	0	0		0	0				0								\vdash
Abney 1-24	24-7N-13E	0	0		2'/0'	2'/0'	1		1	0								\vdash
Abney 3-24	24-7N-13E	0	0		NPLA	NPLA	<u> </u>			0								\vdash
Hill 1-24	24-7N-13E	0	Ö		6'/0'	6'/0'	6		6	Ö								\square
Whitehead 1-24	24-7N-13E	Ū	Ö		6'/0'	6'/0'	14		14	Ũ								\square
Carver 1-25	25-7N-13E	Ū	Ö		7'/2'	7'/2'	12		12	Ũ								Н
King #1	25-7N-13E	Ō	Ö		12/2	12/2	11		11	Ō								\square
King 2-25	25-7N-13E	0	0		0	0	2		2	0								
King 3-25	25-7N-13E	0	0		6'/0'	6'/0'	6		6	0								
King 4-25	25-7N-13E	0	0	0	15'/4'	15'/4'	11		11	0								
Frederick #1	26-7N-13E	0	0		6'/0'	6'/0'	3		3	0								
Collier 1-26	26-7N-13E	0	0	0	5'/2'	5'/2'	6		6	0								
Holt 1-28	28-7N-13E	0	0	0	7'/0'	7'/0'	12		12	0								
Holt 2-28	28-7N-13E	0	0		6'/0'	6'/0'	4		4	0								
Holt 1-29	29-7N-13E	0	0	0	370'	3'/0'	11		11	0								
Walters 1-A	29-7N-13E	0	0	0	NPLA	NPLA	8		8	0								
Elbert 1-30	30-7N-13E	0	0		0	0	40		40	0								
Helen 1	33-7N-13E	0	0		1273	12'/3'	5		5	0								
Lucille 2-34	34-7N-13E	0	0		94'/54'	0				0								
Lucille #1	34-7N-13E	0	0		93'/82'	46'/42'	107		107	0								
State 2-35	35-7N-13E	0	0		94'/84'	48'/44'	147		147	0								
State 1-35	35-7N-13E	0	0		92%56	36718	186		186	0								
Madden 1-36	36-7N-13E	0	0		98'/86'	22'/12'	117		117	0								
Brite 1-36	36-7N-13E	0	0							0								
JWP 1-36	36-7N-13E	0	0		78'/42'	0	90		90	0								\square
Painter #2	36-7N-13E	0	0		5'/0'	5'/0'				0								\square
Sheena 1-36	36-7N-13E	0	0		10%2	1072	16		16	0								\square
Sunshine 1-36	36-7N-13E	0	0		6'/0'	6'/0'				0								\square
White AF #1	36-7N-13E	0	0		54'/22'	0			100	0								\square
Willie Mae 1-36	36-7N-13E	0	0	0	114'/66'	0	127	1	127	0					1			i

<u>Appendix E</u>: Formation Tops

Well Losotton NB Top of UHCoal Top of LNA-40 Ummania Sitetono Deck 31 Sale Sale <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>Top of Upp</th> <th>er Marker</th> <th></th> <th></th>									Top of Upp	er Marker		
Withome #1 LSP-ITE 107 2200 -2317 3456 -2354 2384 -2275 2316 -2305 Cites #1 -5.9-11E 676 3022 -2155 2333 -2355 2000 -2117 2200 -2015 Cites #1 -5.9-11E 107 -2118 3011 -2204 4011 -2217 2009 -2118 Winck #1 -5.9-11E 107 -3311 -2235 3335 -3468 2027 3116 -2306 Brung #1-7 9.9-5-11E 900 -3236 -2326 3416 -2327 3116 -2317 Even #1 0.9-5-11E 9236 -2205 3417 -3410 3237 -3237 3116 -2317 Remmy 1-10 10.9-5-11E 9236 -2205 3417 -3410 3237 -3237 3110 -220 3101 -2307 3117 -2418 1102 -2414 1026 -2307 3117 -2418 3102 -2308	Well	Location	KB	Top of UHCoal	Topo	f LHCoal	Top of A	Atoka			Base of Sha	ile Marker
Obversiti-3 3-89-H1TE 1873 3022 -2153 3223 -2264 2006 -2117 -2103 3021 -217 Coro #1-6 4-59-H1TE 707 -3051 -2264 NDE -3071 -2273 3021 -217 SaP 16-7 7-8-H1TE 164 -2164 NDE -3164 -2224 -2244 Newty 1-0 5-9-H1TE 1692 -3263 -2244 -2244 -2243 -3164 -2205 -2246 -2244 -2245 -2246 -2244 -2245 -2268 -2246 -2245 -2268 -2246 -2243 -3164 -2235 -2268 -2246 -2247 -3166 -2267 -3267 -2242 -2241 -3166 -2277 -2247 -3168 -227 -2284 -2441 -227 -2281 -2404 -247 -3161 -227 -2284 -247 -3161 -2477 -3161 -2476 -2476 -2476 -2476 -2476 -2476 -2	Wildhorse #1	1-5N-11E	909									-2206
Lyons #1-0 -0-N-11E 780 3316 -2204 NNE 3014 -2228 3022 -221 Wrick #1 7-N-11E 740 3311 -2253 3444 -2454 3211 -2221 3144 -2165 Ibrings #1-3 9-SN-11E 690 3248 -2233 3444 -2454 3217 -2221 3146 -2165 Ibrings #1-3 9-SN-11E 690 3223 -2328 3427 -2497 3117 -2248 3177 -2480 3144 -2167 3118 -2144 NICE 3105 -2317 -2323 -3307 -2323 -2300 2301 -3307 -2323 -2400 3101 -2344 NICE 3100 -2318 -2317 -2323 -2307 -2315 -2416 NICE 3105 -2422 2816 -2318 -2328 -2328 -2327 -2316 -2318 -2422 2816 -2318 -2428 2816 -2318 -2428 2816												-2051
SBP 15/7 7.Ph-11E 448 3164 -2200 NDE 3116 -2208 3020 -2218 2400 -216 Binngs #1-0 9-N-11E 960 1248 -2259 3250 -2228 3141 -2228 3141 -2208 3144 -2228 3141 -2208 3141 -2208 3141 -2208 3141 -2217 -2328 3141 -2208 3141 -2217 -3218 -2444 NDE -3316 -2248 3141 -2217 -2328 3141 -2417 3141 -2217 -2328 3141 -2317 -2317 -2328 3141 -2307 -2338 -2338 -2338 -2338 -2338 -2338 -2338 -2338 -2338 -2338 -2338 -2338 -2428 2308 -2249 -2338 -2349 -2238 3138 -2438 2308 -2249 -2338 -2249 -2338 -2249 -2338 -2349 -2249 -2358 -3330 <t< td=""><td>Cities #1</td><td>4-5N-11E</td><td>944</td><td></td><td>3112</td><td>-2168</td><td>NDE</td><td></td><td>3077</td><td>-2133</td><td>3021</td><td>-2077</td></t<>	Cities #1	4-5N-11E	944		3112	-2168	NDE		3077	-2133	3021	-2077
Wrick #1 7-NN-11E 700 5324 -2252 3205 -2428 2920 -2218 2446 -2211 -2214 -2214 -2214 -2214 -2214 -2213 -2214 -2213 -2214 <th< td=""><td>Lyons #1-6</td><td>6-5N-11E</td><td>787</td><td></td><td>3051</td><td>-2264</td><td>NDE</td><td></td><td>3014</td><td>-2227</td><td>2968</td><td>-2181</td></th<>	Lyons #1-6	6-5N-11E	787		3051	-2264	NDE		3014	-2227	2968	-2181
Bings #1-9 0-N-N1E 200 3248 -2258 3444 -2464 3211 -2223 3145 -2283 3148 -2233 3148 -2233 3148 -2233 3148 -2233 3148 -2233 3148 -2233 3148 -2233 3148 -2247 3117 -2148 Mans #1 12 4V-11E 575 3151 -2441 NUE -3168 -2334 3154 -2240 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3164 -2200 3165 -2223 3165 -2214 3174 -2318 -2218 3183 -2424 3240 -2265 3165 -2218 3166 -2116 3166	S&P 15-7	7-5N-11E	848		3154	-2306	NDE		3116	-2268	3062	-2214
Newby 1-0 9-N-11E 9220 3401 -2009 3245 -2228 3184 -2281 3186 -2381 Kenny 1-10 10-SN-11E 323 3233 -2286 3473 -3478 3227 -3227 -3186 -3181 Wallace Fargo #1 12-N-11E 735 3057 -2237 -3280 3011 -2381 3011 <t< td=""><td>Wirick #1</td><td>7-5N-11E</td><td>779</td><td></td><td>3031</td><td>-2252</td><td>3205</td><td>-2426</td><td>2992</td><td>-2213</td><td>2940</td><td>-2161</td></t<>	Wirick #1	7-5N-11E	779		3031	-2252	3205	-2426	2992	-2213	2940	-2161
Evans #1 00-RN-11E 0228 -228 3478 -2478 3227 -2227 3166 -388 Jones #1 10 10-RN-11E 935 3161 -2448 NICE 735 3167 -228 Walace Fargo #1 12-N11E 735 3151 -2411 NICE 3100 -2208 2010 -2308 3011 -2308 3011 -2308 3011 -2308 3011 -2308 3011 -2308 -2308 3011 -2308	Bivings #1-9	9-5N-11E	990		3248	-2258	3444	-2454	3211		3145	-2155
Fremy 1:0 0:5%-TE 237 2328 2428 3427 -2480 3181 -2471 3171 -2188 Jacosa H 12:5%-TE 716 3100 -2412 NUCE 3105 -2237 3024 -2301 Staut T-13 13:5%-TE 716 3115 -2415 NUCE 3100 -2204 2015 -2204 2016 -2204 2016 -2204 2016 -2204 2016 -2204 2016 -2204 2016 -2204 2016 -2202 2331 2-2351 3030 -2201 2311 2-2321 2310 2-2312 2310 -2201 2313 2-2312 2310 2-2312 2310 2-2312 2310 2-2312 2310 2-2312 2310 2-2312 2310 2-2312 2310 2-230 2300 2-231 2-2310 3040 2-231 2-2412 2-2412 2-2412 2-2412 2-2412 2-2412 2-2412 2-2412 2-2412 2-2412	Newby 1-9	9-5N-11E	952		3275	-2323	3461	-2509	3245	-2293	3184	-2232
Junie #1 12-SN-11E 785 3057 -222 Walloo Engo #1 12-SN-11E 710 3125 2412 NDE 3100 -2280 3011 -220 Anderson #1 14-SN-11E 710 3112 2411 NDE 3100 -2280 3021 -2200 3011 -2200 3011 -2200 3011 -2200 3011 -2200 3011 -2200 3012 -2205 3020 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2205 -2007 -211 -2203 2201 -211 -2203 2201 -211 -2203 2201 2201 2201 2201 2201 2201 2201 2201 2201 2201 2201 2201 2201 2201 2201 2201 2001 2001 2001 2001 2001 2001 2001 2001 2001 2001	Evans #1	10-5N-11E			3265	-3265	3478	-3478	3227		3166	-3166
Wallace Fargo #1 12-SN-HE 710 2412 NDE 3100 -2307 3024 -2307 Stuat 1-13 13-SN-HE 711 3112 -2415 NDE 3100 -2307 3024 -2307 Mul 1-41 14-SN-HE 771 3166 -2367 NDE 3010 -2308 2309 -226 Ellis #1 16-SN-HE 771 3166 -2367 NDE 3032 -2252 2979 -2155 Ellis #1 16-SN-HE 786 3349 -2400 NDE -2432 2994 -2439 -2268 -2439 2926 -2439 2926 -2439 2926 2939 -2269 3337 -2239 3267 -2237 3029 -2267 3347 -2237 3367 -2237 3029 -2267 3347 -2237 3377 -2237 3372 -2237 3372 -2237 3162 -2267 3367 -2216 3337 -2238 3446 -2417 3317<	4							-2490	3184			-2180
Shuart 1-13 12-58-11E 7710 3112 -2415 NDE 3100 -2200 3011 -2200 Anderson #1 14-58-11E 771 3116 -2367 NDE 3132 -2280 2296 -2222 Null 1-14 14-58-11E 827 3000 -2263 NDE 3133 -2424 3240 -2421 2313 -2424 3240 -2421 2313 -2424 3263 -2681 -2421 2313 -2424 3263 -2681 -2683 3680 -2472 3263 -2686 -2683 3680 -2472 3263 -2681 -2683 3267 -2281 3261 -2373 3260 -2273 3260 -2273 3260 -2273 3261 -2373 3261 -2373 3261 -2373 3261 -2373 3261 -2273 3261 -2274 3261 -2373 3261 -2373 3261 -2373 3261 -2373 3261 -2373 3261 -23												-2322
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Pearson#2 105-SN-11E 1050 2365 2368 2468 3125 -2230 3000 -2267 Attr#1 10-SN-11E 1972 334 -2265 3383 -2286 3333 -2230 3267 -2267 Black J4 0-SN-11E 997 3344 -2422 NDE 3317 -2234 3226 -2276 Mobil #1 0-SN-11E 997 3244 -2441 3445 -2285 3317 -2234 3260 -2276 3162 -2276 3162 -2276 3162 -2276 3162 -2276 3046 -2441 2483 317 -2328 3087 -2150 3006 -2167 3274 -2448 3106 -2276 3044 -2161 2977 -2074 -			764		2002	-	2106	-				
Belley #1 17.5%.11E 972 3387 -2287 3550 -2550 3330 -2330 2237 P Black J #1 20.5%.11E 983 3355 -2277 NDE 3331 -2234 3260 -2267 Mobil #1 20.5%.11E 983 3326 -2315 NDE 3227 2271 3102 -2221 Hickory Hills #1 21.5%.11E 833 3274 -2441 3445 -2612 833 3172 -2231 Hickory Hills #1 21.5%.11E 833 3020 -2348 NDE 3182 -2280 3004 -2161 2072 -2081 Adams N #1 22.5%.11E 839 3138 -2233 3347 -2448 3108 -2208 2983 -2171 3074 -2277 3074 -2276 3074 -2277 3074 -2277 3074 -2277 3074 -2277 3074 -2277 3074 -2277 3074 -2277 3076 -2288				├── 								
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C.C. Carter #1 30-5N-11E 950 3184 -2234 3317 -2367 950 3080 -2130 Derrick 1-30 30-5N-11E 927 3191 -2264 NDE 3147 -2200 3084 -2130 Wilbanks 3-30 30-5N-11E 927 3191 -2264 NDE 3147 -2220 3085 -2160 Huffman 1-32 32-5N-11E 893 3502 -2609 NDE 3454 -2561 3373 -2480 Mark 1-32 32-5N-11E 805 3835 -2970 NDE 865 3682 -2811 Norvell 32-1 32-5N-11E 801 3624 -2823 3818 -3017 801 801 801 Loftis 1-33 (Formor Op) 33-5N-11E 892 3363 -2471 3544 -2652 3318 -2426 3246 -2355 Martin 1-33 33-5N-11E 892 3363 -2471 3544 -2652 3318 -2426 3246 -2355								0507				
Derrick 1-30 30-5N-11E 927 3191 -2264 NDE 3147 -2220 3084 -2157 WIlbanks 3-30 30-5N-11E 922 3198 -2276 NDE 3152 -2230 3085 -2163 Huffman 1-32 32-5N-11E 893 3502 -2609 NDE 3454 -2561 3373 -2480 Mark 1-32 32-5N-11E 805 3835 -2970 NDE 865 3682 -2811 Norvell 32-1 32-5N-11E 801 3624 -2823 3818 -3017 801 801 801 Loftis 1-33 (Formor Op) 33-5N-11E 835 3210 -2375 NDE 3160 -2325 3090 -2255 Loftis 1-33 33-5N-11E 831 3294 -2413 NDE 3256 -2375 3165 -2284 Martin 1-33 33-5N-11E 880 3392 -2494 NDE 3160 -2305 3026 -2177 Lackey Unit #1									3289			
Wilbanks 3-30 30-5N-11E 922 3198 -2276 NDE 3152 -2230 3085 -2163 Huffman 1-32 32-5N-11E 893 3502 -2609 NDE 3454 -2561 3373 -2483 Mark 1-32 32-5N-11E 805 3835 -2970 NDE 865 3682 -2813 Norvell 32-1 32-5N-11E 801 3624 -2823 3818 -3017 801 801 801 Loftis 1-33 (Formor Op) 33-5N-11E 892 3363 -2471 3544 -2652 3318 -2426 3246 -2325 Loftis 33-1 33-5N-11E 892 3363 -2471 3544 -2652 3318 -2426 3246 -2385 Lackey B Unit #1 34-5N-11E 892 3363 -2471 NDE 3256 -2375 3165 -2284 Lackey Unit #1 34-5N-11E 860 3241 -2381 NDE 860 3095 -22735								-2301	2147			
Huffman 1-32 32-5N-11E 893 3502 -2609 NDE 3454 -2561 3373 -2480 Mark 1-32 32-5N-11E 865 3835 -2970 NDE 865 3682 -281 Norvell 32-1 32-5N-11E 865 3210 -2823 3818 -3017 801 801 Loftis 1-33 (Formor Op) 33-5N-11E 835 3210 -2375 NDE 3160 -2325 3090 -2253 Loftis 3-31 33-5N-11E 892 3363 -2471 3544 -2652 3318 -2426 3246 -2355 Martin 1-33 33-5N-11E 892 3363 -2471 3544 -2652 3318 -2426 3246 -2355 Martin 1-33 35-5N-11E 881 3294 -2413 NDE 3160 -2305 3026 -2177 Lackey Unit #1 34-5N-11E 860 3241 -2381 NDE 860 3095 -2234 Hall E #1												
Mark 1-32 32-5N-11E 865 3835 -2970 NDE 865 3682 -2813 Norvell 32-1 32-5N-11E 801 3624 -2823 3818 -3017 801								<u> </u>				
Norvell 32-1 32-5N-11E 801 3624 -2823 3818 -3017 801 801 Loftis 1-33 (Formor Op) 33-5N-11E 835 3210 -2375 NDE 3160 -2325 3090 -2255 Loftis 1-33 (Formor Op) 33-5N-11E 835 3210 -2375 NDE 3160 -2325 3090 -2255 Martin 1-33 33-5N-11E 881 3294 -2413 NDE 3256 -2375 3165 -2284 Lackey B Unit #1 34-5N-11E 860 3241 -2330 NDE 3160 -2305 3026 -2177 Lackey Unit #1 34-5N-11E 860 3241 -2331 NDE 860 3095 -2284 Hall E #1 35-5N-11E 886 3392 -2494 NDE 898 3274 -2375 Shirley #1 (Joe D.Davis) 36-5N-11E 806 3717 -2911 NDE 3670 -2844 3554 -2748 Shirley #1 (Viking Pet)				├── 					3434			
Loftis 1-33 (Formor Op) 33-5N-11E 835 3210 -2375 NDE 3160 -2325 3090 -2253 Loftis 33-1 33-5N-11E 892 3363 -2471 3544 -2652 3318 -2426 3246 -2355 Martin 1-33 33-5N-11E 892 3263 -2471 3544 -2652 3318 -2426 3246 -2355 Lackey B Unit #1 34-5N-11E 855 3185 -2330 NDE 3160 -2305 3026 -217 Lackey Unit #1 34-5N-11E 860 3241 -2381 NDE 3160 -2305 3026 -217 Lackey Unit #1 34-5N-11E 860 3241 -2381 NDE 860 3095 -2234 Hall E #1 35-5N-11E 898 3392 -2494 NDE 898 3274 -2374 Shirley #1 (Joe D.Davis) 36-5N-11E 806 3717 -2911 NDE 3670 -2864 3554 -2748 </td <td></td> <td></td> <td></td> <td> </td> <td></td> <td></td> <td></td> <td>_3017</td> <td></td> <td></td> <td>2002</td> <td></td>								_3017			2002	
Loftis 33-1 33-5N-11E 892 3363 -2471 3544 -2652 3318 -2426 3246 -2354 Martin 1-33 33-5N-11E 881 3294 -2413 NDE 3356 -2375 3165 -2237 Lackey Unit #1 34-5N-11E 881 3294 -2413 NDE 3360 -2375 3165 -2237 Lackey Unit #1 34-5N-11E 860 3241 -2330 NDE 3160 -2305 3026 -217 Lackey Unit #1 34-5N-11E 806 3241 -2381 NDE 860 3095 -2238 Hall E #1 35-5N-11E 898 3392 -2494 NDE 898 3274 -2376 Shirley #1 (vie Davis) 36-5N-11E 806 3717 -2911 NDE 38670 -2684 3554 -2749 Shirley #1 (Viking Pet) 36-5N-11E 799 3370 -2571 3548 -2749 3337 -2589 3229 -2433 <td></td> <td></td> <td></td> <td> </td> <td></td> <td></td> <td></td> <td>-3017</td> <td>3160</td> <td></td> <td>3000</td> <td></td>								-3017	3160		3000	
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Lackey B Unit #1 34-5N-11E 855 3185 -2330 NDE 3160 -2305 3026 -217 Lackey Unit #1 34-5N-11E 860 3241 -2381 NDE 860 3095 -2237 Hall E #1 35-5N-11E 880 3392 -2494 NDE 898 3274 -2375 Shirley #1 (Joe D. Davis) 36-5N-11E 806 3717 -2911 NDE 3670 -2864 3554 -2748 Shirley #1 (Viking Pet) 36-5N-11E 790 3417 -2927 NDE 3379 -2589 3278 -2484 Marbet #19 1-5N-12E 794 3370 -2571 3548 -2749 3337 -2538 3229 -2484 Sherill #1 2-5N-12E 754 3224 -2470 NDE 754 754 Sherill 3-2 2-5N-12E 758 3253 -2464 NDE 3208 -2419 3117 -2328								-2002				
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Shirley #1 (Viking Pet) 38-5N-11E 790 3417 -2627 NDE 3379 -2589 3278 -2488 Marbet #19 1-5N-12E 799 3370 -2571 3548 -2749 3337 -2538 3229 -2438 Sherill #1 2-5N-12E 754 3224 -2470 NDE 754 754 Sherill 3-2 2-5N-12E 789 3253 -2464 NDE 3208 -2419 3117 -3328									3670			
Marbet #19 1-5N-12E 799 3370 -2571 3548 -2749 3337 -2538 3229 -2430 Shemill #1 2-5N-12E 754 3224 -2470 NDE 754 754 Shemill 3-2 2-5N-12E 789 3253 -2464 NDE 3208 -2419 3117 -2326												
Shemill #1 2-5N-12E 754 3224 -2470 NDE 754 754 Shemill 3-2 2-5N-12E 789 3253 -2464 NDE 3208 -2419 3117 -2328								-27/10				
Sherrill 3-2 2-5N-12E 789 3253 -2464 NDE 3208 -2419 3117 -2326								-2143	5551		3223	
								<u> </u>	3208		3117	
	Everett #1	3-5N-12E	845		3310	-2465	3465	-2620	3264	-2419	3168	-2323

