

FY 2007 Annual Technical Report for NCRDS State Cooperative Program

SUBSURFACE DEVONIAN AND MISSISSIPPIAN GAS-SHALE SAMPLES,
BARNETT AND SMITHWICK SHALES (FORT WORTH BASIN), AND
WOODFORD AND BARNETT SHALES (DELAWARE BASIN):
CORE SAMPLING FOR MEASURED VITRINITE-REFLECTANCE (R_o)
DETERMINATION

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**Subsurface Devonian and Mississippian Gas-Shale Samples,
Barnett and Smithwick Shales (Fort Worth Basin), and
Woodford and Barnett Shales (Delaware Basin):
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Introduction

This report summarizes activities carried out by the Bureau of Economic Geology (BEG) during Fiscal Year (FY) 2007 for the National Coal Resources Data System State Cooperative Program (NCRDS project). The report represents a departure from those prepared in previous years by providing a collection of Devonian-Mississippian and Mississippian gas-shale samples. Approval for this change in sample type was given by the USGS in March 2008. Samples were collected from whole cores of three wells in Wise and San Saba Counties, Fort Worth Basin, north Texas (Fig. 1), and Pecos County, Delaware Basin, west Texas (Fig. 2) for vitrinite-reflectance (R_o) analysis by the USGS. Other study activities include identification of the sampled shales' precise geographic location and their stratigraphic position.

Study Areas

We submit 21 samples of three widespread gas-shale units in two Texas depositional basins. A total of 11 samples of gas shale were collected from whole cores of the Texas United Blakely #1 well in southeastern Wise County and the Houston Oil & Minerals Walker D-1-1 well in north-central San Saba County (Fig. 1, Table 1). Both wells occur in the in the Fort Worth Basin of north Texas. Three samples of the

Mississippian Barnett Shale were provided from the Texas United Blakely #1. The Houston Oil & Minerals Walker D-1-1 yielded three Barnett samples and five samples of the Pennsylvanian (Morrowan-Atokan) Smithwick Shale.

We also provide five samples of the Upper Devonian/Lower Mississippian Woodford Shale and five samples of the Barnett Shale from the Pioneer Reliance Triple Crown #1 well in western Pecos County of west Texas (Table 1). The well penetrates strata of the Delaware Basin of west Texas.

The three cores are stored at the BEG's Austin Core Research Center. Precise geographic locations of these wells and specific well data, core data, and sample depths were plotted and annotated on a GIS (ArcView) map of the two counties, which is included with this report on a CD-ROM.

Stratigraphy and Depositional Setting

The lower Barnett Shale in the Fort Worth Basin (Fig. 3) is a proven prolific reservoir of natural gas, whereas the Smithwick Shale (Fig. 4) in the same basin is currently under investigation as a potential "Barnett-like" gas source. The Woodford and Barnett Shales of the Delaware Basin, like many black-shale formations in the U.S. (e.g., Brown, 2006; Williams, 2006), are also undergoing intensive scrutiny as natural-gas reservoirs.

The Barnett in the Fort Worth Basin varies from 200 to more than 1,000 ft in thickness and comprises primarily a mixture of organic-rich siliceous mudstone and argillaceous lime mudstone (marl) (Loucks and Ruppel, 2007). The unit underlies the Lower Pennsylvanian (Morrowan) Marble Falls Limestone throughout the basin (Figs. 3 and 4). It and the lower Atoka siliciclastic successions are the principal reservoir-bearing zones in the basin. The unit is inferred to have been deposited in a deep-water slope-to-basinal setting under dysaerobic to anaerobic bottom conditions over an extended time

span (~25 m.y.) (Loucks and Ruppel, 2007). Study of the Barnett Shale of the Delaware Basin is ongoing; samples from the Pioneer Reliance Triple Crown #1 well are among the first to be publicly available for analysis.

