DEPOSITIONAL ANALYSIS OF THE HILL SAND OF THE RODESSA FORMATION (LOWER CRETACEOUS) IN THE NORTH SHONGALOO-RED ROCK FIELD WEBSTER PARISH, LOUISIANA

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ABSTRACT

The Hill sand is an informal subdivision of the Lower Cretaceous Rodessa Formation and forms significant petroleum reservoirs in many parts of northeast Texas, southern Arkansas, and northern Louisiana. The North Shongaloo-Red Rock Field is located in north-central Webster Parish, Louisiana and southern Columbia County, Arkansas. The Hill sand is lithologically variable within this region and consists of conglomerate, fine-grained sandstone, siltstone, mottled red to green claystone, black shale, and occasionally fossiliferous limestone. Thickness of the Hill sand in the area ranges from 160 to 220 ft (48.8 to 67.1 m) and averages 186 ft (56.7 m).

Based on a combination of sedimentary structures, texture, lithologic composition, fossil content, and sand-body geometry, five major lithofacies were delineated within the primary study area of the North Shongaloo-Red Rock Field. These include: Facies A- thick (up to 32 ft, 9.8 m), fining upward, cross-bedded sandstone with numerous large-scale sedimentary structures, typically with an erosive lower contact; Facies B- thin (up to 11 ft, 3.4 m), coarsening upward, cross-bedded sandstone containing both large- and small-scale sedimentary structures; Facies C- thinly interbedded siltstone and black shale; Facie D- massive red to green mottled claystone; and Facies E- fossiliferous wackestone to packstone.

Detailed analyses of the lithofacies present in the study area led to the following depositional environment interpretations: Facies A- fluvial point bar; Facies B- crevasse system (minor mouth bar/crevasse channel couplet); Facies C- interdistributary bay and lake; Facies D- swamp; and Facies E- interdistributary bay with carbonate production. Fluvial point bar and crevasse deposits commonly form hydrocarbon reservoirs in the Hill sand with porosities often exceeding 20% and permeabilities exceeding 1000 md. Combination structural-stratigraphic traps occur where these sand bodies pinch out against a westerly plunging anticline within the north Shongaloo-Red Rock Field.

On a regional basis, the Hill sand was divided into upper and lower units based on observed changes in sedimentation pattern. The boundary chosen to separate the upper and lower Hill sand is defined as occurring at a stratigraphic level 80 ft (24.4 m) above the top of the Gloyd Limestone. (The Gloyd Limestone lies directly beneath the Hill sand). Depositional environments of the upper and lower Hill sand were similar, but the relative locations of the environments varied.

On a regional scale, depositional environments observed in the Hill sand include several fluvial deposystems trending northeast-southwest. Regional dip during Hill sand deposition in this area was to the southwest. The fluvial deposystems terminate downdip into deltaic distributary mouth bars distributed along a roughly northwest-southeast trending coastline. Areas to the west of the coastline were occupied by shallow marine environments. Interchannel areas to the east of the coastline were occupied by a variety of environments including interdistributary bay, lake, swamp, and crevasse system environments in both upper and lower deltaic positions.

Lowermost deposits (approximately 35 ft, 10.7 m) of the Hill sand throughout the region are interpreted to consist of shallow marine environments. Interchannel areas to the east of the coastline were occupied by a variety of environments including interdistributary bay, lake, swamp, and crevasse system environments in both upper and lower deltaic positions.

Lowermost deposits (approximately 35 ft, 10.7 m) of the Hill sand throughout the region are interpreted to consist of shallow marine environments. These marine environments are overlain by thick, predominantly non-marine fluvial and deltaic sediments. Near the end of Hill sand deposition, the entire region was covered by very shallow marine environments, just prior to deposition of the overlying "First Lower Anhydrite stringer."

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