Well	Location	KB	TopofL	JHCoal	Торо	f LHCoal	Top of /	Atoka	Top of Upp (Unnamed		Base of Sha	ale Marker
Semeski 1-3	3-5N-12E	862			3243	-2381	3395	-2533	3202	-2340	3109	-2247
Gwinn 1-5	5-5N-12E	727			3208	-2481	3350	-2623	3172	-2445	3104	-2377
Thelma Lee 1-6	6-5N-12E	866			3243	-2377	NDE		3214	-2348	3137	-2271
Bethel #1	9-5N-12E	779	3086	-2307	3211	-2432	NDE		3170	-2391	3027	-2248
Bethel #3-9	9-5N-12E	819	<u> </u>		3304	-2485	NDE		3260	-2441	3166	-2347
Cooper #1	10-5N-12E	862	3200	-2338	3338	-2476	NDE	0000		862	0.10.1	862
Crawford 1-10	10-5N-12E	864	3186	-2322	3331	-2467	3484	-2620	3283	-2419	3181	-2317
Watkins #1	10-5N-12E	848	<u> </u>		3300	-2452	NDE		3253	-2405	3154	-2306
Willard 1-10	10-5N-12E	824			3269	-2445	NDE	0750	3222	-2398	3123	-2299
Marvin #1	11-5N-12E	786	<u> </u>		3370	-2584	3539	-2753	3354	-2568	3220	-2434
Marvin #4 Marvin #5	11-5N-12E 11-5N-12E	815 819	<u> </u>		3332	-2517	NDE NDE			815 819	3197	815
Orr B #1	11-5N-12E	845	<u> </u>		3345 3308	-2526 -2463	3465	-2620	3261	-2416	3166	-2378 -2321
Marbet #17	12-5N-12E	778	3258	-2480	3386	-2403	NDE	-2020	3359	-2581	3252	-2321
Owen "B" #1	12-5N-12E	786	3266	-2480	3403	-2617	NDE		3372	-2586	3262	-2476
Watt #1	12-5N-12E	700	5200	-2400	3403	727	3696	-2969	3434	-2707	3335	-2608
Elliot #1	14-5N-12E	819			3457	-2638	NDE	-2000	3394	-2575	3288	-2469
Mcauley #2-14	14-5N-12E	832			3451	-2619	NDE		3400	-2568	3273	-2441
Valente #1	14-5N-12E	843	<u> </u>		0401	843	NDE		3410	-2567	3300	-2457
Wageman #1	14-5N-12E	752	<u> </u>		3387	-2635	NDE		3358	-2606	3245	-2493
Rheinhart #1	15-5N-12E	791	<u> </u>		3293	-2502	NDE		3247	-2456	3135	-2344
Vaughn #1	15-5N-12E	750	3200	-2450	3344	-2594	NDE		3300	-2550	3191	-2441
Wilcox 1-15	15-5N-12E	728			3248	-2520	NDE		3204	-2476	3096	-2368
Black 1-16	16-5N-12E	785			3318	-2533	3463	-2678	3262	-2477	3163	-2378
Donna #1-16	16-5N-12E	776	3120	-2344	3266	-24.90	NDE		3217	-2441	3112	-2336
Goode #1	16-5N-12E				3218	-3218	3379	-3379	3169	-3169	3066	-3066
J.W. Adams #1-16	16-5N-12E	708			3209	-2501	NDE		3160	-2452	3058	-2350
Brown 1-17	17-5N-12E	750			3208	-2458	NDE		3220	-2470	3125	-2375
John Black G #1	17-5N-12E	792			3322	-2530	NDE		3278	-2486	3177	-2385
Kristy Lee 1-17	17-5N-12E	753	2947	-2194	3213	-2460	NDE		3177	-2424	3080	-2327
Tag Team Brown 1-17	17-5N-12E	736	3131	-2395	3257	-2521	NDE			736		736
Black #1	20-5N-12E	822			3534	-2712	3660	-2838	3486	-2664	3380	-2558
Tim #1-20	20-5N-12E	789			3398	-2609	NDE		3353	-2564	3248	-2459
Gattet 4-21	21-5N-12E	805			3433	-2628	NDE		3393	-2588	3273	-2468
Gattett 3-21?	21-5N-12E	847			3334	-2487	NDE			847		847
Jennifer 2-21	21-5N-12E	754			3314	-2560	NDE		3275	-2521	3158	-2404
Ott 2-22	22-5N-12E	787			3304	-2517	NDE			787	3164	-2377
Ott 4-22	22-5N-12E	820			3318	-2498	NDE		3278	-2458	3162	-2342
Loftis #1	23-5N-12E	729			3288	-2559	nde		3265	-2536		729
0. Morris 3-24	24-5N-12E	689	<u> </u>		3228	-2539	3496	-2807		689	3118	-2429
Ossie Morris #1	24-5N-12E	690			3187	-2497	NDE		3161	-2471		690
E.E. Working Unit #1	25-5N-12E	749	<u> </u>		3285	-2536	NDE		3255	-2506	3168	-2419
Davis Unit #1	26-5N-12E	717	L		3287	-2570	NDE	0747	3262	-2545		717
Black A #3	27-5N-12E	681	<u> </u>		3279	-2598	3428	-2747	3230	-2549	0.04.0	681
Black A #5	27-5N-12E	807	<u> </u>		3368	-2561	NDE		3333	-2526	3216	-2409
Garrett "A" Unit #1	27-5N-12E	678	<u> </u>		3270	-2592	NDE		3228	-2550	2204	678
A.B. Capp#1	28-5N-12E	822	 		3466	-2644 -2594	NDE		3424	-2602 -2553	3304	-2482
Black 3-28	28-5N-12E	777	<u> </u>		3371		NDE		3330		3216	-2439
Hall #1 Trimm #1	29-5N-12E 29-5N-12E	762			3493 3611	-2731 -3611	NDE 3889	-3889	3448 3571	-2686 -3571	3327 3453	-2565 -3453
Rogers 1-30	29-5N-12E 30-5N-12E	828	 		3616	-3611	3889 NDE	-2009	3575	-3571	3453	-3453
Hall #1	30-5N-12E	807	<u> </u>		3710	-2100	3865	-3058	3668	-2747	5400	807
Bennet Hall #1	31-5N-12E 32-5N-12E	789	<u> </u>		3662	-2903	3858	-3056	3625	-2836		789
J.W. Hall Unit #1	32-5N-12E	745	 		3552	-2807	NDE	-5009	3508	-2050		745
Reed#1	33-5N-12E	806	<u> </u>		3576	-2770	NDE		3530	-2703	3422	-2616
Trapp #1-33	33-5N-12E	803	<u> </u>		3484	-2681	NDE		3442	-2639	5422	803
Trapp #1-33	33-5N-12E	761	<u> </u>		3486	-2725	NDE		3447	-2686	3322	-2561
Apache Paschall #1	34-5N-12E	717	<u> </u>		3450	-2723	3703	-2986	3419	-2702	0022	717
Davis Paschall #1	34-5N-12E	855	<u> </u>		3573	-27.18	NDE	2000	0410	855		855
Wright-Wood Unit #1	34-5N-12E	700	<u> </u>		3458	-2755	3622	-2919	3408	-2705	3288	-2585
S. McDonald Unit #1	35-5N-12E		<u> </u>		3375	-2694	NDE		3348	-2667	3250	-2569
Depot #1	36-5N-12E		<u> </u>		3485	-2748	3740	-3003	3454	-2717	3368	-2631
Thompson #1	1-5N-13E		3464	-3464	3497	-3497	3658	-3658	3428	-3428	3324	-3324
Watkins #2	2-5N-13E	725	3446	-2721	3479	-2754	3619	-2894	3402	-2677	3298	-2573
Food #2	3-5N-13E	678	3204	-2526	3350	-2672	NDE		3321	-2643	3201	-2523
Food Unit #1	3-5N-13E	655	3203	-2548	3332	-2677	NDE		3305	-2650	3190	-2535
Peters #1	3-5N-13E	658			3200	-2542	NDE					
Gibson-Lindsey Unit #1	4-5N-13E	646	3230	-2584	3342	-2696	NDE		3309	-2663	3213	-2567
Thornton #1	5-5N-13E	761			3510	-2749	NDE					
				-						1		1 0011
Thornton #1	5-5N-13E	761			3490	-2729	NDE		3474	-2713	3375	-2614

Well	Location	КВ	Topofl	JHCoal	Topo	f LHCoal	Top of,	Atoka	Top of Uppe (Unnamed		Base of Sha	ale Marker
Stipe #1-6	6-5N-13E	788	3422	-2634	3457	-2669	3505	-2717		,		<u> </u>
Stipe #1-6	6-5N-13E	815	3413	-2598	3492	-2677	NDE		3390	-2575	3276	-2461
Stipe 1-6	6-5N-13E	788				788				788		
Firestone Unit #1	7-5N-13E	777			3434	-2657	NDE		3456	-2679	3368	-2591
Reynolds #1	7-5N-13E	674			3317	-2643	NDE		3297	-2623		
Buse 1	8-5N-13E	836			3495	-2659	NDE		3470	-2634	3375	-2539
W.C. Wallace Unit #1	9-5N-13E	655				655	NDE		3268	-2613	3175	-2520
Wallance #2	9-5N-13E					0		0	3316	-3316	3188	-3188
Gibson 1-10	10-5N-13E	745	3440	-2695	3470	-2725	NDE		3410	-2665	3290	-2545
Grant 1-10	10-5N-13E	805	3546	-2741	3584	-2779	NDE		3502	-2697	3386	-2581
Winnie #1	10-5N-13E	651				651			3297	-2646	3190	-2539
Watkins #1	11-5N-13E	774	3543	-2769	3573	-2799	3811	-3037	3502	-2728	3402	-2628
Core Energy Watkins #1	12-5N-13E	698	2765	-2067	2813	-2115	3050	-2352	2705	-2007	2565	-1867
Field Heirs #1	13-5N-13E	796		1707	0.4.4.0	796	NDE	1070	3380	-2584	3295	-2499
Glennie #1-13	13-5N-13E	665	2392	-1727	2448	-1783	2635	-1970	F/O? 2311'		F/0?	4045
Marbet #31	14-5N-13E	681	2727	-2046	2780	-2099	NDE		F/O? 2690'	707	2596	-1915
Sandra #1-13	13-5N-13E	727	0.500	4057	0575	727			0400	727		727
Watson #1	13-5N-13E	666	2523	-1857	2575	-1909	2006	0400	2466 2946	-1800	0770	666
Ramsey #1	14-5N-13E	716	3005	-2289	3051	-2335	3206	-2490		-2230	2778	-2062
Watkins 114 Eggleston 1-15	14-5N-13E 15-5N-13E	757 904	3398 3563	-2641 -2659	3440 3601	-2683 -2697	NDE NDE	<u> </u>	3350 3516	-2593 -2612	3230	-2473 904
Investors Royalty	15-5N-13E	904 828	3563	-2609	3485	-2697 -2657	3744	-2916	3405	-2012	3300	-2472
Marbet #37	15-5N-13E	808	3388	-2580	3485	-2657	3744 NDE	-2910	3405	-2577	3233	-2472
Marbel #37 Mason 1-15	15-5N-13E	785	3378	-2580	3435	-2627	3655	-2870	3329	-2534	3233	-2425
L.W. Chandler #1-1	16-5N-13E	748	3406	-2658	3450	-2045	NDE	-2070	3377	-2629	3289	-2445
W.P. Rock #1	17-5N-13E	744	3400	-2000	5450	744	NUL	744	3314	-2570	5205	744
W.P. Rock #2	17-5N-13E	659			3276	-2617		659	3250	-2591		659
Robbins Unit #1	18-5N-13E	667			0270	667		667	0200	667	3130	-2463
Hazelwood #1	19-5N-13E	795			3351	-2556	NDE	007		795	0100	795
Crawley #1-21	21-5N-13E	732	3324	-2592	3364	-2632	NDE		3275	-2543	3160	-2428
Virail 1-22	22-5N-13E	751	3330	-2579	3374	-2623	3588	-2837	3288	-2537	3167	-2416
Marbet #25	23-5N-13E	715	2909	-2194	2961	-2246	NDE	2001	2848	-2133	2711	-1996
Marbet #32	23-5N-13E	680	2812	-2132	2862	-2182	NDE		2748	-2068		
Deer Creek #1	24-5N-13E	681	2681	-2000	2742	-2061	2932	-2251	2642	-1961		
Parks 1	1-6N-10E				2861	-2861	2970	-2970	2840	-2840	2816	-2816
Parks 2	1-6N-10E				2908	-2908	3009	-3009	2886	-2886	2860	-2860
Lytal #1	11-6N-10E				2849	-2849	2947	-2947	2835	-2835	2800	-2800
Degraffenried #1	12-6N-10E				2758	-2758	2872	-2872	2735	-2735	2708	-2708
Cecil Gumm	13-6N-10E				2998	-2998	3123	-3123	2966	-2966	2936	-2936
Warren 1	4-6N-11E				3000	-3000	NDE		2972	-2972	2935	-2935
Eckles 1-5	5-6N-11E				2856	-2856	2987	-2987	2835	-2835	2804	-2804
Walter 1-5	5-6N-11E				3179	-3179	NDE		3162	-3162	3120	-3120
Boyd #1	7-6N-11E				2751	-2751	2870	-2870	2740	-2740	2700	-2700
Boyd 2	7-6N-11E	747			2727	-1980	NDE		2707	-1960	2674	-1927
Herrod #1	7-6N-11E				2764	-2764	2881	-2881	2740	-2740		0
Black #2	9-6N-11E				2981	-2981	NDE		2949	-2949	2905	-2905
Black #1	9-6N-11E				2947	-2947	NDE		2917	-2917	2872	-2872
Black 4	9-6N-11E				2894	-2894	NDE		2860	-2860	2812	-2812
Warren 1	9-6N-11E				3030	-3030	NDE			0		0
Black #3	10-6N-11E				2912	-2912	NDE		2880	-2880	2832	-2832
Gayler 1-10	10-6N-11E			I	2991	-2991	NDE		2955	-2955	2906	-2906
Geneva 1-10	10-6N-11E			I	2907	-2907	NDE	#VALUE!	2877	-2877	2838	-2838
McDonald 1-10	10-6N-11E				2955	-2955	NDE	L	2917	-2917	2869	-2869
Hill 1-11	11-6N-11E	-			3191	-3191	NDE	2000	3154	-3154	3106	-3106
Blevins 1-12	12-6N-11E				3191	-3191	3320	-3320	3152	-3152	3096	-3096
Gill 1	12-6N-11E			 	3111	-3111	3274	-3274	3073	-3073	3022	-3022
Ballinger 1-13	13-6N-11E			I	3395	-3395	NDE		3353	-3353	3240	-3240
Ballinger 3-13 Ballinger 4-13	13-6N-11E 13-6N-11E				3322	-3322	NDE		3280	-3280	3283	-3283
DI					3366	-3366	NDE		3326	-3326	3274	-3274
Blevins 1-13-C Bloving A 1	13-6N-11E				3206	-3200	NDE	I	3164	-3104	3107	-3107
Blevins A-1 Hill 4-14	13-6N-11E 14-6N-11E				3318 3145	-3318 -3145	NDE NDE		3273 3107	-3273 -3107	3215 3057	-3215 -3057
	14-6N-11E	6E0					NDE		3107 3012			
Parker 1-14		UCO			3052	-2402				-2362	2965	-2315
Hill 2-15 Smoker 1, 17	15-6N-11E				3150 2984	-3150	NDE 3142	-3142	3113	-3113	3062	-3062
Smoker 1-17	17-6N-11E					-2984	3142 NDE	-3142	2950	-2950	2000	0
Aldridge 1-18	18-6N-11E				2961	-2961	NDE	<u> </u>	2931	-2931	2892	-2892
Nail 1-18 Debbel A.1	18-6N-11E				2910	-2910	NDE NDE	l	2877	-2877	2847	-2847
Rahhal A-1	18-6N-11E				2886	-2886			2854	-2854	2817	-2817
Smoke 1-18	18-6N-11E 19-6N-11E				2910 3080	-2910 -3080	NDE NDE	<u> </u>	2876 3052	-2876 -3052	2837 3011	-2837 -3011
Blavlock 1-19										-5037		