Few detailed data on depositional origins of the organic-rich Smithwick Shale exist in the geologic literature. Most interpretations follow that of Lahti and Huber (1982), which infers that the unit is the prodelta facies of the regional Grant deltaic system in the south and southeast parts of the Fort Worth Basin. The unit comprises dark-gray to black shales that are as much as 900 ft thick.

The Upper Devonian-Mississippian Woodford Shale (Fig. 5) of the Delaware Basin is a prolific hydrocarbon source rock throughout the southern Midcontinent of the United States. In south-central and southeastern Oklahoma it produces both oil and natural gas. The dominant Woodford lithology is black shale, but chert, siltstone, sandstone, dolostone, and light-colored shale are common locally. The primary sites of hydrocarbon generation coincide mostly with principal depocenters of the Delaware and Anadarko Basins; however, mature source beds are found in adjacent provinces (Comer, 2007).

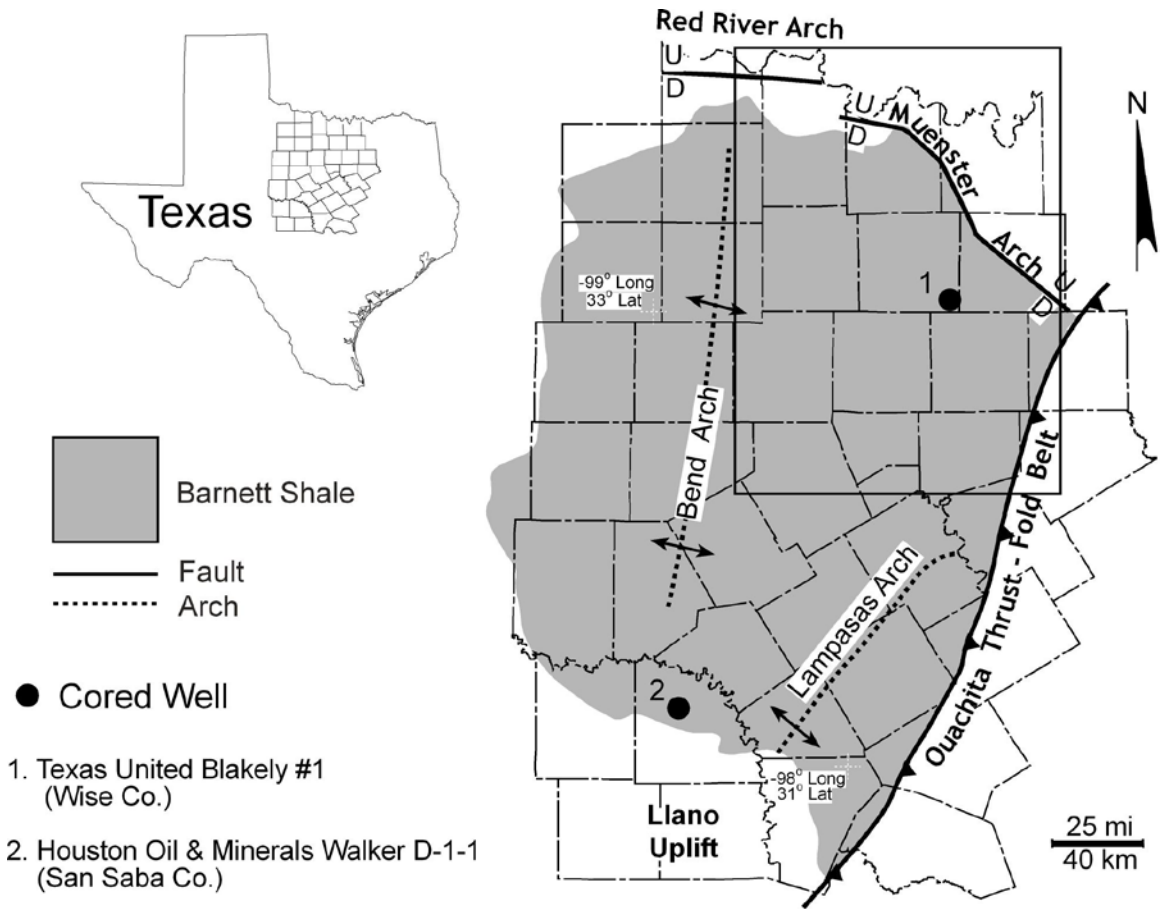


Figure 1. Map showing locations of the Texas United Blakely #1 and Houston Oil & Minerals Walker D-1-1 wells in the Fort Worth Basin, north Texas. Modified from Loucks and Ruppel (2007).

