

**GEOLOGIC EXPLANATION**  
for the approval of the  
**HUECO SOUTH UNIT AREA**  
**HIDALGO COUNTY, NM**

**Regional Setting**

The Pedregosa Basin is located in southwest New Mexico, southeast Arizona and Chihuahua Province of Mexico and originated in early Paleozoic time. A significant portion of the basin (and the main emphasis of this report) is positioned in the southeast corner of Hidalgo County, New Mexico (as is the Hueco South Unit area) and has a similar depositional history as the Midland and Delaware basins and many of the same rock units.

The Hueco South Unit, if approved, will be located west of the Alamo and Big Hatchet Mountains and offers extraordinarily attractive structural targets, dramatic stratigraphic traps and major reef trends that remain untested for oil and natural gas reserves. Also the Percha shale (Woodford equivalent) holds superlative potential and is laterally pervasive over the entire unit area. The only well located within the unit area was drilled in 1958 at a location on the eastern down dip portion of the unit. The Humble #1 BA State well tested gas at 86 MCFGPD from the Permian Epitaph formation (Abo equivalent) and is on the western margin of the U-Bar syncline that defines the depo-center of the basin (through time) within the USA. Reserves for the US Pedregosa Basin have been estimated at 13TCF and 2 billion barrels of oil.

Dan A. Hughes Company, L.P., the Operator of the proposed Hueco South Unit, has recently contracted with Dawson Geophysical Company to acquire 3-D seismic data to better define drilling targets near the old Paleozoic basin center in Hidalgo County. Seismic operations are expected to commence in November 2007 or as soon as a field crew is available to the site.

However, in the event the final processed and interpreted 3-D seismic data is unavailable for determining a superior location prior to December 1, 2007, it is the intent of the operator to drill the initial well (Hueco South Unit 26 State #1) in the unit to test the Percha Shale (and the Permian Abo reef formation) in Township 32 South, Range 17 West, Section 26, in the southwest quarter at 660' FWL and 660' FSL achieving a proposed total depth of 6,600' subsurface. This location has been selected utilizing 2-D seismic data acquired and reprocessed in 2005 and is currently being surveyed and platted (along with the source and receiver lines) by Dawson's surveying contractor.

**Deposition History**

## Ordovician through Mississippian Age

The basin is characterized by four main depositional cycles, which are separated by major hiatuses and erosional truncation. The oldest cycle is Ordovician through Mississippian and is dominated carbonate deposition. Both conventional and unconventional plays are attractive targets in this sequence of rocks. The two major reservoir units in this cycle are the Ordovician El Paso dolomites and the Montoya dolomite. The El Paso is equivalent to the Ellenberger Formation in the Midland and Delaware basins. These plays are expected primarily on structural highs such as those observed in the Hueco South Unit area.

The unconventional gas play in this sequence is the Percha shale, which is age equivalent to the Woodford shale in the Midland and Delaware basins as well as the Mid-Continent region. The Woodford is a hotly pursued play in these areas and is yielding considerable success. However, it should be noted that the Percha shale within the Hueco South Unit area ranges in thickness from 300 to 350 feet as opposed to less than 100 feet of shale encountered in most of the areas where the Woodford is actively being explored and developed.

The TOC values measured in the Percha, measure less than what might be expected due to inherently poor quality samples. The readings are from composite well cuttings that were stored "open-shelved" for decades prior to analysis. Outcrop samplings were also used. Consequently the reported values (see section on Source Rock and Thermal Maturity) are lower than those that are freshly sampled and properly obtained. Therefore, it is reasonable to assume original TOC values of 2.5%, or better, are characteristic for the Percha. Thermal maturity values are primarily in the dry gas window. The Percha shale, due to its pervasive nature through out the Hueco South Unit area, is a most attractive exploration target.

## Pennsylvanian through Permian Age

The second depositional cycle is Pennsylvanian through Permian age. This cycle exhibits the most attractive opportunities in the Pedregosa Basin in the Permo - Penn sequence which was deposited in a dramatically smaller basin than the previous cycle. Large well-developed reef tracks, depositional onlap, depositional terminations and erosional truncations characterize the Permo-Penn cycle in the Hueco South Unit area.

Sparse drilling in the region, however, failed to test any of these targets. 2D seismic data and nearby reef outcrops verify the presence of these plays in the subsurface. Seismic reef profiles are observed in the Hueco South Unit trending from south to north at (varying depths) across major portions of the unit. Therefore, the main objectives within the unit area are reef sequences and depositional on lap in the Horquilla formation whose Midland and Delaware age equivalents are the Wolfcamp, Cisco, Canyon, Strawn, Atoka and Morrow formations.