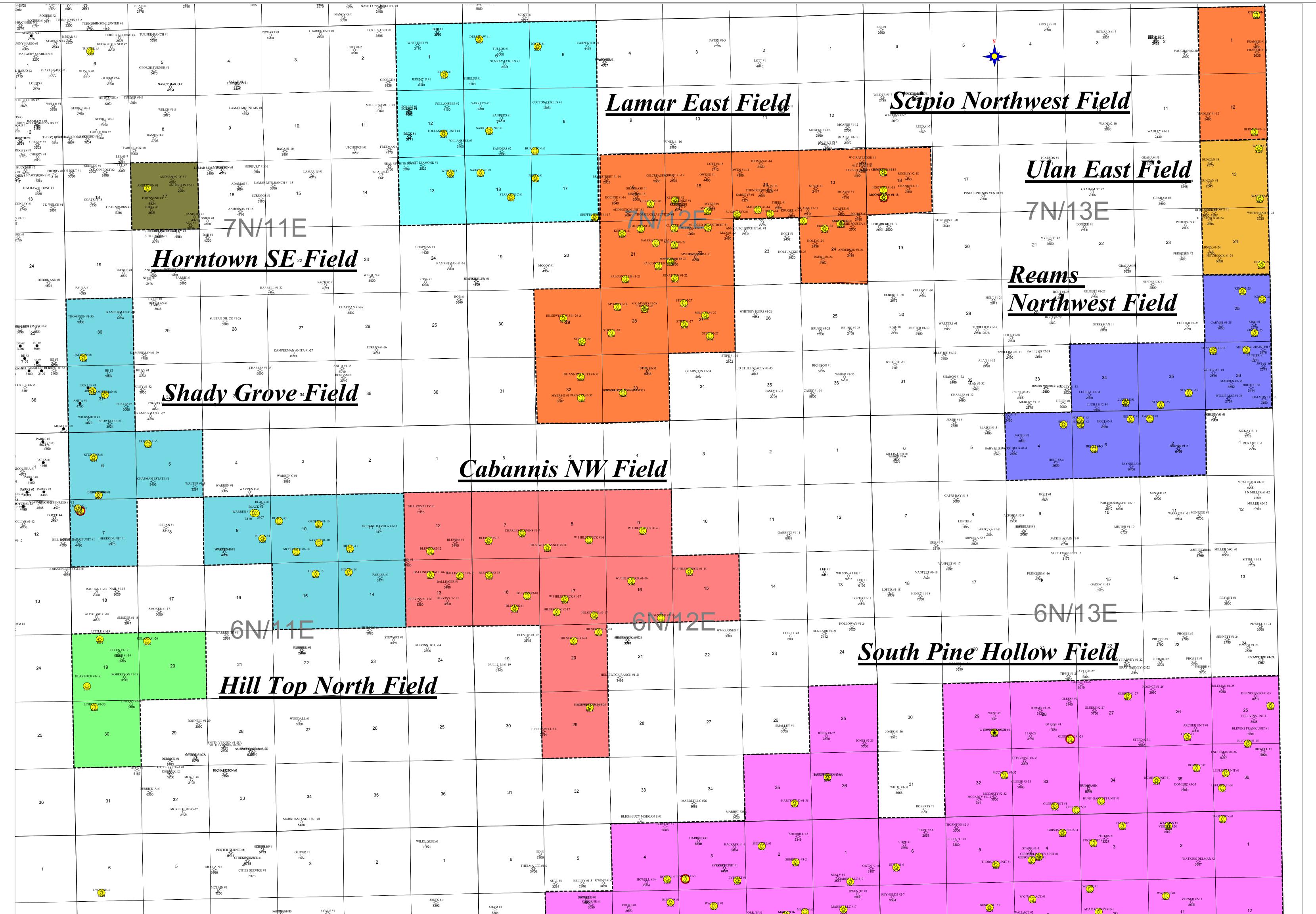
Well	Location	KB	Topofl	JHCoal	Торо	f LHCoal	Top of A	Atoka	Top of Upp (Unnamed		Base of Sha	ale Marker
Little 1-19	19-6N-11E				2980	-2980	NDE		2947	-2947	2906	-2906
Robertson 1-19	19-6N-11E				3050	-3050	NDE		3013	-3013	2968	-2968
Roland 1-20	20-6N-11E				3131	-3131	NDE		3098	-3098	3054	-3054
Blevins 'B' 1-24	24-6N-11E				3322	-3322	NDE		3278	-3278	3220	-3220
Smith 1-28	28-6N-11E				3050	-3050			3010	-3010	2960	-2960
Smith 1-28	28-6N-11E				3048	-3048	3229	-3229				
Vernon Smith 1-28	28-6N-11E				3011	-3011	NDE		2974	-2974	2917	-2917
Derrick 1-29	29-6N-11E				2982	-2982	3145	-3145	2948	-2948	2898	-2898
McKee 1-29	29-6N-11E				2942	-2942	3113	-3113	2910	-2910	2854	-2854
Lindley 1-30	30-6N-11E				3029	-3029 -2966	3194	-3194	2992	-2992	2950	-2950 -2882
Lindley 2-30 McKee 3-32	30-6N-11E 32-6N-11E				2966 3020	-2966	NDE NDE		2928 2985	-2928 -2985	2882 2934	-2002
Richardson 1	33-6N-11E				3020	-3020	3225	-3225	3016	-3016	2934	-2934
Blevins 1-7	7-6N-12E	985			3371	-2386	NDE	-3223	3330	-2345	3282	-2297
Hilseweck 1-8	8-6N-12E	000			3454	-3454	NUL		0000	2040	0202	2207
Hilseweck 1-8	8-6N-12E				3456	-3456	NDE		3410	-3410	3345	-3345
Hilseweck 2-8	8-6N-12E				3419	-3419	NDE		3372	-3372	3316	-3316
Hilseweck 1-9	9-6N-12E	1025			3426	-2401	NDE		3380	-2355	3325	-2300
Garrett 1-11	11-6N-12E	1020			0120	2101	HEE		3178	-3178	3114	-3114
Loftis 1-13	13-6N-12E				2533	-2533			2490	-2490	F/0?	
Hilseweck 1-15	15-6N-12E						NDE		3298	-3298	3224	-3224
Hilsewck 1-16	16-6N-12E				3436	-3436	3612	-3612	3391	-3391	3333	-3333
Hilseweck 2-17	17-6N-12E		3321	-3321	3422	-3422	NDE		3378	-3378	3316	-3316
Hilseweck 3-17	17-6N-12E				3228	-3228	NDE		3184	-3184	3122	-3122
Blevins 1-18	18-6N-12E				3350	-3350	NDE		3306	-3306	3246	-3246
Blevins 2-18	18-6N-12E				3288	-3288	NDE		3248	-3248	2193	-2193
Blevins 9-18	18-6N-12E				3272	-3272	NDE		3218	-3218	3170	-3170
Blevins 1-19	19-6N-12E				3440	-3440	NDE		3386	-3386	3330	-3330
Hilseweck 1-20	20-6N-12E				3294	-3294	NDE		3253	-3253	3188	-3188
Hilseweck 3-20	20-6N-12E				3286	-3286	NDE			0	3194	-3194
Hilseweck 5-21	21-6N-12E	904			3458	-2554	NDE		3412	-2508	3341	-2437
Hilseweck Ranch 1-21	21-6N-12E	764			3345	-2581	NDE		3312	-2548	3240	-2476
William G. Jones #1	22-6N-12E	886			3416	-2530	3677	-2791	3377	-2491	3304	-2418
Lubell 1-23	23-6N-12E	795			3318	-2523			3278	-2483	3200	-2405
Smalley 1	26-6N-12E				3374	-3374	NDE		3344	-3344	3272	-3272
Hilseweck 1-29	29-6N-12E				3684	-3684			3645	-3645	3568	-3568
Ashley 1-1	1-6N-13E	665	2420	-1755	2519	-1854			2486	-1821	2420	-1755
Durant 1-1	1-6N-13E	670			2470	-1800	NDE		2440	-1770	2376	-1706
McKay 1-1	1-6N-13E	677			2480	-1803			0005	677	2367	-1690
Brown Estate 1-2	2-6N-13E	768			2725	-1957	3004	-2236	2695	-1927	2620	-1852
Carter 1-2	2-6N-13E	711	0404	4700	2544	-1833	2938	-2227	2508	-1797	2439	-1728
Holt J #1	3-6N-13E	722	2431	-1709	2532	-1810	nde		2501	-1779	2429	-1707
Holt J #2	3-6N-13E	000		 	2697	-2697	NDE	0000	2675	-2675	2607	-2607
Jaynelle #1	3-6N-13E	982 875	2606	1724	2983 2697	-2001 -1822	3375	-2393 -2176	2952	-1970	2882	-1900
Holt 1-4 Jessie 1-5	4-6N-13E 5-6N-13E	755	2000	-1731		-1022	3051 NDE	-2170	2603	-1728	2676	-1801
Gillin #1	6-6N-13E	734			2659 2729	-1904 -1995	NDE					──
Capps Day 1-8	8-6N-13E	720			2842	-2122	NDE		2810	-2090	2741	-2021
Arpoika #1-9	9-6N-13E	238	2839	-2601	2042	-2122	NDE		2010	-2090	2741	238
Banks Estate #1	10-6N-13E	705	2008	-2001	2937	-2099	3057	-2352	2783	-2078	2700	-1995
Minter #1-10	10-6N-13E	694	<u> </u>		2961	-2103	3231	-2532	2917	-2223	2828	-2134
Menefee #1	11-6N-13E	674	2659	-1985	2768	-2094	NDE	-2007	2017	-2225	2020	-2104
Minter #2-11	11-6N-13E	750	2000	1.000	2856	-2106	3134	-2384	2826	-2076	2752	-2002
Warren #1-11	11-6N-13E	712			2924	-2212	0.01	2001	2884	-2172	2794	-2082
J.N. Miller #1 (12)	12-6N-13E	705	2715	-2010	2715	-2010	3017	-2312	2667	-1962	2581	-1876
J.N. Miller #2-12	12-6N-13E	693	2750	-2057	2750	-2057	3057	-2364	2700	-2007	2609	-1916
McAlester #1	12-6N-13E	697			2764	-2067	2956	-2259	2608	-1911	2520	-1823
Bryant #1	13-6N-13E	730	3197	-2467	3197	-2467	3452	-2722	3140	-2410		
Miller "AG" #1	13-6N-13E	705	2916	-2211	2916	-2211	3232	-2527	2859	-2154	2767	-2062
Sittel #1-13	13-6N-13E	000	2977	-2295	2977	-2295	3295	-2613	2924	-2242	2831	-2149
Ashley#1	14-6N-13E		2944	-2239		-2239	3160	-2455	2887	-2182	2789	-2084
Gaddy 1-15	15-6N-13E	686			3202	-2516	3428	-2742				
Phoebe #1	23-6N-13E		3448	-2775	3460	-2787			3410	-2737	3298	-2625
Phoebe #2	23-6N-13E		3446	-3446	3446	-3446	3626	-3626	3395	-3395	3283	-3283
Crawford 1-24	24-6N-13E	649			3448	-2799	3650	-3001	3365	-2716	3230	-2581
Powell 1-24	24-6N-13E	631	3114	-2483	3259	-2628	3502	-2871	3209	-2578	3104	-2473
Frank Blevins Unit #1	25-6N-13E	785			3672	-2887	NDE		3640	-2855	3555	-2770
Leo #1	25-6N-13E	618			3705	-3087	3950	-3332			3588	-2970
Archer Unit #1	26-6N-13E	772			3687	-2915	NDE		3655	-2883	3565	-2793
Gray #1	26-6N-13E	750			3665	-2915	NDE		3636	-2886	3543	-2793
	27-6N-13E	644	3592	-2948	3595	-2951	3790	-3146	3538	-2894	3429	-2785

Well	Location	KB	TopofL	JHCoal	Topot	fLHCoal	Top of /	Atoka	Top of Upp (Unnamed		Base of Sha	ale Marker
Steed 27-1	27-6N-13E	756				756			3648	-2892	3523	-2767
Gleese A #1-28	28-6N-13E	670	3652	-2982	3662	-2992	3820	-3150	3610	-2940	3489	-2819
Francis 1-29 (11?)	29-6N-13E	779			3681	-2902	NDE		2628	-1849	3528	-2749
West #2	29-6N-13E	778			3680	-2902	3885	-3107				
Roberts #1	31-6N-13E	760	3432	-2672	3459	-2699	3663	-2903	3396	-2636	3294	-2534
White #1-31	31-6N-13E	811	3427	-2616	3456	-2645	NDE		3398	-2587	3299	-2488
Gleese Unit #1	33-6N-13E	785			3602	-2817	NDE		3540	-2755	3430	-2645
Buddy #1-X	34-6N-13E	773			3545	-2772					3430	-2657
Hunt Garret Unit #1	34-6N-13E	805			3825	-3020	NDE		3485	-2680		805
Dominic Unit #1	35-6N-13E	802			3588	-2786	NDE		3551	-2749	3460	-2658
Engleman 1-36	36-6N-13E	802			3775	-2973	??			802		802
Howell #1	36-6N-13E	634	3434	-2800	3637	-3003	NDE		F/O? 3598		3427	-2793
LeFlore #1	36-6N-13E	643			3522	-2879	NDE		3482	-2839	3388	-2745
LeFlore 1-36	36-6N-13E	639	3336	-2697	3484	-2845			3455	-2816	3348	-2709
Bob #1	1-7N-11E	741			2365	-1624	2412	-1671	2345	-1604	2318	-1577
Jeremy D #1	1-7N-11E	774			2424	-1650	NDE		2407	-1633	2378	-1604
Kleine Unit #1	1-7N-11E	703			2338	-1635	2445	-1742	2313	-1610	2297	-1594
West Unit #1	1-7N-11E	740			2434	-1694	2531	-1791	2414	-1674		740
Eckles Unit 1	2-7N-11E	761			2409	-1648	2496	-1735	2390	-1629	2370	-1609
George #1	2-7N-11E	717			2458	-1741	2553	-1836	2437	-1720	2410	-1693
Huff 1-2	2-7N-11E	755			2433	-1678	2521	-1766	2415	-1660	2389	-1634
Cowart #1	3-7N-11E	946			2680	-1734	2762	-1816				
D. Harris #1	3-7N-11E	846			2571	-1725	NDE		2556	-1710	2537	-1691
Lee Epps #1	4-7N-11E	720			2396	-1676	NDE		2362	-1642	2298	-1578
Nancy Harjo 1	4-7N-11E	901			2727	-1826	2806	-1905	2698	-1797	2714	-1813
Sarah #1-4	4-7N-11E	932			2862	-1930	2942	-2010	2845	-1913	2822	-1890
Thompson 1	4-7N-11E	836			2863	-2027	2944	-2108	2854	-2018	2885	-2049
Turner 1	5-7N-11E	944			2730	-1786	2806	-1862	2716	-1772	2695	-1751
Turner Ranch 1	5-7N-11E	995			2775	-1780	2852	-1857	2762	-1767	2742	-1747
B. Bear 1	6-7N-11E				2695	-2695	2768	-2768	2682	-2682	2664	-2664
George Turner 2	6-7N-11E	947			2688	-1741	2762	-1815	2674	-1727	2655	-1708
Oliver 1	6-7N-11E	907			2664	-1757	2733	-1826	2650	-1743	F/O	
Turner 5	6-7N-11E	938			2704	-1766	2777	-1839	2690	-1752	2672	-1734
George 7-1	7-7N-11E	937			2719	-1782	2791	-1854	2705	-1768	2012	
Lankford 2	7-7N-11E	884			2729	-1845	2804	-1920	2715	-1831	2694	-1810
Lankford 3	7-7N-11E	906			2696	-1790	2768	-1862	2682	-1776	2662	-1756
Lee 1	7-7N-11E	918			2732	-1814	2812	-1894	2719	-1801	2699	-1781
Thomas 1	7-7N-11E	960			2718	-1758	2790	-1830	2702	-1742	2684	-1724
Turner	8-7N-11E	1027			2800	-1773	NDE	1000	2786	-1759	2767	-1740
Welch 1-8	8-7N-11E	946			2790	-1844	NDE		2774	-1828	2752	-1806
Yaroslaski #1	8-7N-11E	988			2818	-1830	2904	-1916	2806	-1818	2784	-1796
Lamar Mt. #1	9-7N-11E	1000			2860	-1860	2939	-1939	2845	-1845	2830	-1830
Baca #1-10	10-7N-11E	856			2696	-1840	2794	-1938	2680	-1824	2654	-1798
Freeman 1	11-7N-11E	807			2030	-1672	2580	-1773	2462	-1655	2430	-1623
Miller #1	11-7N-11E	753			2474	-1721	2575	-1822	2450	-1697	2400	1025
Upchurch #1	11-7N-11E	771			2514	-1743	2614	-1843	2490	-1719		
Follansbee #2	12-7N-11E	765			2396	-1631	2507	-1742	2430	-1613	2349	-1584
Beck #1	12-7N-11E	786			2330	-1625	2514	-1728	2394	-1608	2343	-1580
M.B. White #1	13-7N-11E	782	<u> </u>		2411	-1662	2552	-1720	2394	-1648	2300	-1618
White #12-1	13-7N-11E	841	<u> </u>		2444	-1649	2610	-1769	2430	-1631	2400	-1601
Neal #1-14	14-7N-11E	798	-		2430	-1675	2582	-1784	2472	-1658	2442	-1636
Neal #2	14-7N-11E	790			2473	-1684	2583	-1793	2450	-1667	2434	-1652
Lamar #15	15-7N-11E	790	<u> </u>		2610	-1813	2365	-1913	2594	-1797	2566	-1769
Adamas #1	16-7N-11E	1058			2934	-1876	3029	-1913	2594	-1797	2300	-1709
Anderson #1	16-7N-11E	1038			2934	-1914	3018	-2006	2920	-1899	2888	-1876
Anderson 1-16	16-7N-11E	1012	<u> </u>		2920	-1914	3018	-1943	2911	-1828	2878	-1804
Scruggs #1	16-7N-11E	1074			2910	-1866	3068	-1943	2902	-1020	2010	1098
Anderson "Q" #1	17-7N-11E	917			2904	-1000	2928	-1970	2950	-1652	2800	-1883
Anderson Q #1	17-7N-11E	917	<u> </u>		2837	-1920	2928	-2011	2822	-1905	2800	-1883
	47.711.445	1000			0.000	40.00	0007	1000	0004	1005	0.070	1001
Anderson No. 1 Jerry #1	17-7N-11E 17-7N-11E		<u> </u>		2909	-1900 -2808	2997	-1988 -2898	2894	-1885 -2789	2873	-1864
Bolt #1	18-7N-11E				2600	-2000	2090	-2090	2658	-2769	2639	-2765
					2762	-1790	2840	-1869				-1763
Bolt #2 Coats 1-18	18-7N-11E 18-7N-11E				2762	-1791	2840	-1869	2750 2746	-1779 -1848	2738 2726	-1767
	18-7N-11E					-1863	2847			-1808	2720	-1020
Lee #2 Shiolds #1					2757			-1855	2794		2662	4764
Shields #1	18-7N-11E 19-7N-11E		<u> </u>		2696 2800	-1798	2774	-1876	2683	-1785	2662	-1764
Backus #1			<u> </u>			-1936	2890	-2026	2781	-1917	2761	-1897
Paula #1 Anita 1-20	19-7N-11E	918			2906	-1988	2993	-2075	2887	-1969	2865	-1947
	20-7N-11E	1			2758	-2758	2853	-2853	2740	-2740	2714	-2714
Eckles A-1	20-7N-11E	771			2538	-1767	2636	-1865	2522	-1751	2497	-1726

Well	Location	КВ	Top of UHCoal	Topot	fLHCoal	Top of /	Atoka	Top of Upp (Unnamed		Base of Sha	ile Marker
Schilling #1-20	20-7N-11E	799		2810	-2011	2904	-2105	2595	-1796	2572	-1773
Factor #1	22-7N-11E	796		2627	-1831	2746	-1950	2609	-1813	2580	-1784
Weston 1	23-7N-11E	798		2589	-1791	2717	-1919	2570	-1772	2538	-1740
Chapman #1	24-7N-11E	866		2652	-1786	2772	-1906	2630	-1764	2600	-1734
Kamperman 1-24	24-7N-11E	789		2593	-1804	NDE		2567	-1778	2542	-1753
Rosa #1	24-7N-11E	806		2584	-1778	2719	-1913	2561	-1755	2529	-1723
Bob #1	25-7N-11E	896		2705	-1809	2826	-1930	2679	-1783	2635	-1739
Chapman 1-26	26-7N-11E	815		2634	-1819	2768	-1953	2618	-1803	F/0	0.001
Eckles 1-26	26-7N-11E	834		2960	-2126	3090	-2256	2931	-2097	2895	-2061
Kamperman 1-27	27-7N-11E	833		2962	-2129	3089	-2256	2936	-2103	2904	-2071
Lott 1-28 Sultan Oil #1-28	28-7N-11E 28-7N-11E	803		2890	-2087	3006	-2203	2865 2865	-2865 -2062	2836 2836	-2836 -2033
Douglass #1	29-7N-11E	874		2890	-1937	2906	-2032	2792	-1918	2030	-2055
Eckles #1	29-7N-11E	856		2818	-1957	2900	-2052	2792	-1913	2772	-1916
Kamperman 1-29	29-7N-11E	857		2900	-2043	3009	-2152	2880	-2023	2852	-1910
Jackson #1	30-7N-11E	750		2799	-2049	2900	-2152	2000	-2028	2750	-2000
Kamperman 1-30	30-7N-11E	927		2950	-2023	3045	-2118	2929	-2002	2902	-1975
Thompson 1-30	30-7N-11E	863		2926	-2063	NDE	2110	2905	-2042	2881	-2018
Anita #1	31-7N-11E	854		2906	-2052	3008	-2154	2885	-2031	2858	-2004
B.E. #1	31-7N-11E	747		2799	-2052	2903	-2156	2778	-2031	2750	-2003
B.E. #2	31-7N-11E	734		2787	-2053	NDE		2776	-2042	2740	-2006
Eckles #1	31-7N-11E	754		2807	-2053	2912	-2158	2788	-2034	2763	-2009
Eckles 3-31	31-7N-11E	744		2774	-2030	2882	-2138	2750	-2006	2724	-1980
Kamperman 1	31-7N-11E	787		2822	-2035	2928	-2141	2801	-2014	2774	-1987
Showalter #1	31-7N-11E	760		2784	-2024	2896	-2136	2765	-2005		760
Kamperman 1-32	32-7N-11E	769		2797	-2028	2914	-2145	2776	-2007	2748	-1979
Riley #1	32-7N-11E	754		2774	-2020	2885	-2131	2754	-2000		
Rogers #1	32-7N-11E	748		2786	-2038	2897	-2149	2768	-2020	2747	-1999
Benham 1	35-7N-11E	807		2960	-2153	NDE		2932	-2125	2896	-2089
Lott 1	2-7N-12E			2544	-2544	2673	-2673	2514	-2514	2476	-2476
Patsy 1-3	3-7N-12E			2450	-2450	NDE		2417	-2417	2380	-2380
Wagoner #1	4-7N-12E	724		2420	-1696	2554	-1830	2392	-1668	2356	-1632
Carpenter #1	5-7N-12E	799		2540	-1741	2659	-1860	2512	-1713	2482	-1683
Shields #1	6-7N-12E	714		2358	-1644	2470	-1756	2338	-1624	2310	-1596
Sanders #1	7-7N-12E	784		2503	-1719	2624	-1840	2481	-1697	2448	-1664
Sanders #2	7-7N-12E	878		2537	-1659	2656	-1778	2515	-1637	2485	-1607
Sarkey Unit #1	7-7N-12E	768		2456	-1688	2577	-1809	2428	-1660	0.101	768
Sarkeys #2	7-7N-12E	004		0454	1050	0533	1770	2444	-2444	2404	-2404
Sarkeys #1	7-7N-12E	801		2454	-1653	2577	-1776	0440	801	0.005	801
Burleson #1	8-7N-12E 8-7N-12E	712		2442 2621	-1730 -1846	2574 NDE	-1862	2418 2594	-1706	2385	-1673
Cotton-Eckles #1 McAfee 1-12	12-7N-12E	772		2448	-1676	NDE		2394	-1819 -1642	2368	775 -1596
McAfee #1	13-7N-12E	725		2328	-1603	2465	-1740	2414	-1042	2300	-1590
McAfee 1-13	13-7N-12E	745		2326	-1591	2405	-1740	2235	-1561	2243	-1520
State #1	13-7N-12E	741		2345	-1604	NDE	-1750	2313	-1572	2267	-1526
W.C. Ratledge #1	13-7N-12E	725		2343	-1618	NDE		2312	-1587	2258	-1533
Mad Max 1-14	14-7N-12E	977		2552	-1575	2686	-1709	2518	-1541	2468	-1491
Owen #1-14	14-7N-12E	880		2528	-1648	2657	-1777	2496	-1616	2452	-1572
Sarkey#1	14-7N-12E	1007		2597	-1590	NDE		2566	-1559	2522	-1515
Sarkeys #1	14-7N-12E	954		2528	-1574	2662	-1708	2500	-1546	2456	-1502
Theel #1	14-7N-12E	966		2573	-1607	NDE		2542	-1576	2497	-1531
Thunderdome 1-14	14-7N-12E	875		2508	-1633	2638	-1763	2476	-1601	2427	-1552
Tom 2-14	14-7N-12E	913		2505	-1592	NDE		2477	-1564	2428	-1515
Kleinke #2	15-7N-12E			2472	-2472	NDE		2445	-2445	2402	-2402
Kleinke 4	15-7N-12E	918		2497	-1579	2638	-1720	2469	-1551	2417	-1499
Lott 1-15	15-7N-12E	893		2546	-1653	NDE		2515	-1622	2422	-1529
Myers 1	15-7N-12E			2498	-2498	NDE		2461	-2461	2418	-2418
Owens #1	15-7N-12E	851		2505	-1654	2636	-1785	2474	-1623	2428	-1577
Addington 1	16-7N-12E	863		2504	-1641	2638	-1775	2474	-1611	2438	-1575
Gilcrease 1	16-7N-12E			2493	-2493						
Gilcrease 3	16-7N-12E			2444	-2444	NDE		2415	-2415	2322	-2322
Hoehne 1-16	16-7N-12E	822		2428	-1606	2618	-1796	2450	-1628	2412	-1590
Perry 1	17-7N-12E	747		2481	-1734	2622	-1875	2453	-1706	2422	-1675
Sarkeys B-1	18-7N-12E	875		2528	-1653	NDE		2508	-1633	2476	-1601
Sarkeys C-1	18-7N-12E	917		2622	-1705	NDE	1000	2597	-1680	2554	-1637
Shirley Jean	19-7N-12E	845		2660	-1815	2807	-1962	2640	-1795	2602	-1757
McCoy 1	20-7N-12E	672		2406	-1734	2546	-1874	2376	-1704	2334	-1662
Falcon Club 1-21	21-7N-12E	1000	+ $+$ $+$	2648	-1648	NDE		2616	-1616	2574	-1574
		886		2581	-1695	NDE		2548	-1662	2507	-1621
Falcon Club 2-21 Falcon Club 3-21	21-7N-12E 21-7N-12E	953		2601	-1648	NDE			953	2517	-1564