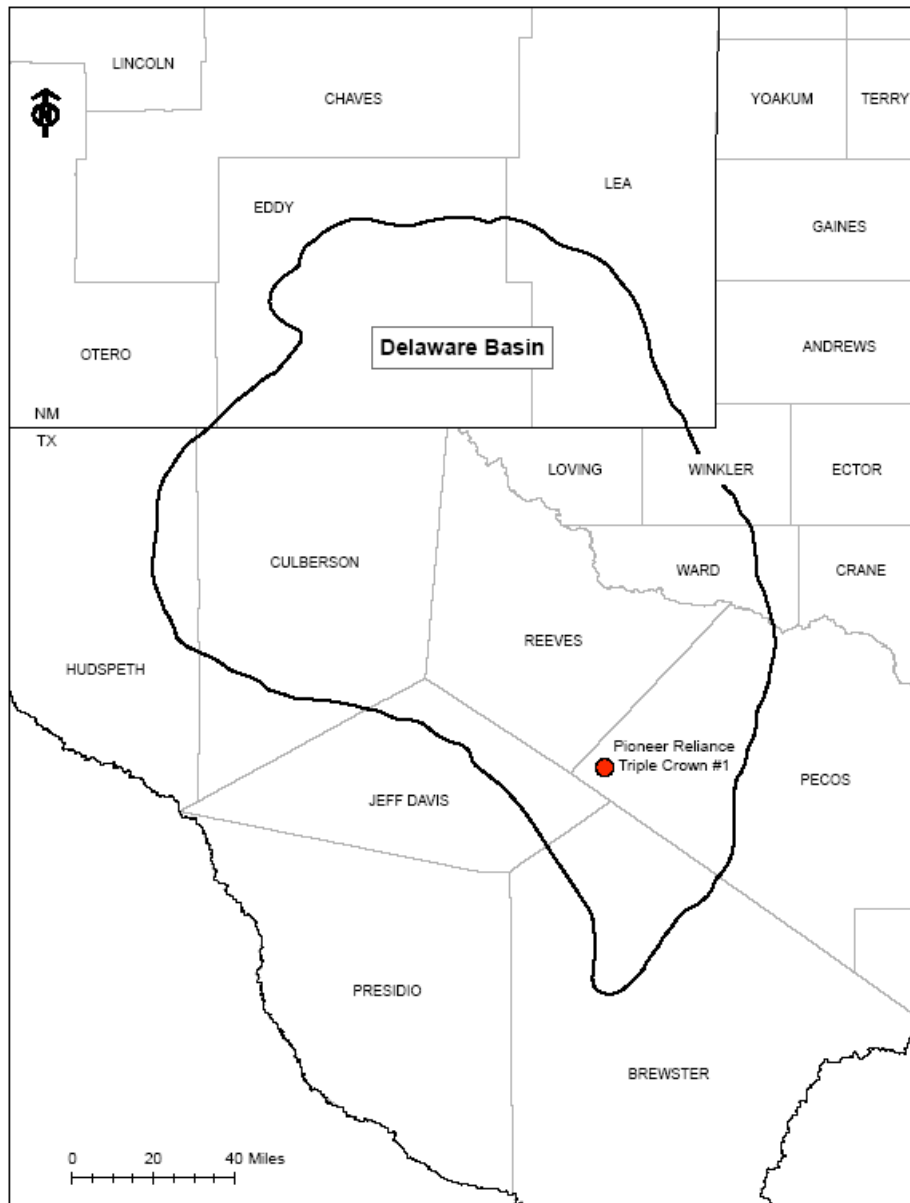


Figure 2. Map showing location of the Pioneer Reliance Triple Crown #1 well in the Delaware Basin, west Texas.