Additionally, the Permian age Epitaph and Concha formations are also characterized by reef buildups, depositional bed terminations and erosional truncation of their upper members. These formations are age equivalent to the San Andres, Bone Springs and Abo formations in the Midland and Delaware basins and are significant targets within the unit.

#### Cretaceous Age

The third depositional cycle is early Cretaceous in age and duration and appears as a thin veneer of sediments that were deposited across the basin with an extraordinarily thick sequence of rocks being deposited in the U-Bar syncline. The syncline is a deep basinal trough, which trends from northwest to southeast through southwest New Mexico and into Mexico. Rich source beds and good reservoir units are expected in the U-Bar formation, which may exceed 3500' in total thickness in syncline. The eastern margin of the unit is at the western edge of the U-Bar syncline.

#### Tertiary and Quaternary Age

The fourth and final depositional cycle is the Tertiary and Quaternary age sequence of rocks. These units were deposited as lacustrine, marginal lacustrine and fluvial sediments in the Playas and Hachita Valleys. They form a relatively thin veneer and do not hold significant hydrocarbon value. In addition both intrusive and extrusive rocks were implaced at this time but it appears the overall effect of volcanic activity in the area is limited since most of the wells in the area are not thermally altered. Consequently, most of the source rocks in this portion of the basin are in the early to late gas window and the vast majority of the hydrocarbon reserves in the Hueco South Unit area are expected to be natural gas.

#### **Tectonic History**

The Pedregosa basin has been subjected to extensive tectonic activity throughout its history creating major concerns about maintaining trap integrity. Our analysis which includes the use of seismic data, demonstrates the existence of undisturbed basinal sequences in the Hueco South Unit area where the sediment packages (of the Permo-Penn and Cretaceous age sequences) remain in tack. These packages are highly prospective over the targeted unit area.

Furthermore, it can be reasonably assumed from the data that basinal packages containing Pennsylvanian through Permian section are undisturbed by the sequence of tectonic events that effected the region and that reef trends extend laterally from the east boundary to west boundary of the Hueco South Unit. It is within the unit that these packages, that trap and seal hydrocarbon accumulations, remain in tack and represent the greatest opportunity for finding significant reserves. The assembled leasehold acreage within the Hueco South Unit has been selected for unitization for the purpose of exploiting these sequences and other structural traps.

Additionally, localized regional uplifts (during the Paleozoic and Mesozoic age) have resulted in erosional truncation and non-deposition of various stratigraphic units. Later

tectonic events involved late Cretaceous thrust faulting, followed by basin and range extensional faulting, with the most recent event being the localized emplacement of volcanics. The volcanic event involved both surface flows and intrusions. However, despite the extensive tectonic activity in the region undisturbed basinal sequences (particularly in the Permo-Penn sequence as well as several large structural features) remain intact.

### **Source Rock and Thermal Maturity**

Generally, southwest New Mexico (and specifically the Hueco South Unit area) is prone to generating (and accumulating) natural gas throughout most of the objective horizons. Geochemical data confirms this fact and proves the existence of source rocks with adequate kerogen and necessary thermal maturity to produce gas in quantities warranting exploration activities.

Also, it is important to recognize that throughout most of the region the later igneous activity did not overcook sediments and only adversely affects thermal maturity in localized areas. TOC values of .88 to 1.36% are described with thermal maturity levels ranging from 2 to 4 TAI (thermal alteration index) or late oil through late gas generation. It is also important in any analysis of these figures to recognize that the foundational source of these measurements were poorly preserved well samples and outcrop data.

Consequently, the TOC numbers reported in published data are inherently low and do not adequately represent adjusted projected values. It is expected that carefully obtained shale samples within the Hueco South Unit area will yield TOC values in the range of 2.00%, or greater.

In closing, we refer you to an extensive rock study of the Pedregosa Basin that was conducted by Sam Thompson of the New Mexico Oil Conservation Division in 1981. He concluded in his report that the US portion of the basin could possibly yield ultimate oil and gas reserves in the range of 13 TCF and 2 billion barrels of oil. A major portion of these hydrocarbons may underlie the Hueco South Unit.

Gary Kornegay, Geologist  
Stonebridge Energy, LLC  
14275 Midway Road  
Suite 220  
Addison, TX 75001  
AAPG # 434471  
Texas License #4239  
Wyoming Certified Geologist #PG-745