Well	Location	КВ	Top of UHCoal	Торо	f LHCoal	Top of /	Atoka	Top of Upp (Unnamed		Base of Shal	e Marker
Broadstreet 1	22-7N-12E	970		2592	-1622	2733	-1763	2560	-1590	2516	-1546
C.G. Myers et al #1	22-7N-12E	912		2594	-1682	2748	-1836	2566	-1654	2522	-1610
Jonathan 1-22	22-7N-12E	760		2452	-1692	2594	-1834	2420	-1660	2372	-1612
Melissa 2-22	22-7N-12E	950		2608	-1658	2732	-1782	2578	-1628	2534	-1584
Michael 2-22	22-7N-12E	880		2554	-1674	2696	-1816	2524	-1644	2429	-1549
Holt 3-24	24-7N-12E	693		2332	-1639	NDE		2299	-1606	2244	-1551
Jackie Holt 2-23	23-7N-12E	740		2392	-1652	NDE		2361	-1621	2307	-1567
Upchurch 1	23-7N-12E	906		2586	-1680	NDE		2556	-1650	2510	-1604
Anderson 1-24	24-7N-12E	693		2360	-1667	NDE		2325	-1632	2270	-1577
Holt 1	24-7N-12E	737		2338	-1601	NDE		2308	-1571	2254	-1517
Mamie Sousea 1	24-7N-12E	000		2313	-2313	NEE		2283	-2283	2240	-2240
Rabke 1-24	24-7N-12E	693		2357	-1664	NDE		2324	-1631	2272	-1579
Ross 1-24	24-7N-12E	705		2315	-1610	NDE 2404	0700	2282	-1577	2234	-1529
Soused 3	24-7N-12E	734		2357	-1623	3494	-2760	2326	-1592	2277	-1543
Bruno 3-25 Whitnev Heirs 1-26	25-7N-12E 26-7N-12E	727 976		2477 2888	-1750 -1912	NDE NDE		2432 2658	-1705 -1682	2372 2606	-1645 -1630
	20-7N-12E	976		2666	-1912	NDE			-1654	2505	-1630
Million 1-27 Stipe 1-27		962		2646	-1695	NDE		2636	-1004	2007	-1605
Stipe 2-27	27-7N-12E 27-7N-12E	905		2590	-1685	NDE		2560	-1655	2512	-1607
	29-7N-12E	905		2590	-1587	2715	-1728	2546	-1559	2503	-1516
Hilseweck A-1-29 Stipe 1-29	29-7N-12E	838		2674	-1836	2776	-1938	2644	-1806	2505	-1759
Be Ann Puckett 1-32	32-7N-12E	978		2842	-1864	2987	-2009	2810	-1832	2597	-1759
Myers B-1	32-7N-12E	830		2975	-2145	NDE	2008	2940	-2110	2890	-1794
Puckett 2-32	32-7N-12E	925		2975	-2145	NDE	1	2940	-2023	2898	-1973
Charles 1-33	33-7N-11E	638		2990	-2005	3093	-2455	2940	-2023	2090	-1973
Doss Rovalty 1-33	33-7N-12E	698		2916	-2218	NDE	-2400	2878	-2180	2824	-2126
Stipe 1-33	33-7N-12E	926		2750	-1824	2892	-1966	2766	-1840	2663	-1737
Gladstein 1-34	34-7N-12E	946		2727	-1781	2868	-1922	2694	-1748	F/O? 2504'	1707
Stacy 1	35-7N-12E	796		2656	-1860	NDE	1022	2621	-1825	2568	-1772
Casey 1-36	36-7N-12E	771		2618	-1847	2792	-2021	2579	-1808	2516	-1745
Richison 1	36-7N-12E	749		2589	-1840	2760	-2011	2557	-1808	2494	-1745
Brow 2-2	2-7N-13E	741		2356	-1615	2478	-1737	2321	-1580	2260	-1519
Vaughan 2-2 B	2-7N-13E	736		2344	-1608	NDE	1101	2308	-1572	2242	-1506
Howard 1-3	3-7N-13E	662		2347	-1685	2482	-1820	2312	-1650	2247	-1585
Lee #1	6-7N-13E	857		2571	-1714	NDE	1020	2540	-1683	2484	-1627
Proctor #1	7-7N-13E	964		2633	-1669	2770	-1806	2599	-1635	2534	-1570
Reed 1-7	7-7N-13E	744		2398	-1654	2540	-1796	2365	-1621	2304	-1560
Watkins 1-7	7-7N-13E	795		2437	-1642	2577	-1782	2406	-1611	2354	-1559
Wade 2-10	10-7N-13E	741		2392	-1651	2556	-1815	2362	-1621	2294	-1553
Wadley 1-11	11-7N-13E	733		2371	-1638	NDE		2341	-1608	2274	-1541
Herman #1-12	12-7N-13E	738		2552	-1814	2693	-1955	2518	-1780	2446	-1708
Wadley 1-12	12-7N-13E	751		2405	-1654	NDE		2371	-1620	2302	-1551
Duncan #1	13-7N-13E	785		2386	-1601	NDE					
Duncan #3	13-7N-13E	812		2436	-1624	NDE		2404	-1592	2335	-1523
Ward #1-13	13-7N-13E				0			2484	-2484	2408	-2408
Ward 2-13	13-7N-13E	698		2331	-1633	2524	-1826	2296	-1598	2224	-1526
Graham #1	14-7N-13E	786		2416	-1630	2583	-1797	2386	-1600	2315	-1529
Graham #2	14-7N-13E	770		2443	-1673	NDE		2410	-1640	2341	-1571
Graham #3	14-7N-13E	760		2406	-1646	NDE		2378	-1618	2304	-1544
Graham C #2	15-7N-13E			2411	-2411	NDE		2378	-2378	2310	-2310
Pearson 1-16	16-7N-13E	702		2358	-1656	2516	-1814	2326	-1624	2266	-1564
Crandell #1	18-7N-13E	726		2330	-1604	NDE		2298	-1572	2238	-1512
Crandell #1-18	18-7N-13E	729		2325	-1596	2473	-1744	2292	-1563	2240	-1511
Mooneyham 1-18	18-7N-13E	724		2321	-1597	NDE		2289	-1565	2236	-1512
Rockey #2-18	18-7N-13E	715		2311	-1596	NDE		2279	-1564	2222	-1507
Bush 1-19	19-7N-13E	683		2324	-1641	2480	-1797	2293	-1610	2238	-1555
Stergios #1-20	20-7N-13E	665		2338	-1673	2495	-1830	2307	-1642	2238	-1573
Graham #1	22-7N-13E	824		2540	-1716	2698	-1874	2510	-1686	2432	-1608
Pedersen #2	23-7N-13E	830		2538	-1708	NDE		2506	-1676	2432	-1602
Pederson #1	23-7N-13E			2494	-1672	NDE		2462	-1640	2384	-1562
Abney 1-24	24-7N-13E			2584	-1700	2738	-1854	2552	-1668	2477	-1593
Abney 3-24	24-7N-13E	910		2613	-1703	NDE	L	2577	-1667	2505	-1595
Hill 1-24	24-7N-13E	693		2393	-1700	NDE	10.00	2356	-1663	2282	-1589
Hitchcock 1-24	24-7N-13E	897		2633	-1736	2815	-1918	2598	-1701	2524	-1627
Whitehead 1-24	24-7N-13E	701		2356	-1655	NDE	L	2322	-1621	2250	-1549
Carver 1-25	25-7N-13E	692		2578	-1886	NDE	L	2540	-1848	2460	-1768
King #1	25-7N-13E	712		2456	-1744	NDE		2416	-1704	2336	-1624
King 2-25	25-7N-13E	714		2400	-1686	NDE		2357	-1643	2286	-1572
King 3-25	25-7N-13E	702		2431	-1729	NDE	L	2392	-1690	2320	-1618
King 4-25	25-7N-13E	_		2476	-2476	NDE		2436	-2436	2354	-2354
Collier 1-26	26-7N-13E	701		2488	-1787	NDE	1	2449	-1748	2378	-1677

Well	Location	KB	Top of UHCoal	Торо	f LHCoal	Top of /	Atoka	Top of Upp (Unnamed		Base of Sha	ale Marker
Frederick #1	26-7N-13E	885		2587	-1702	2779	-1894	2552	-1667	2480	-1595
Holt 1-28	28-7N-13E	720		2515	-1795	2678	-1958	2482	-1762	2410	-1690
Holt 2-28	28-7N-13E	738		2540	-1802	NDE		2507	-1769	2435	-1697
Holt 1-29	29-7N-13E	715		2528	-1813	NDE		2494	-1779	2528	-1813
Walters 1-A	29-7N-13E	712		2536	-1824	2614	-1902	2504	-1792	2494	-1782
Elbert 1-30	30-7N-13E	724		2526	-1802	NDE		2491	-1767	2426	-1702
Helen 1	33-7N-13E	870		2693	-1823	NDE		2876	-2006	2810	-1940
Lucille #1	34-7N-13E	908		2707	-1799	2973	-2065	2689	-1781	2619	-1711
Lucille 2-34	34-7N-13E	900		NP		NDE		2685	-1785	2608	-1708
State 1-35	35-7N-13E	707		2549	-1842	2828	-2121	2520	-1813	2445	-1738
State 2-35	35-7N-13E	703		2510	-1807	2804	-2101	2482	-1779	2410	-1707
Brite 1-36	36-7N-13E	642		2365	-1723	NDE		2328	-1686	2264	-1622
JWP 1-36	36-7N-13E	658		2322	-1664	NDE		2298	-1640	2234	-1576
Madden 1-36	36-7N-13E	704		2479	-1775	2739	-2035	2449	-1745	2377	-1673
Painter #2	36-7N-13E	678		2413	-1735	NDE		2384	-1706	2303	-1625
Sheena 1-36	36-7N-13E	738		2523	-1785	NDE		2492	-1754	2409	-1671
Sunshine 1-36	36-7N-13E	671		2663	-1992	NDE		2632	-1961	2540	-1869
White AF #1	36-7N-13E	664		2607	-1943	NDE		2585	-1921	2518	-1854
Willie Mae 1-36	36-7N-13E	697		2454	-1757	NDE		2423	-1726	2352	-1655



Hillon #1 Billon #1 Top Field	9 5720 10 Stuart 12 NEWBY #1-9 10 12	3284 7 ROOKS #1 3184 FARGO #1 IVA SIMS #1	8 9 10 BETHEL #1 CI 3358 WILLOW #1-10 3280 BETHEL #2.9	COOTTER #1	7 FIRESTOTE UNIT #1 S650 ATTS #1 REYXOLOS #1 S650	8 3547	9 Scze 10 GRANT #1-10 3829	11 BIG Y #1-11 3360 WA2SONS #1	
CKEY #1 3140	Southwest	3295 3198 GRACE FARGO #1 3198 HARRISON #1 HALL UNIT #1	BEZTEN, #3 S448 S448 KREIMEJER #1-15 DONN #1 3459	S420 Ntel Ntel <t< td=""><td>BRUCE ROCENS UNIT #1</td><td>2^{#2} ROCK TR #3-17 SE22 L WAYNE OF NOI</td><td>LER #16-1 INVESTERS ROYALTY #1 3802</td><td>NATKINS #1-14 3700 RAMSEY #1</td><td>-13 SANDITA #1-13 2428</td></t<>	BRUCE ROCENS UNIT #1	2 ^{#2} ROCK TR #3-17 SE22 L WAYNE OF NOI	LER #16-1 INVESTERS ROYALTY #1 3802	NATKINS #1-14 3700 RAMSEY #1	-13 SANDITA #1-13 2428
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-CI- 310 GOURTEV SERA #1 WALTON JAMES UNIT #1 BLACT #1-17 CAT	ARKE MAURICE G 'B #1 3154 THY #1	ADAMS #1-13 3336	3455 BLACK IQHN 61 ACK #1-16 3500 3550 TRACEY #11.005 #1-15 MARY #2-16 S500 5421 3120 JENN (1, 2, 1	3 0777745-22 WN 0777745-22 3528	IIVERSIPTOF TULSA #1		5N/13E	MARBETSLC #32	NELL MARY # -24 2884 DEER CRESK #1-24 NG4 HILDERS UNIT #1
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S206 S204 THORNION #3-MICKEE #2 WILBANKS #3-30 3230 3330 CARTER CD UNIT #1 VERXOD #1-29 PARKS ESTATE #1-29	HERRES D' #1 WALKER TISIRS #27-2 WALKER TISIRS #1 WALKER TISIRS #1 WALKER TISIRS #1 WALKER TISIRS #1 DATABASE FOR #10 Processing #15-26	LOFTIS #1-2:	BLACK A #50ABBACKAAU BLACK 3. BLACK A #60-21 A B CAMP ETAL #1 BLACK VERNON J #2-38 BLACK VERNON J #2-38 BLACK VERNON J #2-38 BLACK A #4	BLACK #1-26 DAVIS #2-26 2943 3525 E E WORKING UNIT #1 S670 JV BLACK # 26 25	USA 30-1 #1 	29	28 27	26	25
MCKEE #1 3444 368 3396 WILBANKS #1 3465 25 30 29 VERNON DERRICK #1-30 3313	S288 Intraction Intraction <td>3330 30 ROG275 #1- NEWTQN #125</td> <td>TRIMM #1 28 3300 27 4000 29 BLACK #4-28 3700AVIS UNIT #1 3575</td> <td>VERNON BLACK A' #7-27 7470</td> <td></td> <td></td> <td></td> <td>F BLEVINS UNT-A #1 3751</td> <td></td>	3330 30 ROG 275 #1- NEWTQN #125	TRIMM #1 28 3300 27 4000 29 BLACK #4-28 3700AVIS UNIT #1 3575	VERNON BLACK A' #7-27 7470				F BLEVINS UNT-A #1 3751	
	TRIMM #1 3400 TRIMM JAMES D #27-1 LACKEY #1 3143 TRIMM JAMES D #27-1 LACKEY #1 5440 Stars OFTUS #33-1 LOFTUS #1 JACKEY B UNIT #1 LACKY JR UNIT #1 SHIRLEY #1 3000 SHIRLEY #1 3000	3625	BENNETT-HALL #1 3959 WALKER #1 JW HALL AVI #1 A 3200 PASCHALL #1	USA-TEXTECO #36-1 WRIGHT_WOOD #1 3809					
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NORVELL #32-1 3820	MARTIN #1-33 3415 STEVENSON #1 2901 ROGENS #1 3340	SHIRTEN # S820	3846	HENDERSON #1 					

Hartshorne Production

PLATE 1

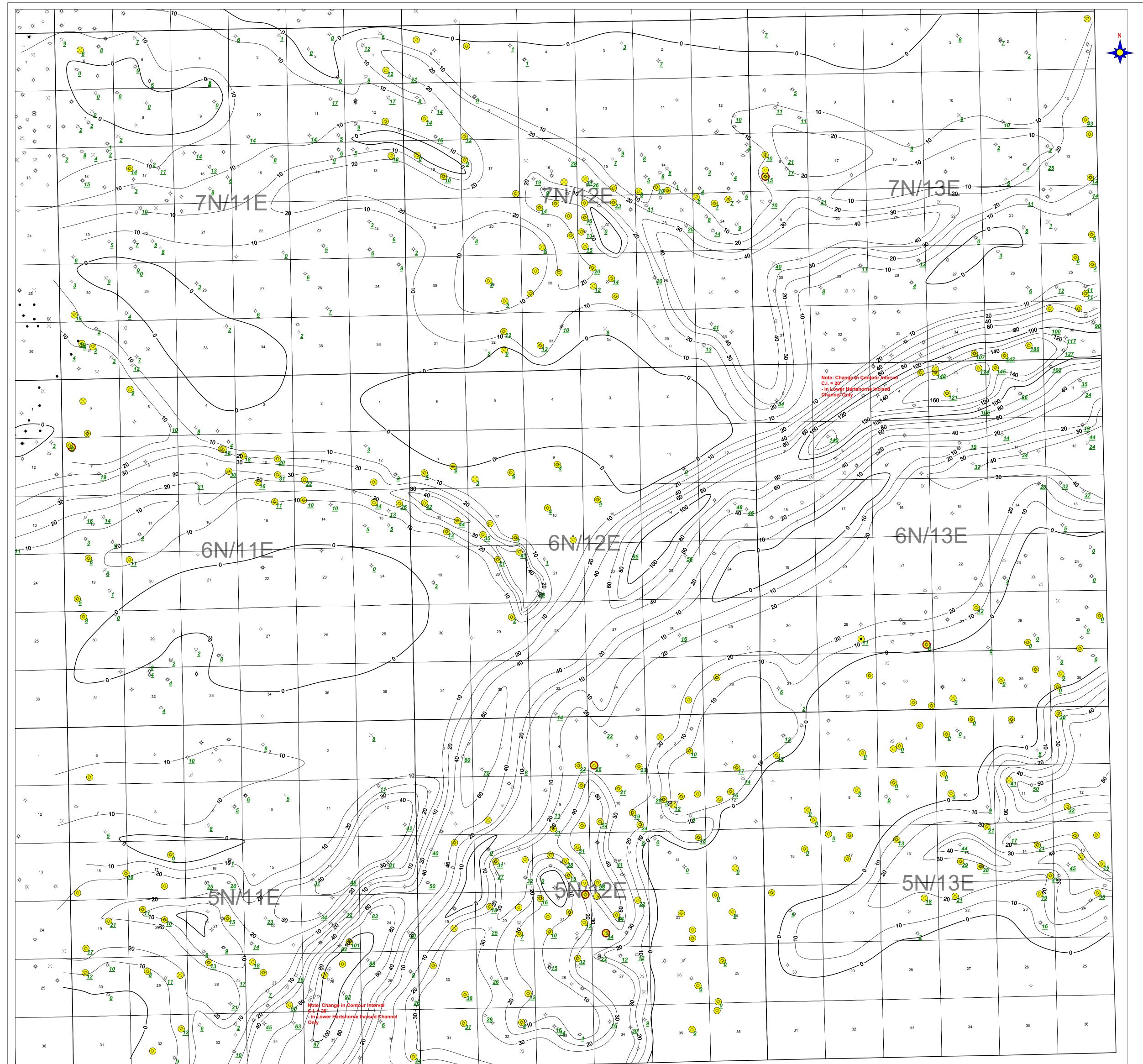
Basemap Hartshorne Project Pittsburg & Hughes Counties, OK