Table 1. Distribution of gas-shale samples by formation.

Texas United Blakely #1

Barnett Shale

7,105 ft
7,170 ft
7,221 ft

Houston Oil & Minerals Walker D-1-1

Smithwick Shale

247 ft
374 ft
515 ft
772 ft
1,053 ft

Barnett Shale

1,256 ft
1,282 ft
1,292 ft

Pioneer Reliance Triple Crown #1

Barnett Shale

12,345 ft
12,420 ft
12,482 ft
12,545 ft
12,621 ft

Woodford Shale

12,770 ft
12,850 ft
12,930 ft
13,011 ft
13,098 ft

**Texas United Blakely #1
Wise County, Texas**

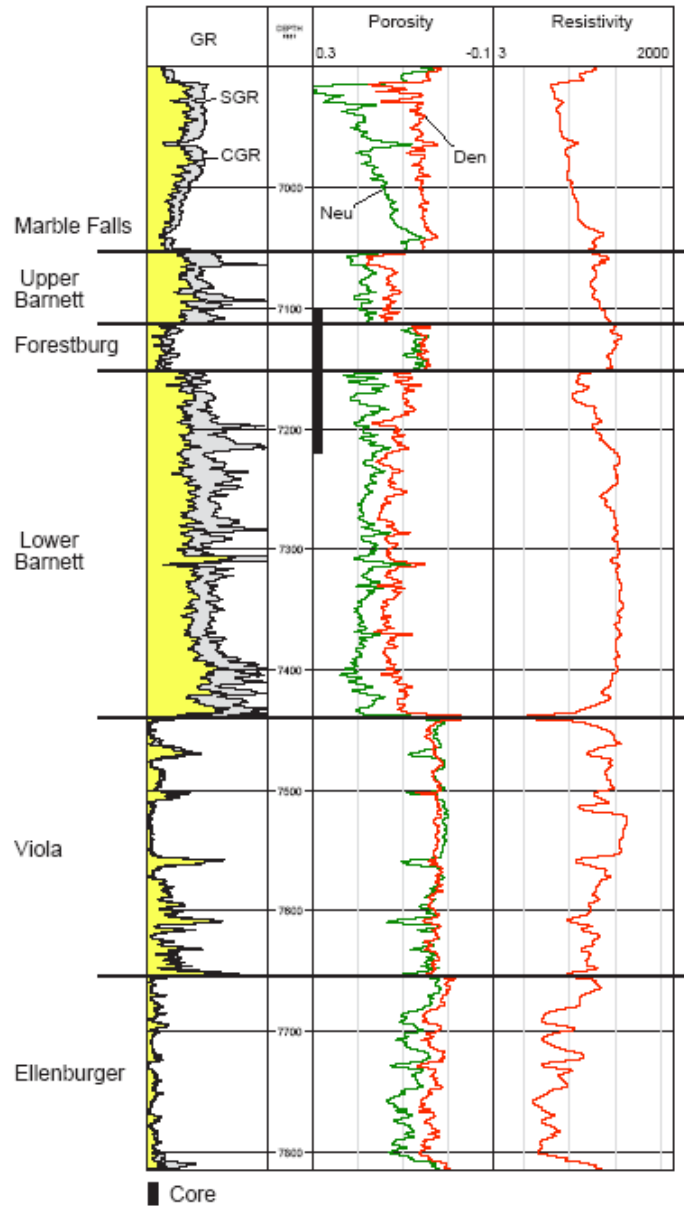


Figure 3. Wireline-log suite and location of cored zone for the Texas United Blakely #1 well.