Author: CJG	Date: 15 May, 2004

		1" = 3000'		
4000	0	4000	8000	12000 ft

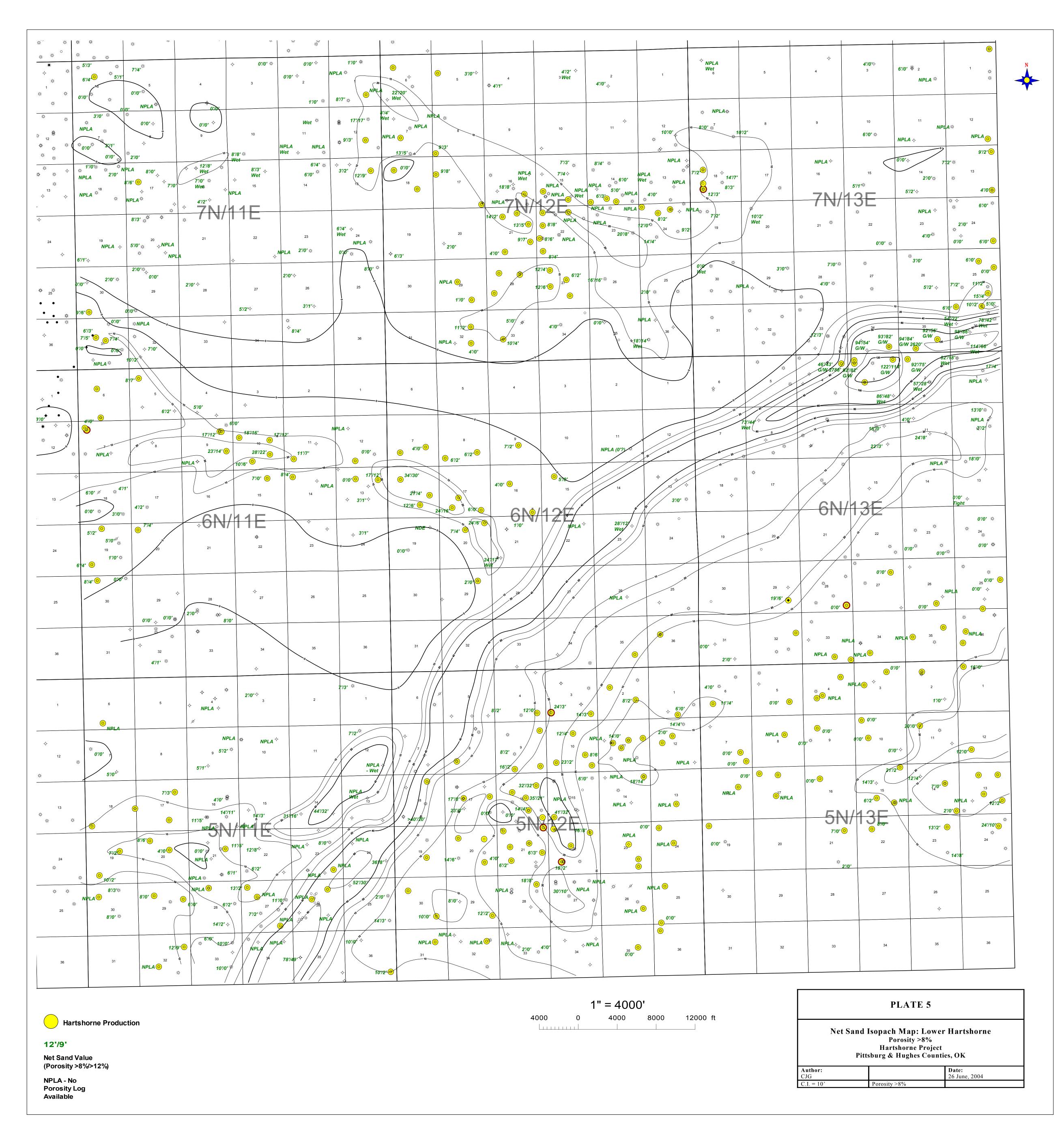
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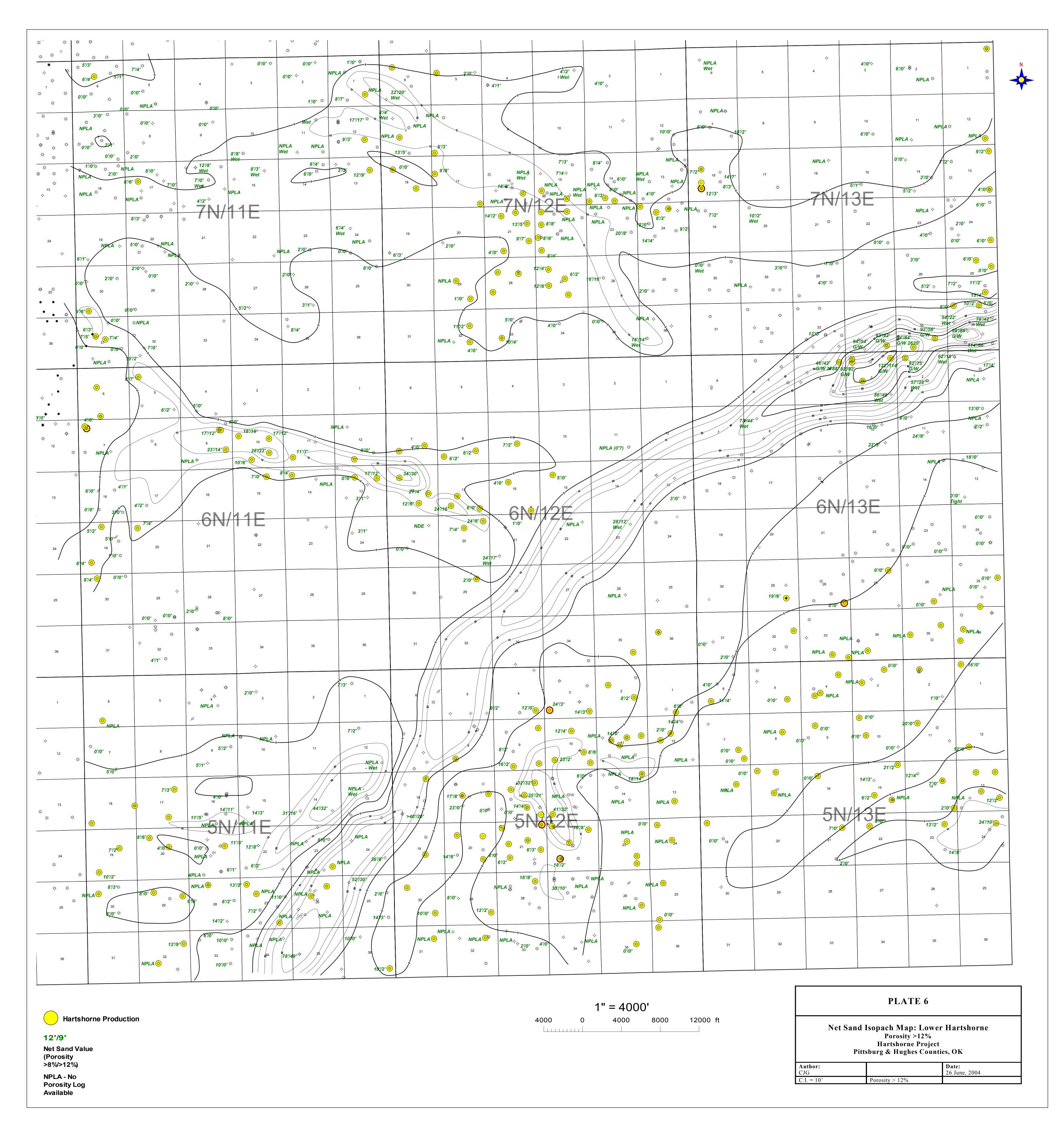
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** ** <td< td=""><td>11 → Hartshorne Coal 12/00-7/03 .019 Bcf 16 Mcfd 2550-94' HERMAN #1-12 ↓</td></td<>	11 → Hartshorne Coal 12/00-7/03 .019 Bcf 16 Mcfd 2550-94' HERMAN #1-12 ↓
** * </td <td>St Field ↓ 13 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓</td>	St Field ↓ 13 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
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↓ ↓	Booch & Hartshorne 25 3/01-8/03 .103 Bcf 62 Mcfd 1907-2522' Booch & Hartshorne KING #4-25 SUNSHINE #1-36 SHEENA #1-36 5/96-8/03 .073 Bcf 10/80-4/87 .607 Bcf INA 36
A Refused of the contraction of	35-8/03 Mcfd 62-2790' 35 .607 Bcf INA 2560-2600' .70 Mcfd Booch & 2560-2600' 1.200 Bcf 221 Mcfd 2522-76' 35 .74 Eff 2522-76' .74 Eff 2522-76' LUCILLE #1 .5TATE #2-35
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	↔ ↔ ↔ ↔ GLEESE #1-27 ↔ ↔ ↔ ↔ Ø/88-7/03 .208 Bcf Ø/88-7/03
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36 31 32 33 34 35 36 56 57 61 41 57 41 57 41 151 41 <t< td=""><td>bold MINIC UNIT #1 35 .032 BCT .032 BCT 10 M A 35 .18 A .18 A 5-9/03 2.745 Bcf .18 A .18 A 41 Bcf 2.745 Bcf .064 Bcf .064 Bcf 3 Mcfd .064 Bcf .064 Bcf 3605-3770* THOMPSON #1 COOD #2 WATKINS #1 Coop #2 WATKINS #1</td></t<>	bold MINIC UNIT #1 35 .032 BCT .032 BCT 10 M A 35 .18 A .18 A 5-9/03 2.745 Bcf .18 A .18 A 41 Bcf 2.745 Bcf .064 Bcf .064 Bcf 3 Mcfd .064 Bcf .064 Bcf 3605-3770* THOMPSON #1 COOD #2 WATKINS #1 Coop #2 WATKINS #1
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13 18 ALECT VICEVILI MI 1025-003 23 Michi 17 16 15 File 105-003 11 16 11 17 16 13 18 13 18 13 18 13 18 13 18 13 18 13 18 13 18 13 18 13 18 13 13 18 100-803<	3608-63' 15 #37 :GGLESTON UNIT #1A 7/94-7/03 .286 Bcf 35 Mcfd 3418-72' MARBET LLC #32 10/01-3/03 ♀ MARBET LLC #32 10/01-3/03 ♀ MARBET LLC #32 10/01-3/03 ♀ MARBET LLC #32
24 347-3407 358-92 O/IV III 400-103 358-92 O/IV 120-803 358-92 120-803 358-92 00-103 358-92 00-103 358-92 00-103 120-803 358-92 00-103 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 358-92 00-103 120-803 322-371 100-103 <t< td=""><td>.017 Bcf 19 Mcfd 2866-2938' 24 INA 2748-2822</td></t<>	.017 Bcf 19 Mcfd 2866-2938' 24 INA 2748-2822
NBRE C UNIT N VENNUF 1-29 VENNUF 2-20	27 26 25 -¢-
All All <td>34 35 36</td>	34 35 36
Hartshorne Production	PLATE 2
Hartshorne Production Dates of Production Cumulative Gas (Bcf) Current Rate Gas (Mcfd) Perforations 1" = 3000' 4000 0 4000 8000 12000 ft	Hartshorne Production Map Hartshorne Project Pittsburg & Hughes Counties, OK Date: 15 May, 2004



Hartshorne Production	1" = 4000'	Р	LATE 3
<u>10</u>	4000 0 4000 8000 12000 ft	Hart	ap: Lower Hartshorne shorne Project Hughes Counties, OK
Gross Sand Value (50%		Author: CJG	Date: 15 May, 2004
Clean Sand Gamma Ray Cutoff)		C.I. = 20' (with 10' Contour for thinner sandstone bodies)	

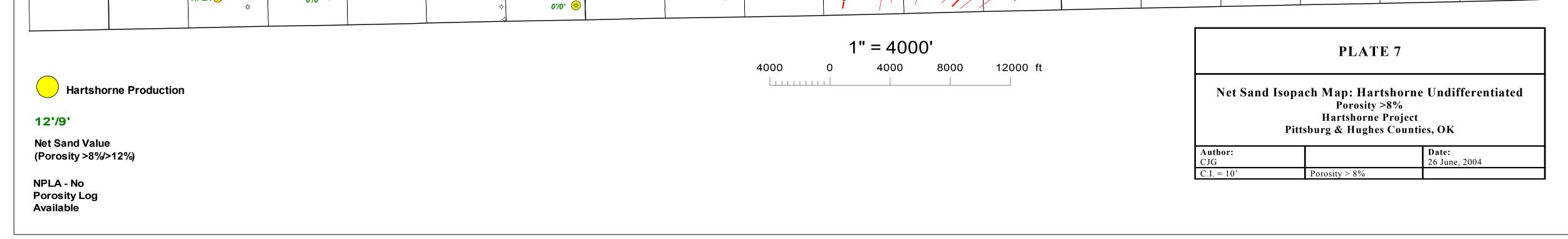
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36 31 32 33 34 2 35 36 3 * * * * * * * * * Hartshorne Production * * * * * *	I" = 4000' 4000 0 4000 8000 12000 ft Gross Sand Map: Hartshorne Undifferentiated Hartshorne Project Pittsburg & Hughes Counties, OK
<u>10</u> Gross Sand Value (50% Clean Sand Gamma Ray Cutoff)	Author: CJGDate: 15 May, 2004C.I. = 20' (with 10' Contour for thinner sandstone bodies)



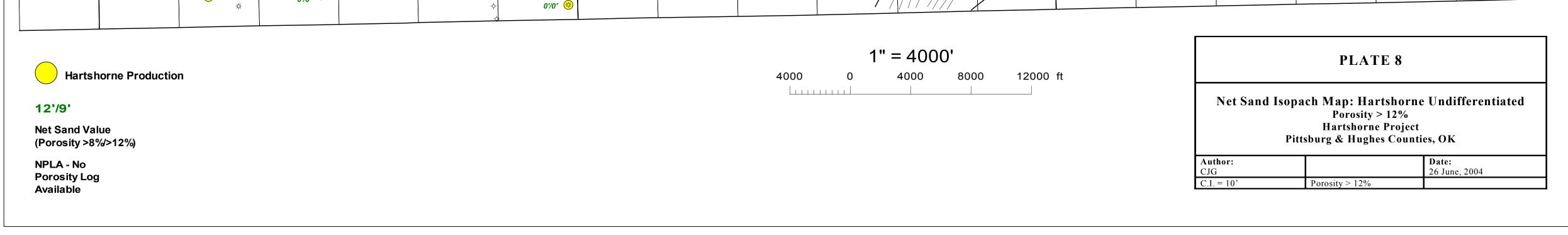


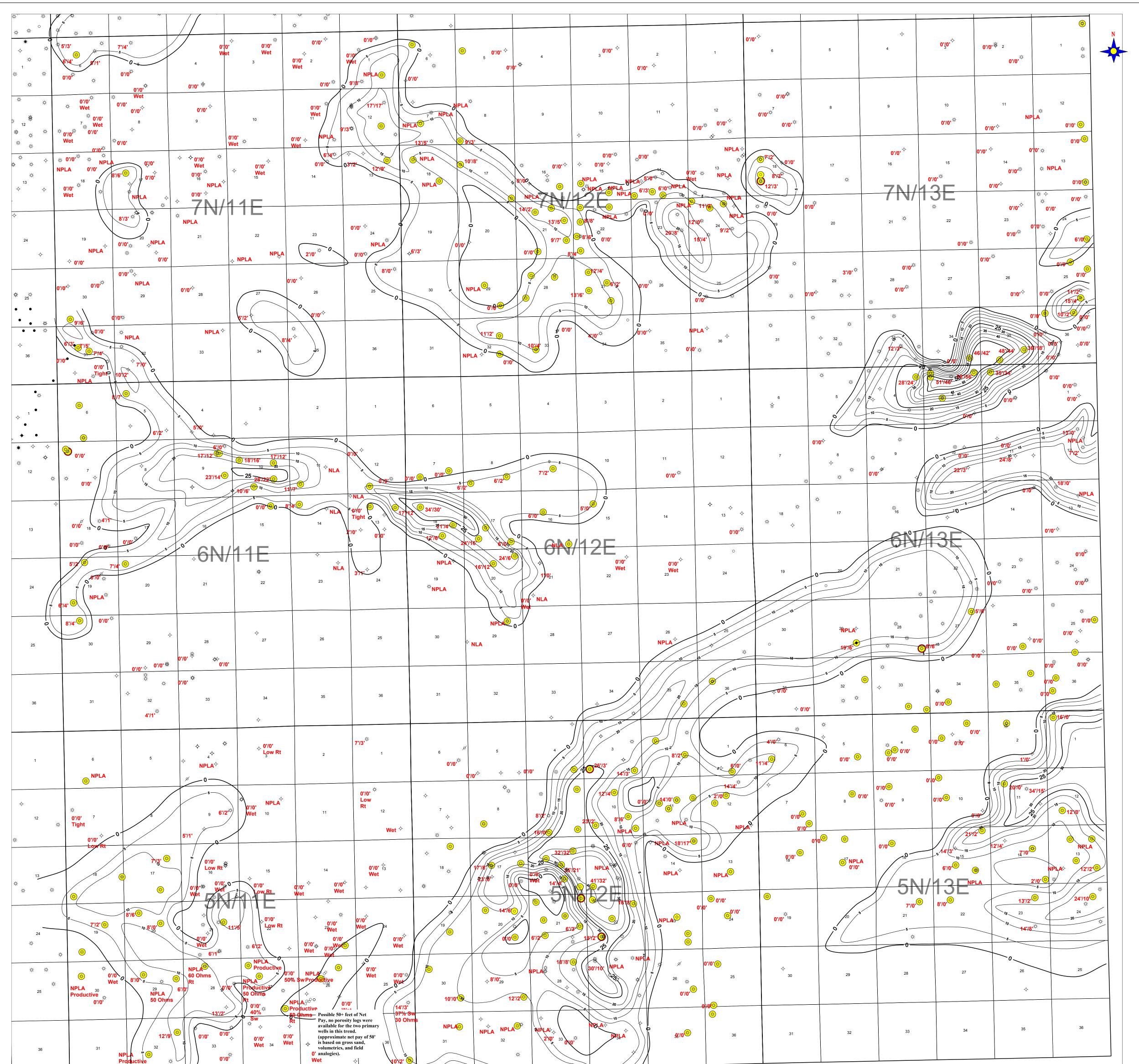
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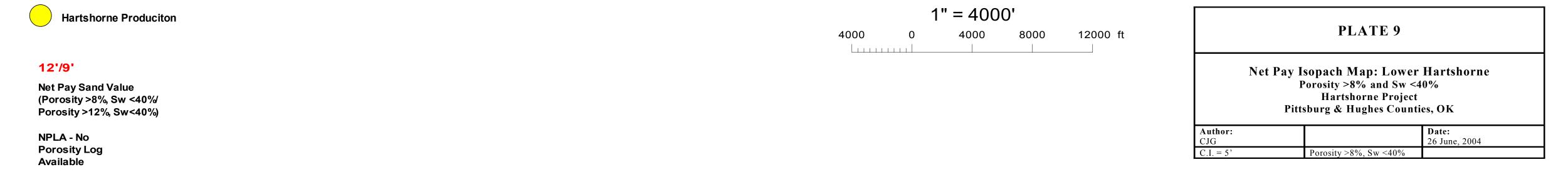


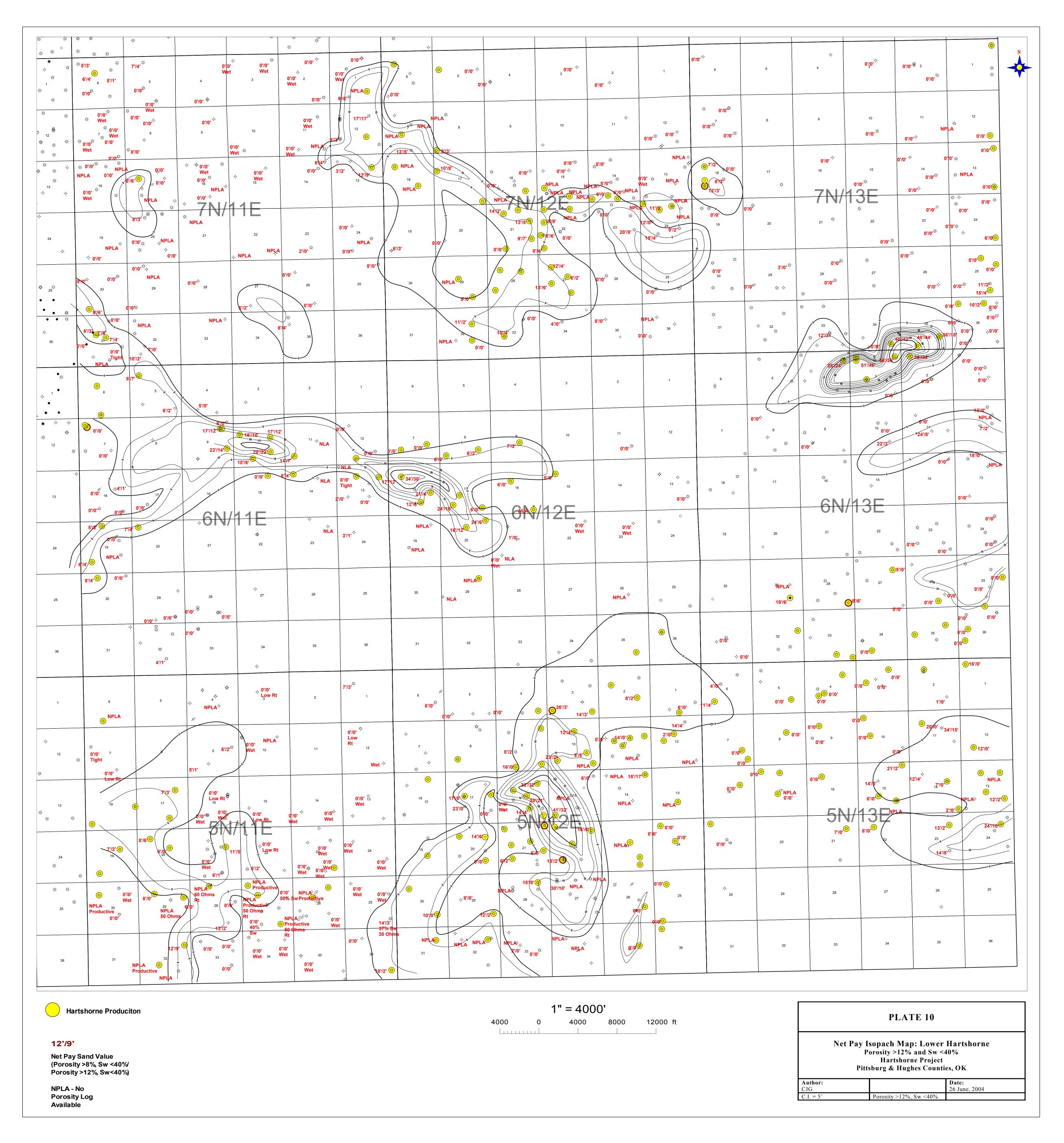
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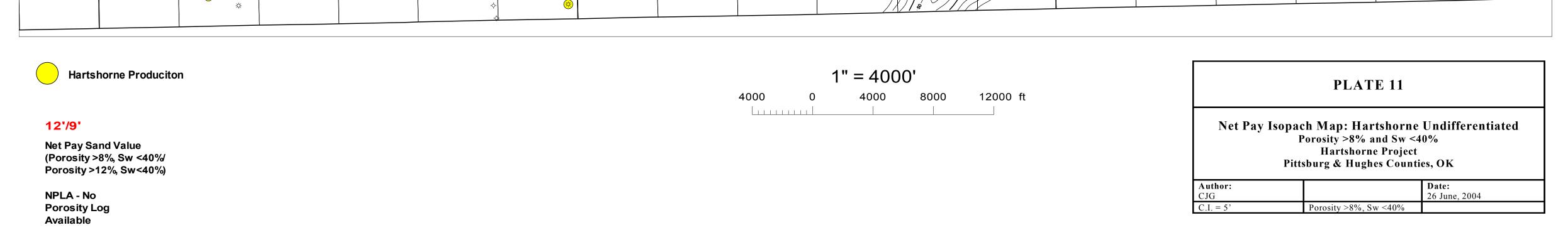