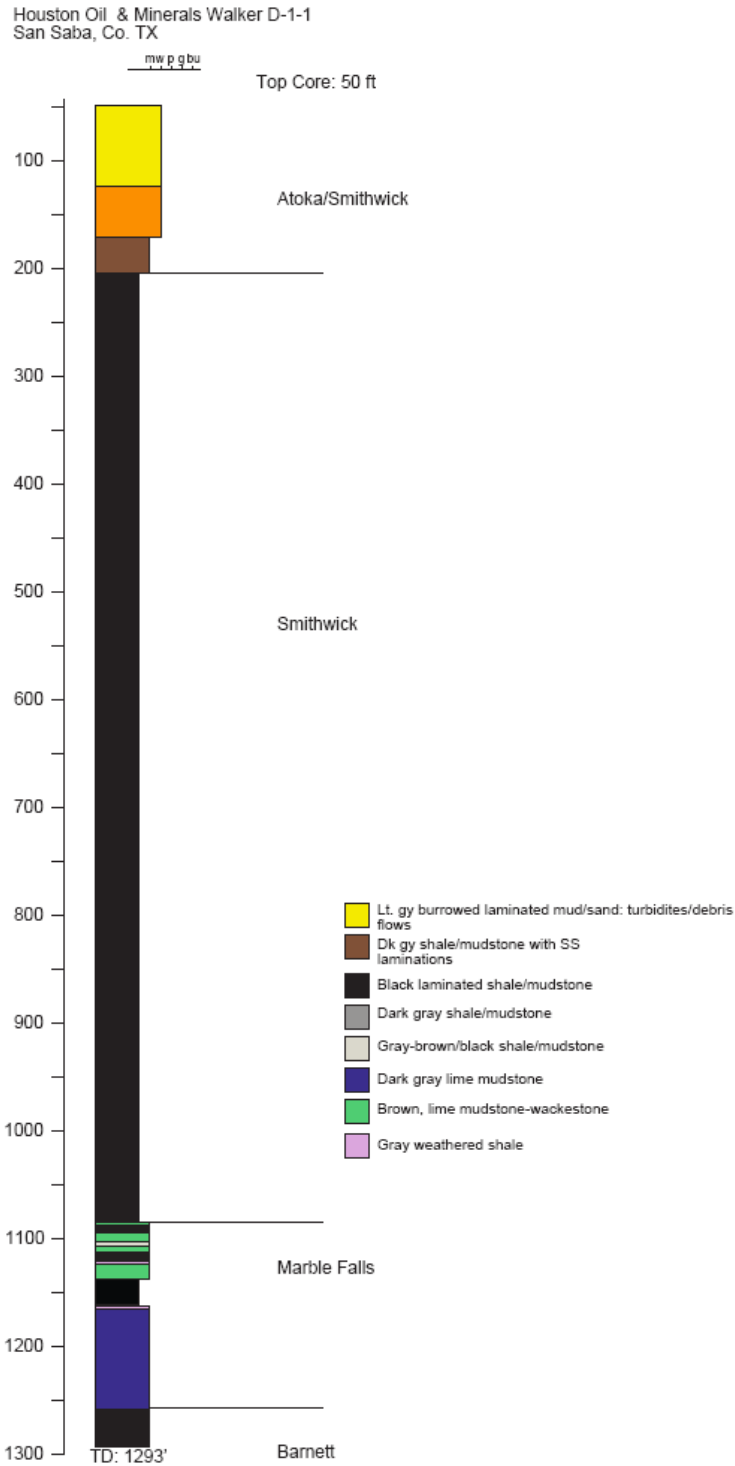


Figure 4. Core description of the Houston Oil & Minerals Walker D-1-1 well. No well log is available at this time. Gas-shale samples are from the Barnett and Smithwick Shales.