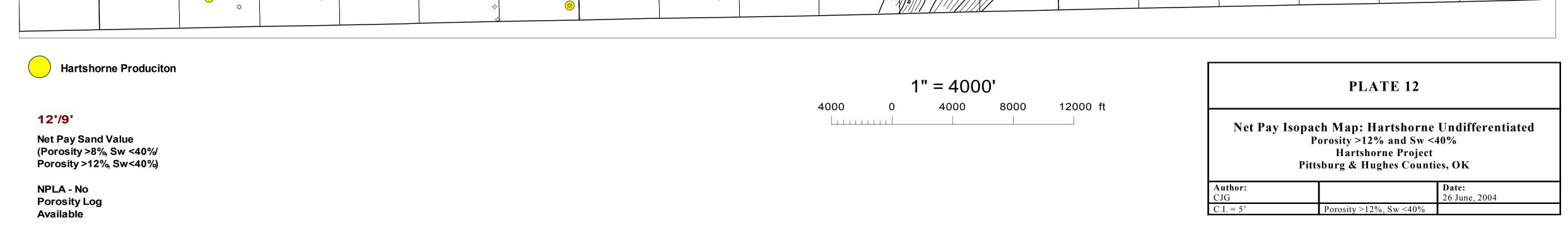


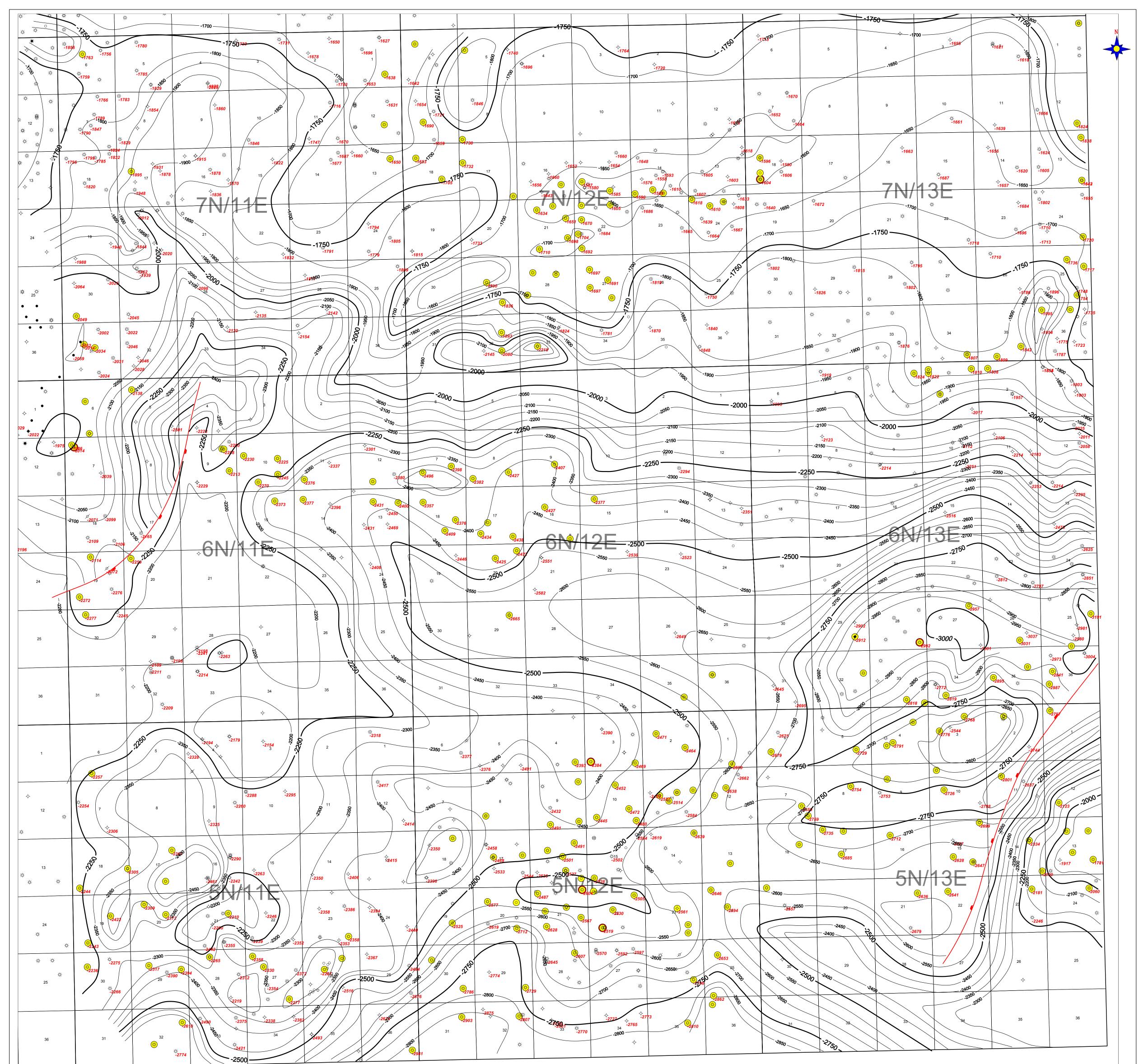


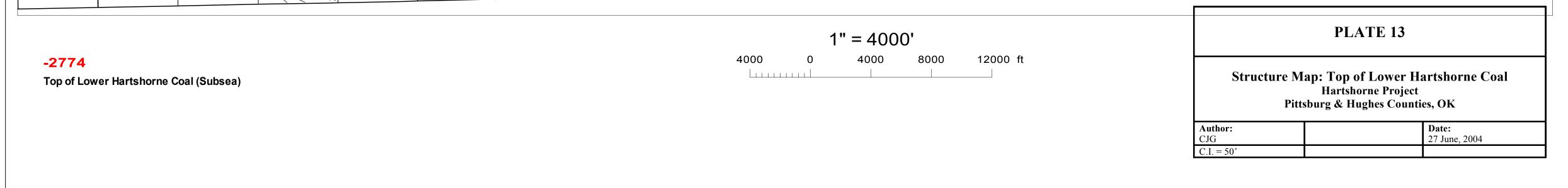
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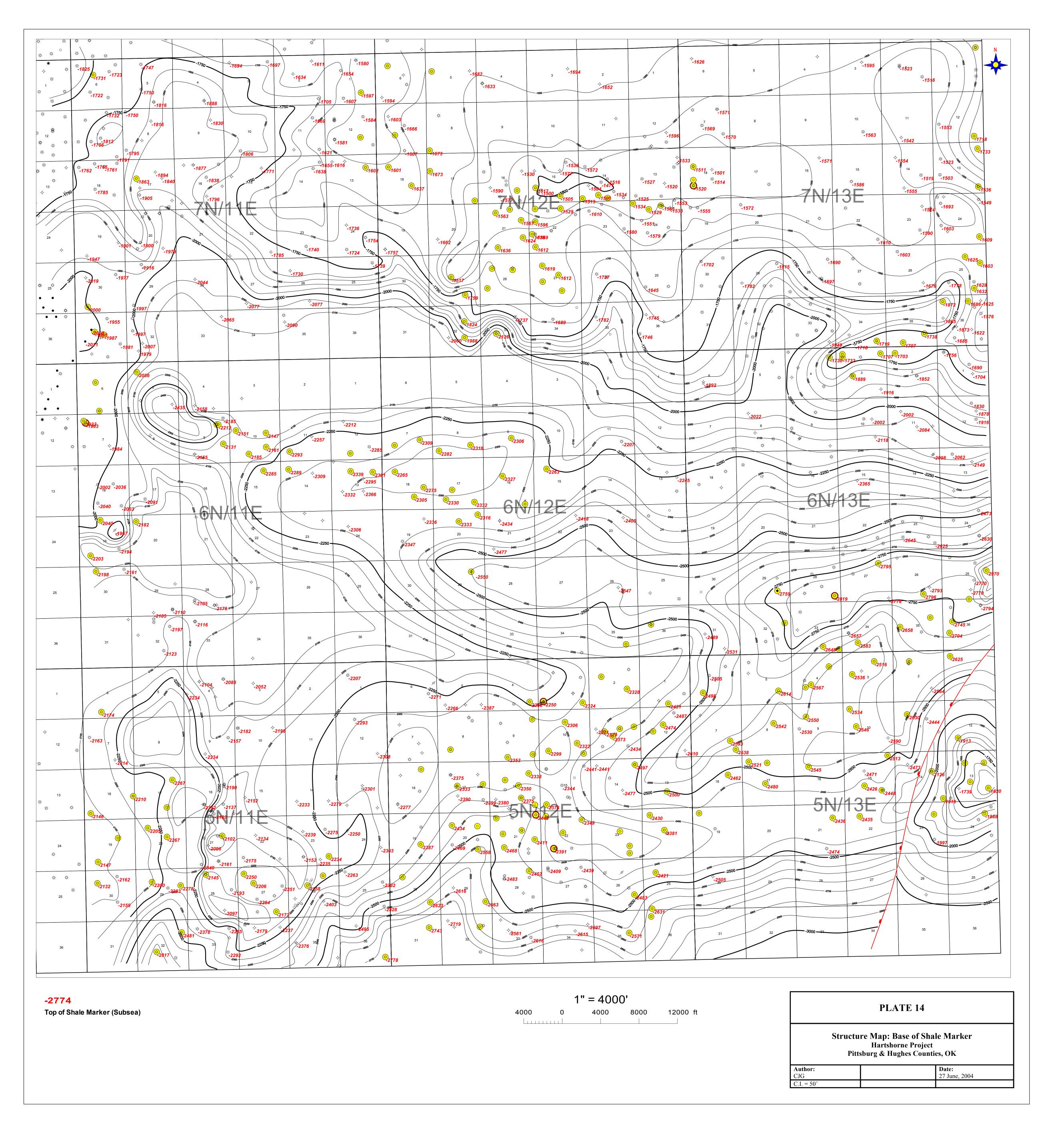


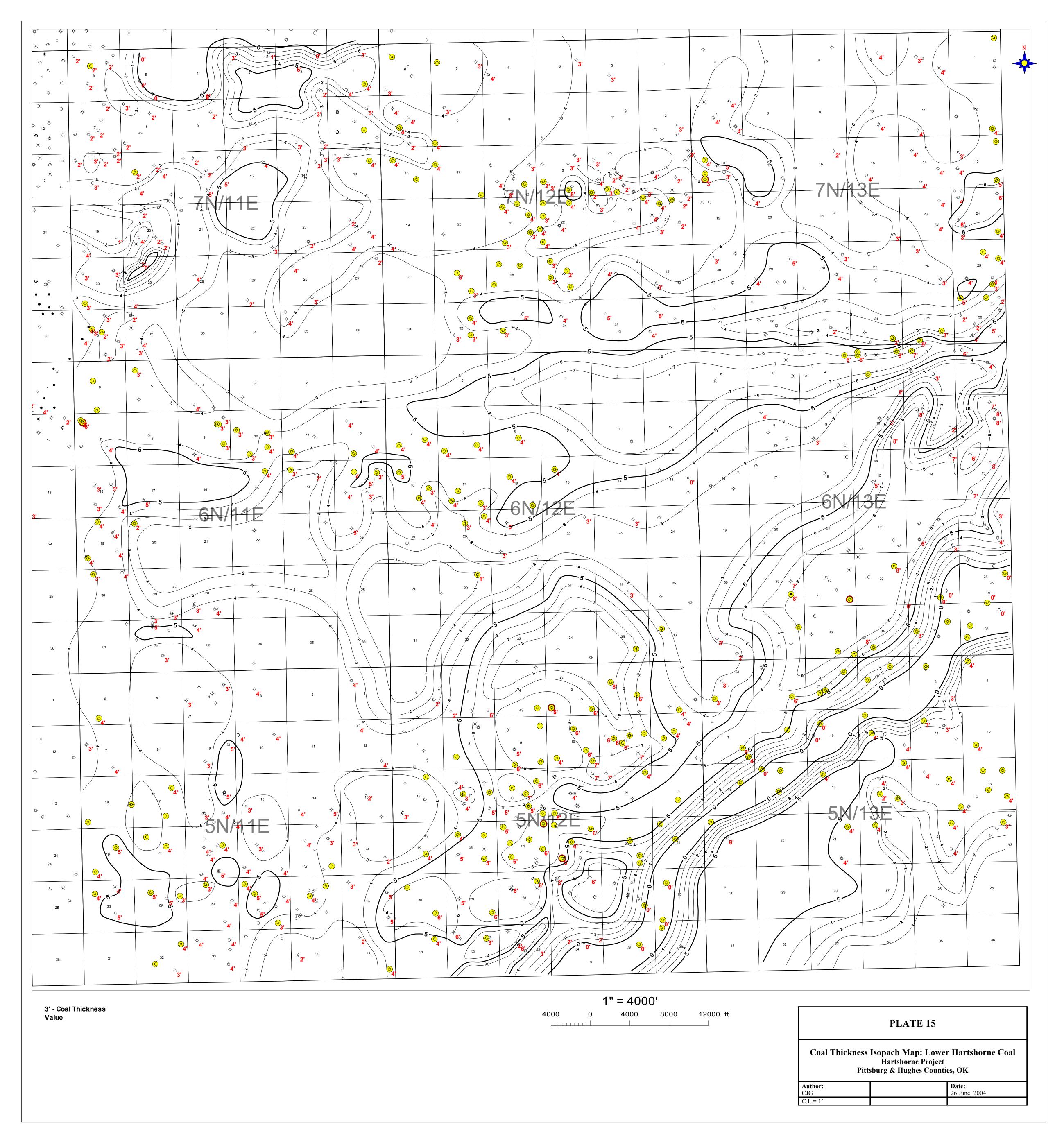
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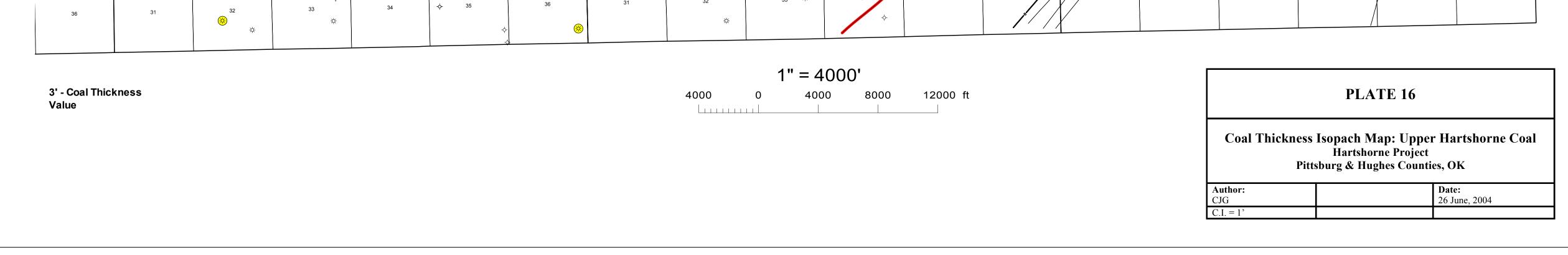