Reliance Triple Crown 1

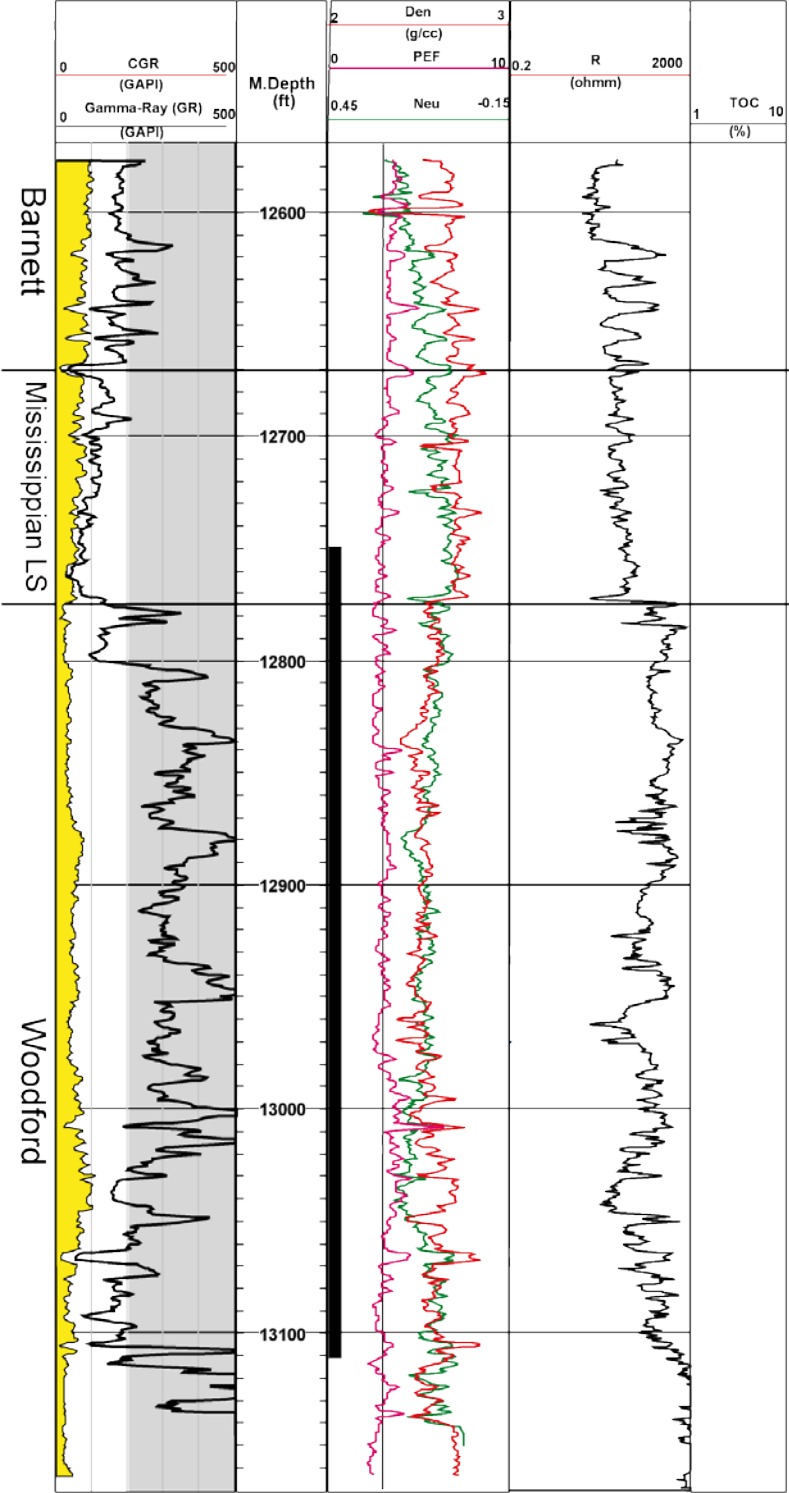


Figure 5. Wireline-log suite and location of cored zone for the Pioneer Reliance Triple Crown #1 well.

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