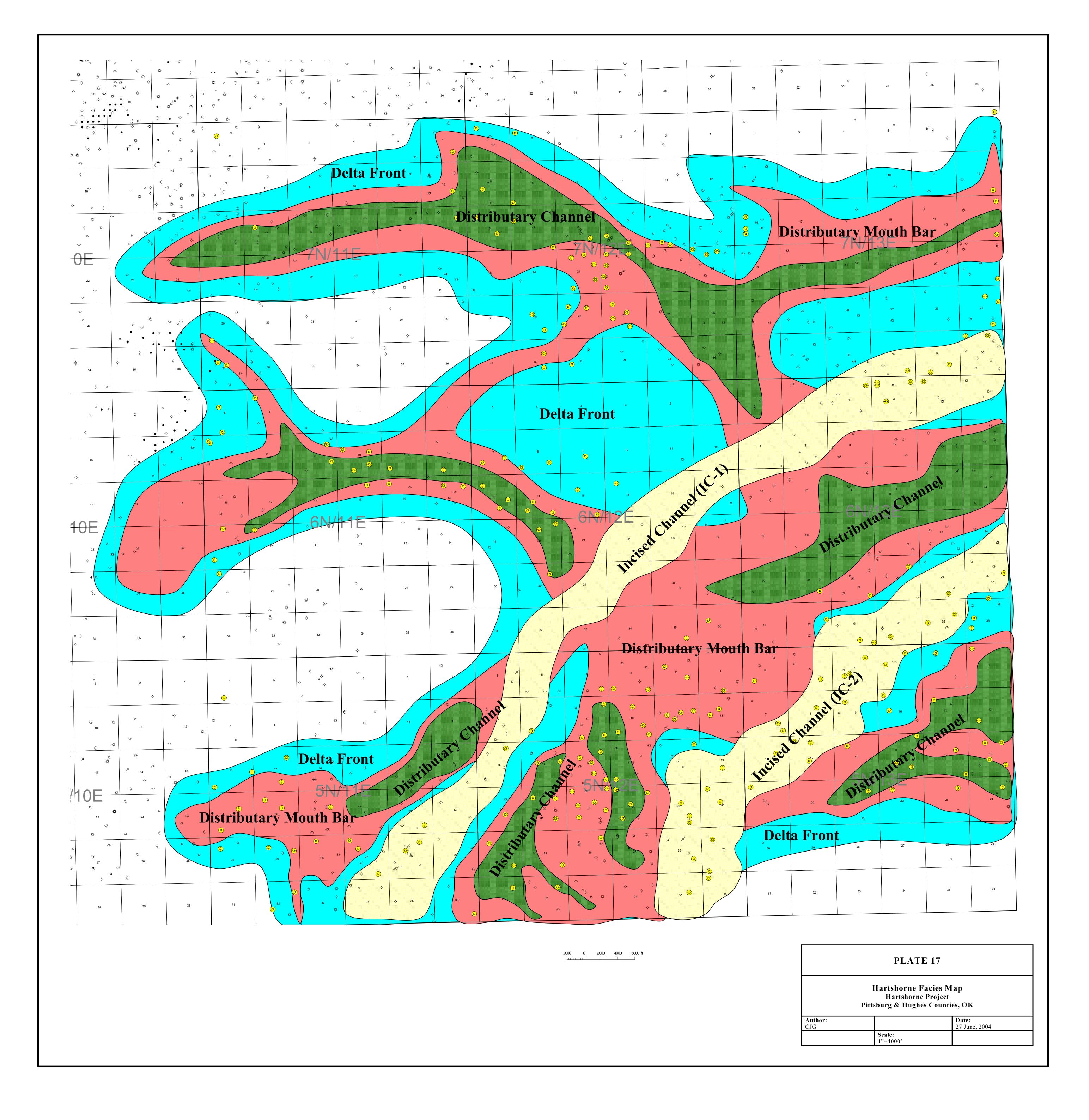


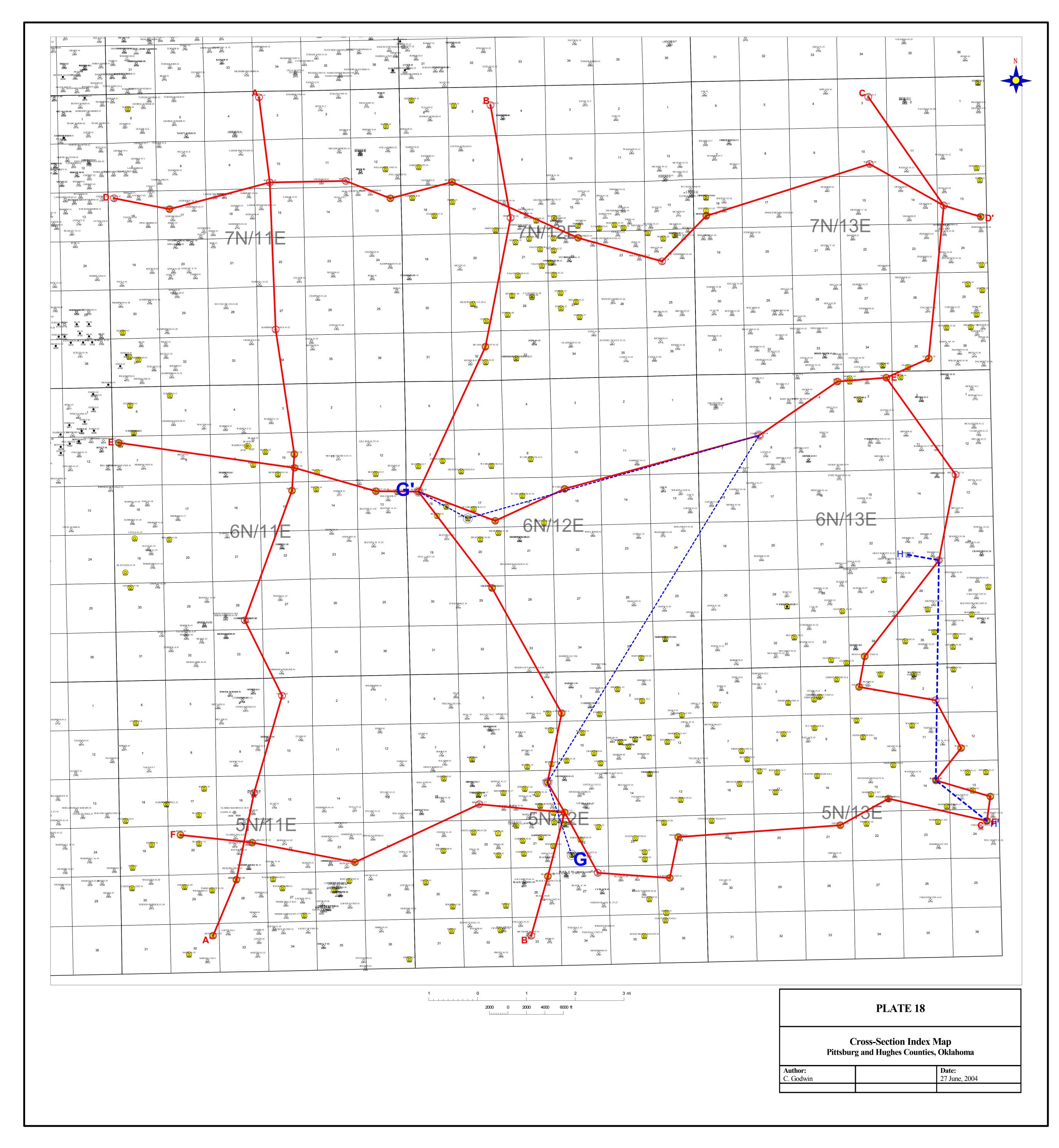


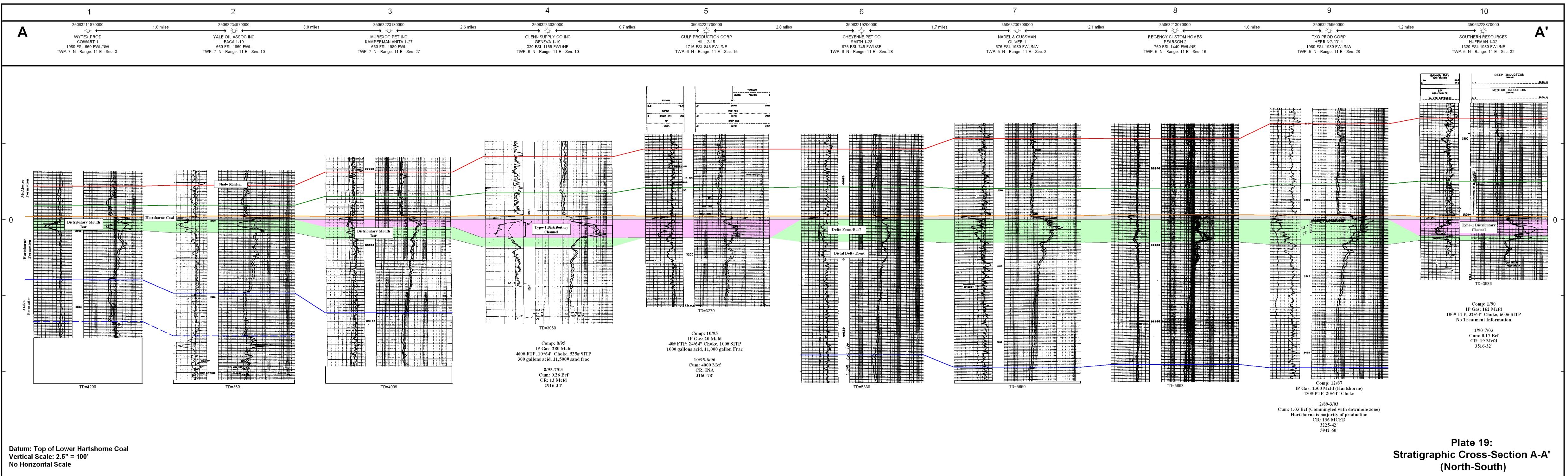


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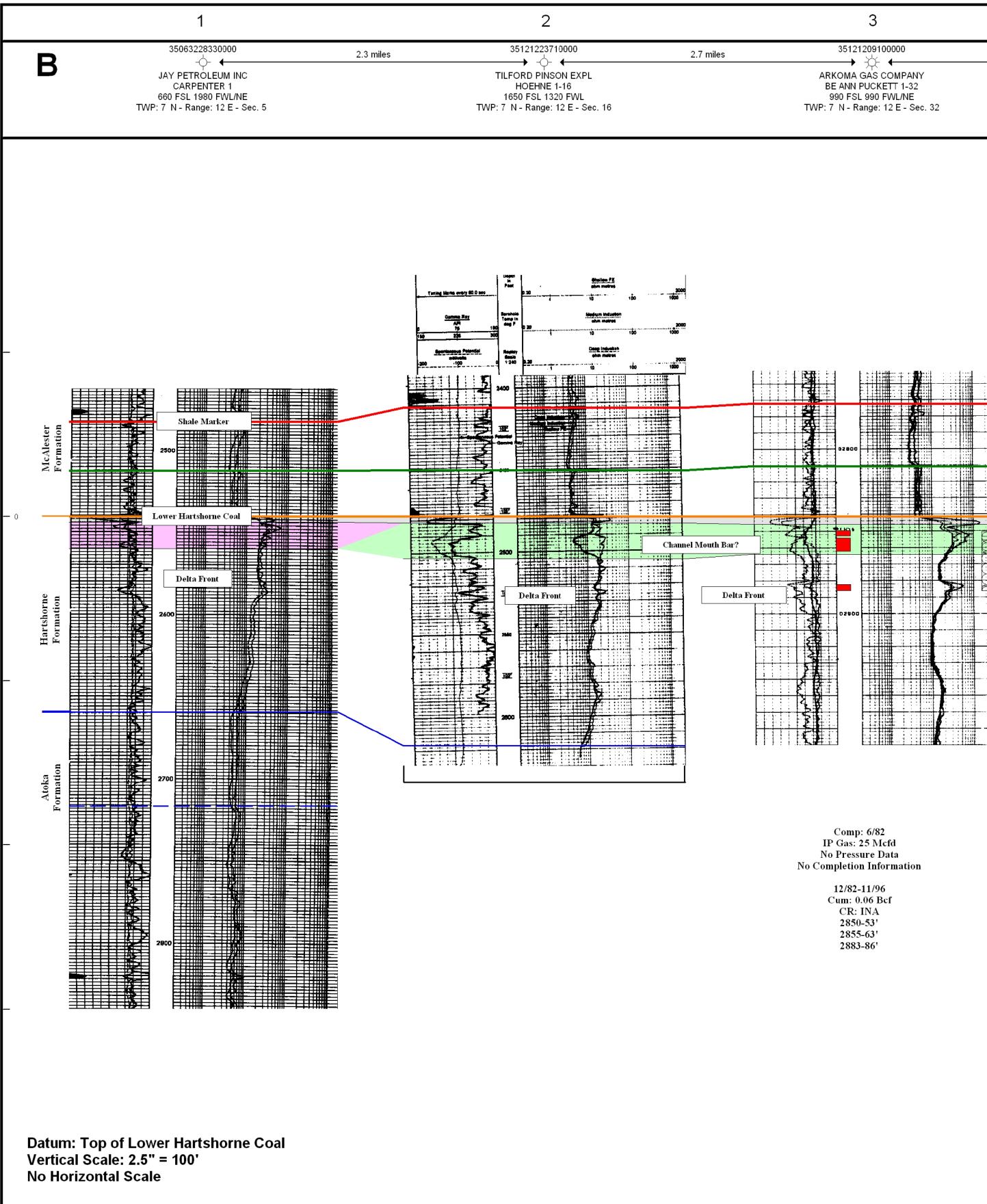








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3.3 miles

35121209100000 $\rightarrow \forall \leftarrow$ ARKOMA GAS COMPANY BE ANN PUCKETT 1-32

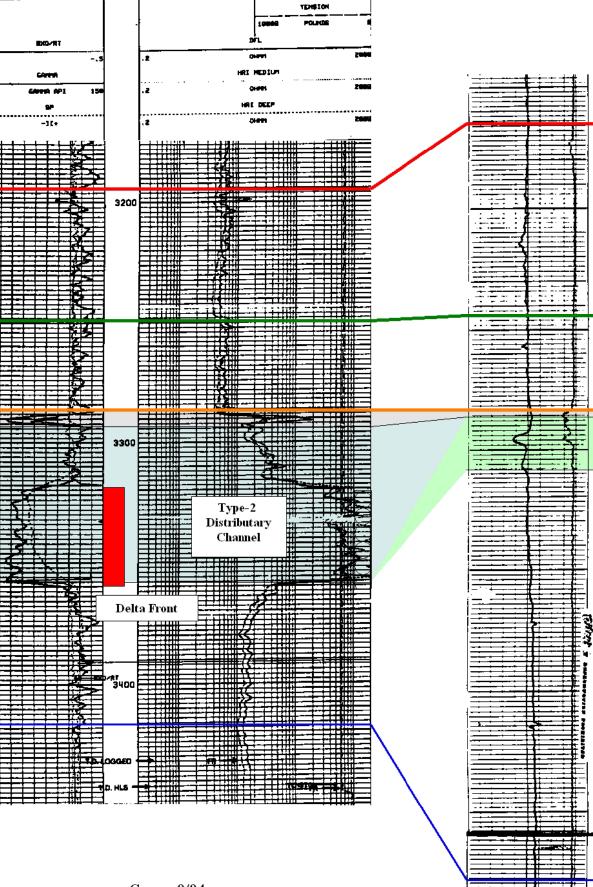
990 FSL 990 FWL/NE TWP: 7 N - Range: 12 E - Sec. 32

35121218230000 →☆ ←── GULF PRODUCTION CORP BLEVINS 2-18 1320 FSL 1320 FWL/NW TWP: 6 N - Range: 12 E - Sec. 18

2.5 miles

35121202410001 →☆ ←── ARKOMA GAS COMPANY HILSEWECK W J 1-29 1320 FSL 1220 FWL/NE TWP: 6 N - Range: 12 E - Sec. 29

3

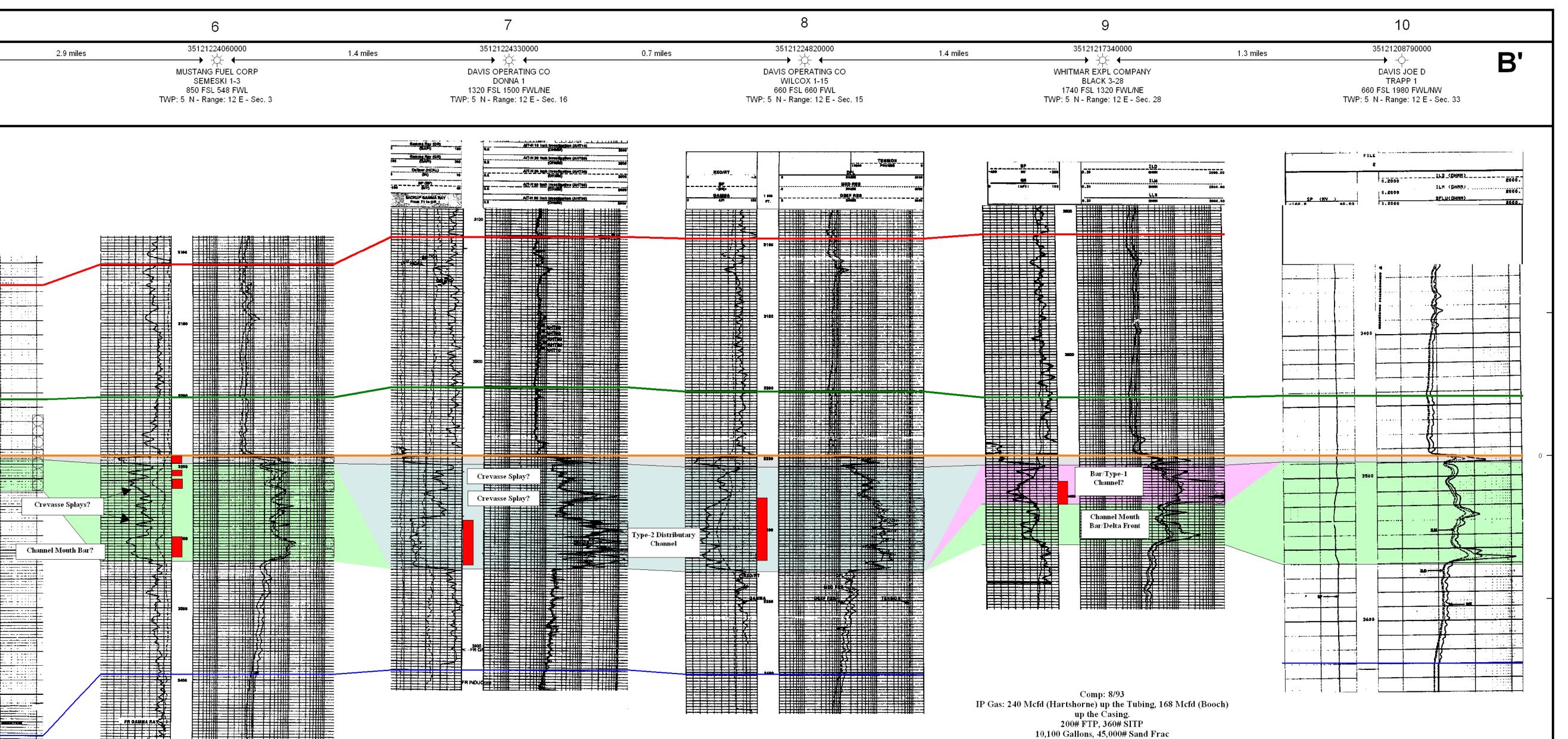


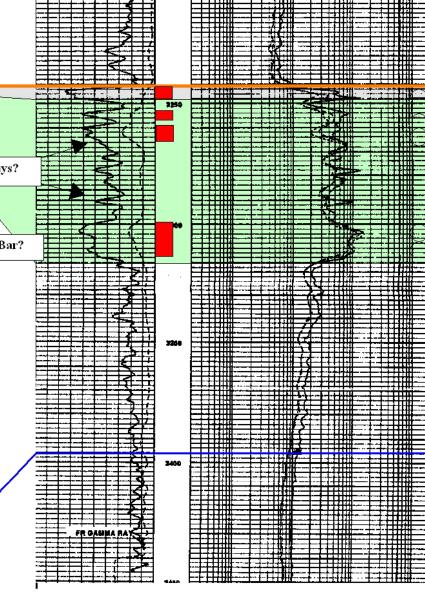
Comp: 6/82 IP Gas: 25 Mcfd No Pressure Data No Completion Information

> 12/82-11/96 Cum: 0.06 Bcf CR: INA 2850-53' 2855-63' 2883-86'

Comp: 9/94 IP Gas: 527 Mcfd 140# FCP, 24/64'' Choke 505# SICP 2000 Gallons Acid

> 6/95-7/03 Cum: 0.98 Bcf CR: 169 Mcfd 3319-60'





Comp: 7/00 IP Gas: 262 Mcfd 235# FTP, 14/64" Choke 450 BBL, 46,000# Frac

> 10/00-9/03 Cum: 0.22 Bcf CR: 139 Mcfd 3244-48' 3254-56' 3260-68' 3300-14'

Comp: 9/00 IP Gas: 561 Mcfd 110# FTP, 16/64'' Choke 2000 Gallons Acid 35,646 Gallons & 56,240# Sand Frac

> 9/00-8/03 Cum: 0.43 Bcf CR: 177 Mcfd 3311-42'

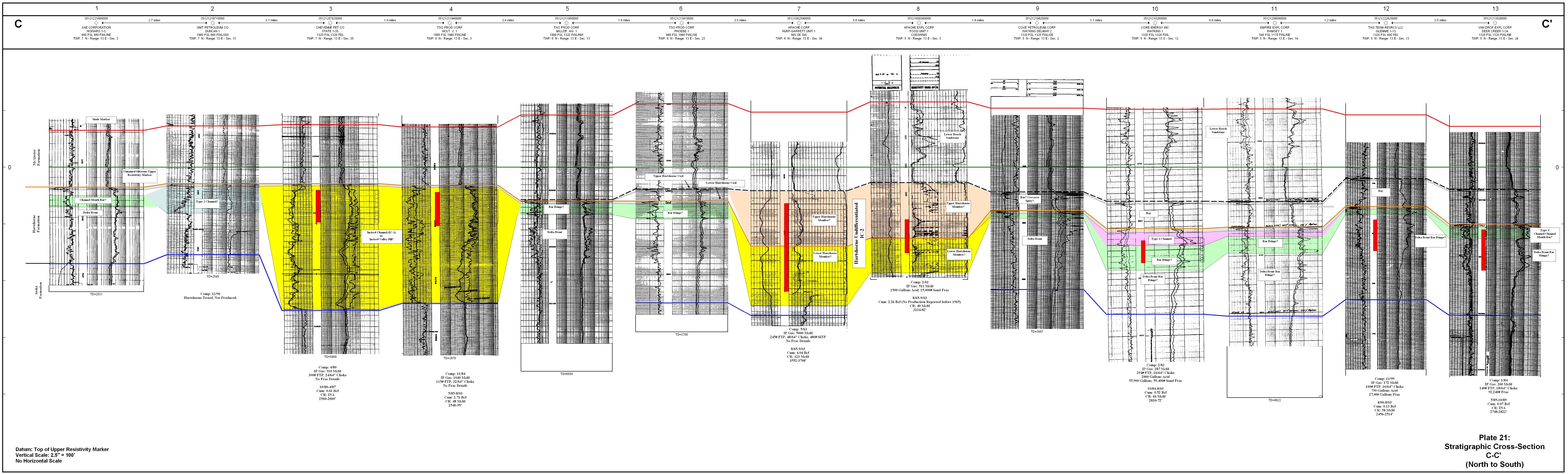
Comp: 1/01 IP Gas: 517 Mcfd 285# FTP, 20/64'' Choke 1500 Gallons HCL Acid 56,000# Sand Frac

> 2/01-8/03 Cum: 0.38 Bcf CR: 56 Mcfd 3278-3322'

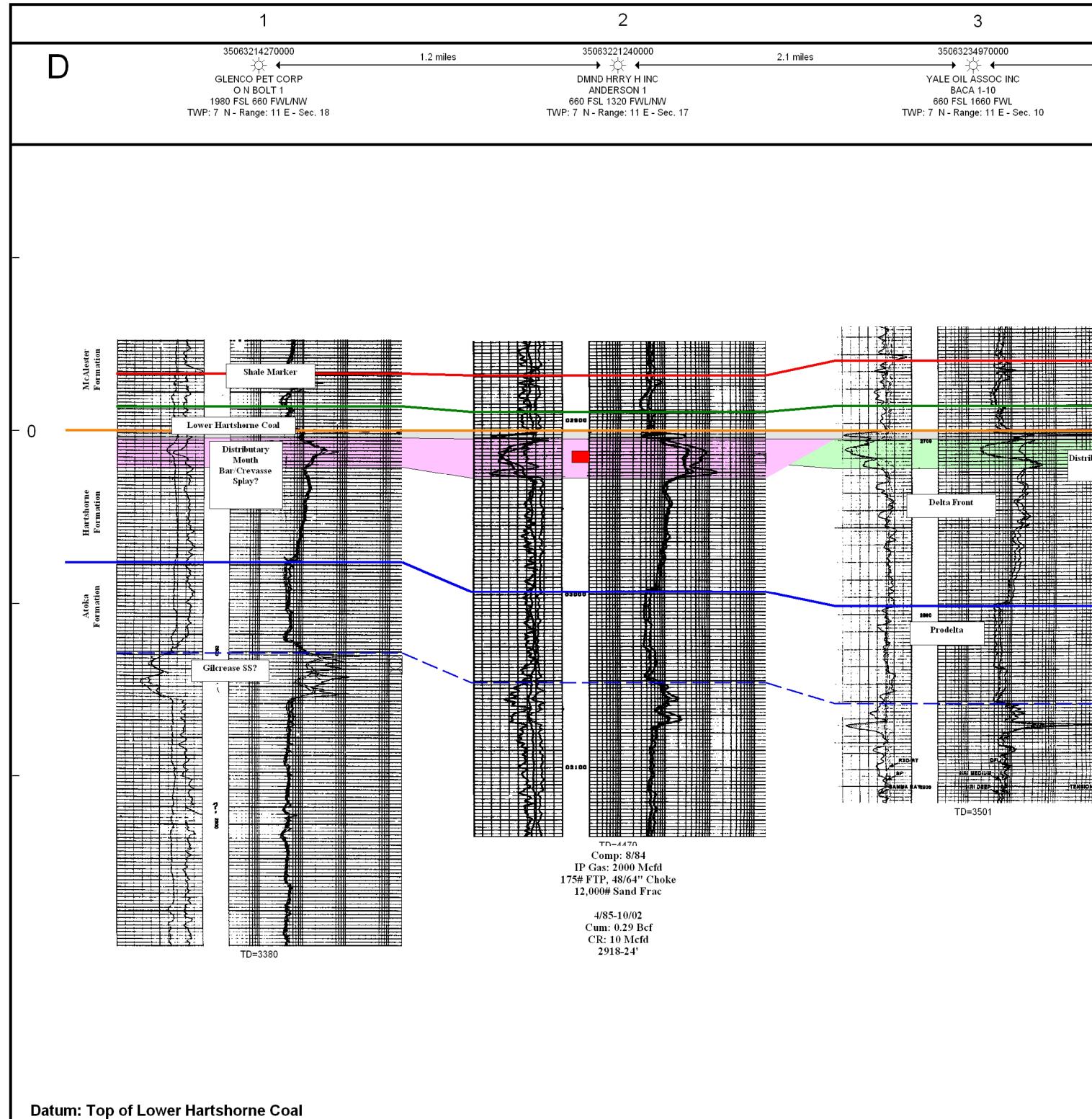
8/93-6/03 Cum: 0.43 Bcf (Hartshorne & Booch) CR: 80 Mcfd 3390-3406' (Hartshorne)

2932-46' (Booch)

Plate 20: Stratigraphic Cross-Section B-B' (North to South)



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	TXO PROD CORP HOLT `J` 1 1980 FSL 1980 FWL/NE TWP: 6 N - Range: 13 E - Sec. 3		TXO PROD CORP MILLER `AG` 1 1980 FSL 1320 FWL/NW TWP: 6 N - Range: 13 E - Sec. 13		TXO PROD CORP PHOEBE 1 660 FSL 1980 FWL/SE TWP: 6 N - Range: 13 E - Sec. 23		APAC HUNT-GA NV TWP: 6 N - R

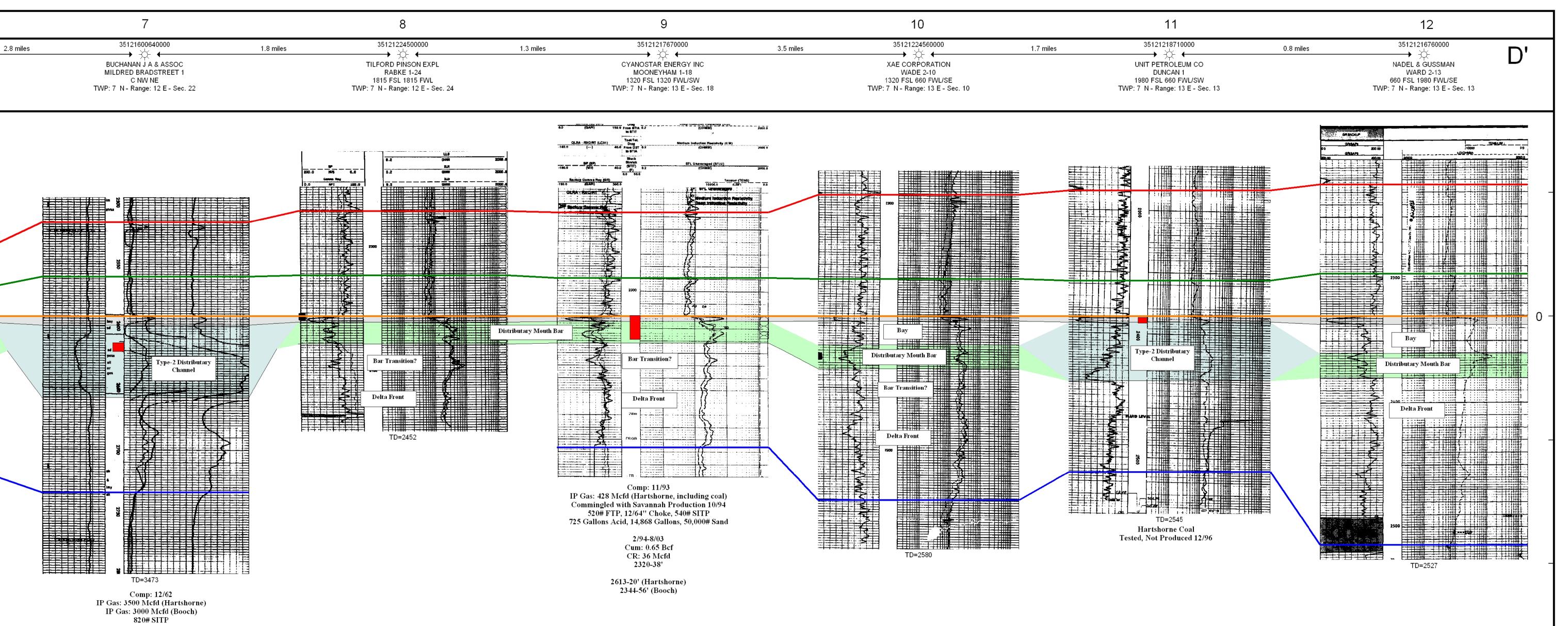


Vertical Scale: 2.5" =100' No Horizontal Scale - Equally Spaced Logs

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6/85-8/03 Cum: 0.24 Bcf CR: 12 Mcfd 2531-44'

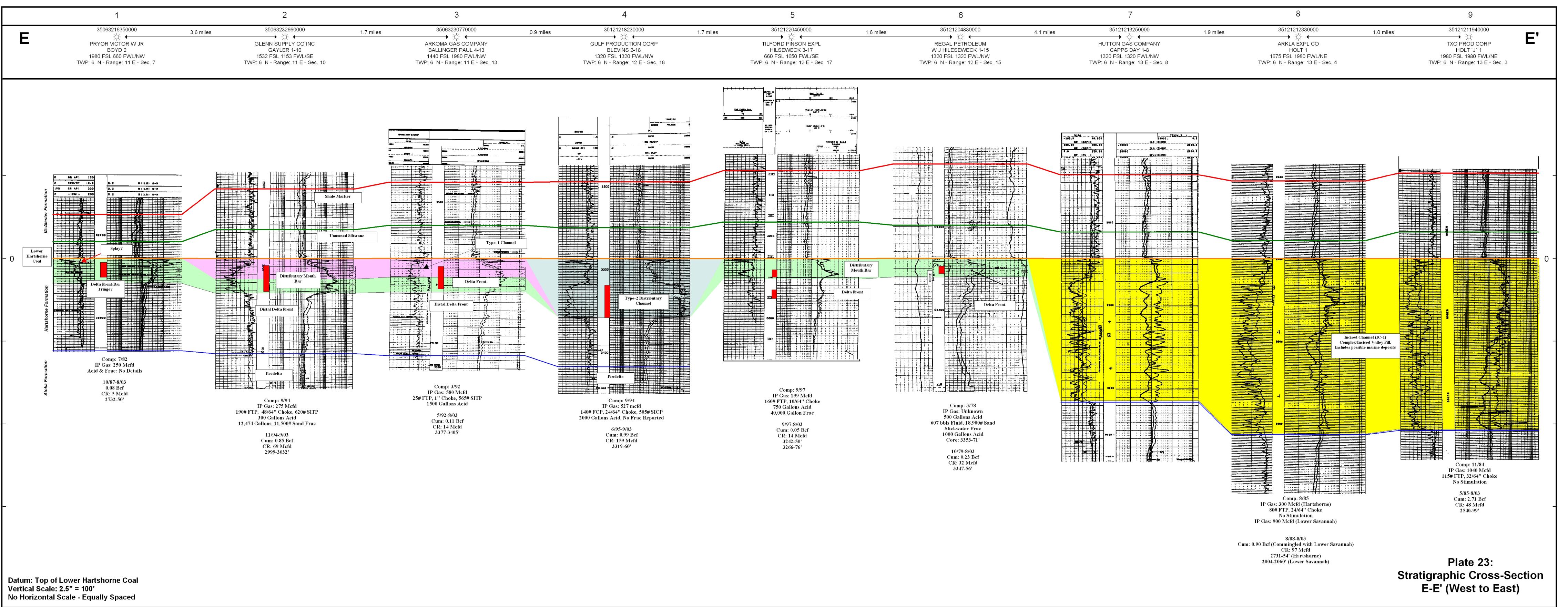
4/85-10/02 Cum: 0.29 Bcf CR: 10 Mcfd 2918-24'

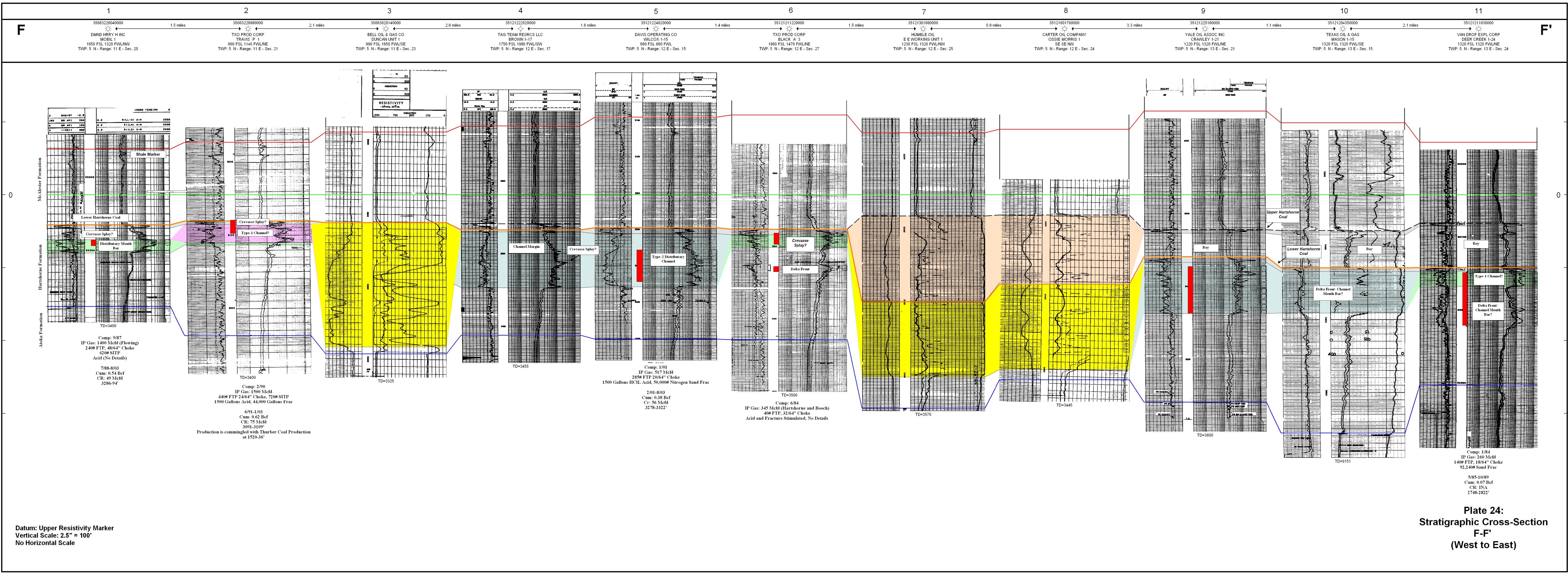


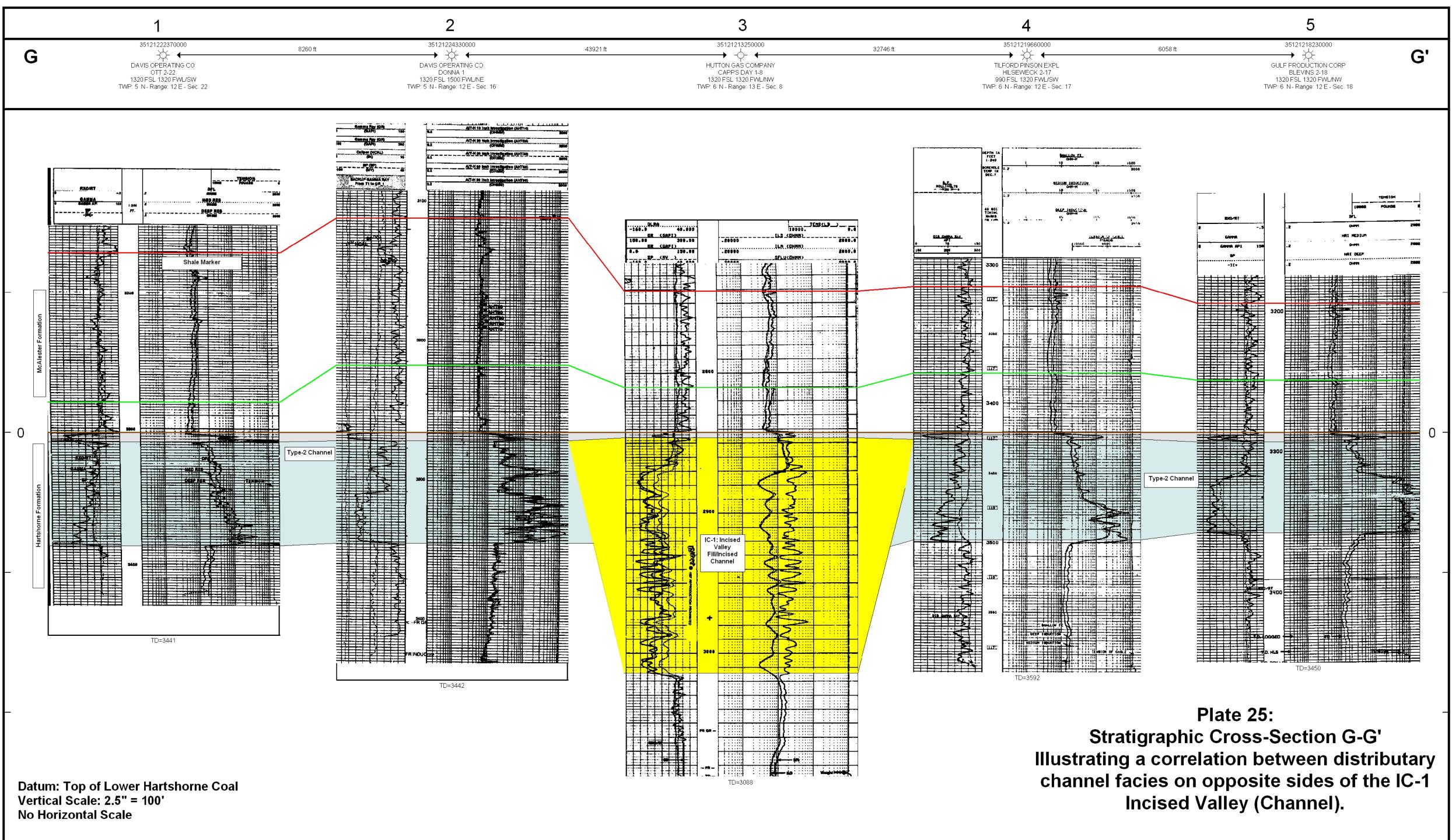
2/63-8/69 Cum: 0.69 Bcf CR: INA

2613-20' (Hartshorne) 2344-56' (Booch)

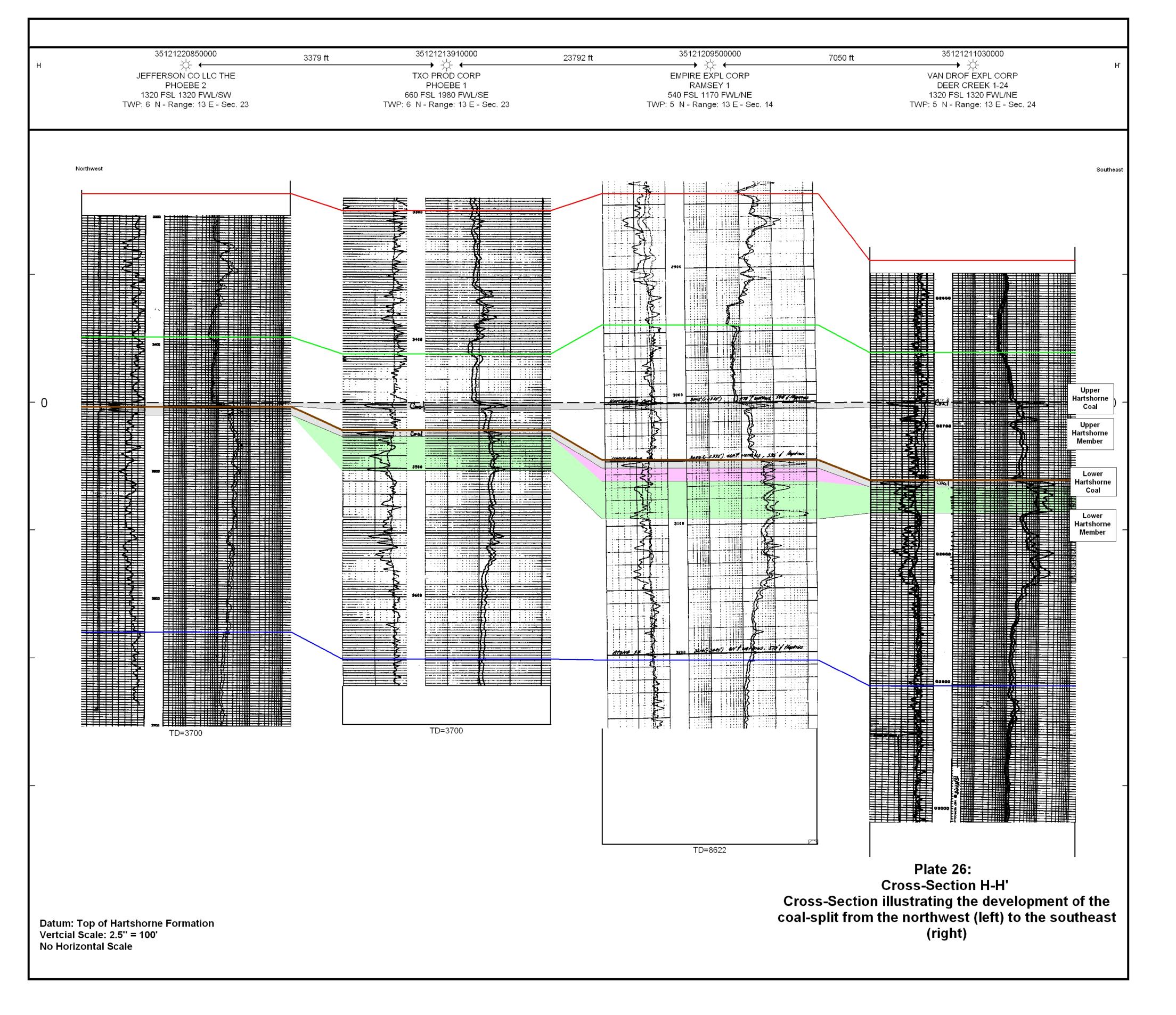
Plate 22: Stratigrapchic Cross-Section D-D' (West to East)











VITA

Cory John Godwin

Candidate for the Degree of

Master of Science

Thesis: ELECTROFACIES, DEPOSITIONAL ENVIRONMENTS, AND PETROLEUM GEOLOGY OF THE HARTSHORNE FORMATION IN PARTS OF HUGHES AND PITTSBURG COUNTIES, OKLAHOMA

Major Field: Geology

Biographical:

- Personal Data: Born in Tulsa, Oklahoma, On June 14, 1974, the son of Robert and Sandra Godwin.
- Education: Graduated from Cascia Hall Preparatory School, Tulsa, Oklahoma in May 1993. Received Bachelor of Science Degree in Geology from Oklahoma State University, Stillwater, Oklahoma in December 1997. Completed the requirements for the Master of Science degree with a major in Geology at Oklahoma State University in August, 2004.

Experience: Worked as teaching assistant at Oklahoma State University in 1998, at the University of Tennessee in Knoxville in 1998, and at Baylor University in Waco, Texas from 1999-2000. Currently employed as an Associate Geologist with Questar Exploration and Production Company in Tulsa, Oklahoma.

Professional Memberships: American Association of Petroleum Geologists, Tulsa Geological Society, East Texas Geological Society, Shreveport Geological Society