

# Memorandum

HOBBS OCD

MAR 11 2014

From: Kristin Pope

Date: March 5, 2014

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**RE: Murchison Oil and Gas, Bettis 20 State Com 2H, Rat Hole Evaluation**

The Bettis 20 State Com 2H well site has a surface elevation of 3,531 feet and the nearest wells with reliable groundwater data are approximately 1 mile away. Based on data from area wells, published sources, and our experience, the regional groundwater table in this area is expected to occur at approximately 3,375 feet, or 156 feet below the surface of the subject site. As a condition of approval for the C-144 temporary pit application for this well, NMOCD requested that we log the cuttings from the rat hole installation to confirm that the distance between the bottom of the proposed reserve pit and groundwater is greater than 100 feet, as stated in the permit application.



On March 3<sup>rd</sup> and 4<sup>th</sup>, 2014 I witnessed the drilling of the conductor hole for the Bettis 20 State Com 2H well, located in eastern Lea County. Ready Drill LLC of Monahans, Texas performed the work using a track-mounted 30-inch auger drilling rig as shown in the photograph above.



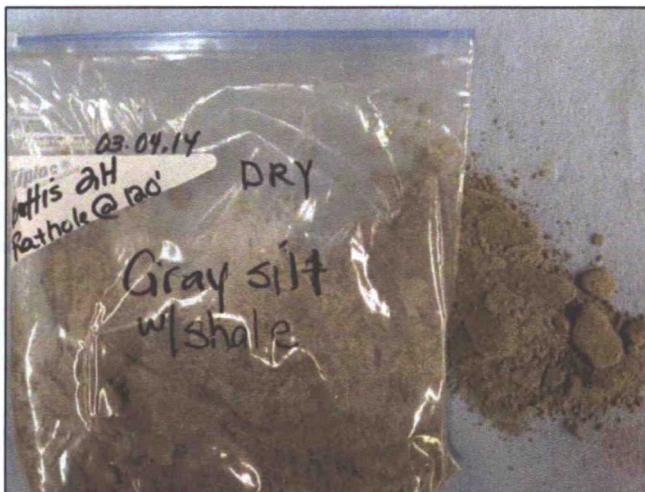
On March 3<sup>rd</sup>, I arrived at the site at 9:50 am when the auger just began to break ground, beginning at 8 feet below ground surface (the depth of the cellar). Cuttings were continuously monitored for moisture (none observed) and lithology with each trip into the hole. At 26 feet, a loose, fine "sugar sand" (shown in adjacent photograph) was encountered which caused progress to slow and eventually cease at 38 feet due to collapse and sand flow. No water or drilling fluids were used to drill up to this point, but after 2 hours

with no returns, water was added to the hole to aid advancement beyond the sand. Adding water to the hole seemed to make the sand flow worse and create voids in the walls of the hole so drilling mud was needed. The mud was not available until the next day.

approved  
*Jeffrey Seking*  
Environmental Specialist  
NMOCD-DIST 1  
3/21/14

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On March 4, 2014, the hole was resumed using drilling mud only to advance past the sand. The driller reported that he progressed out of the sand at 53 feet and cuttings returned dry again at 76 feet. No water or drilling fluids were used in the remainder of the hole. I arrived on site at approximately 3:30 pm when the depth was approximately 80 feet and returns consisted of dry, massive, purplish-red clay. I continued to monitor the cuttings as they were returned until total depth of 120 feet was reached at

approximately 6:30 pm. An absence of moisture was noted in the 0-38 feet and 80-120 feet intervals that I observed. The following lithologic log was assembled based on my observations and the driller's descriptions:

18-26 feet	Dry, tan sand with red clay
26-53 feet	Dry, fine, loose brown sand
53-55 feet	Dry, tan clay and silt (base of alluvium and/or Ogallala)
55-60 feet	Dry, green and purplish-red clay, massive (top of red beds)
60-87 feet	Dry, purplish-red clay, massive
87-96 feet	Dry, green clay, massive
96-102 feet	Dry, green clay with some gray shale
102-115 feet	Dry, loose, red clay
115-120 feet	Dry, loose, gray silt with shale (sample shown in photograph above)

Based on my evaluation of the cuttings, data from area wells, published sources, and anecdotal descriptions of other rat holes in the area by the same driller, I conclude that no groundwater is present below this site to at least 120 feet below ground surface (3,411 feet below sea level).

*Kristin Pope*

Final trip out of hole at 6:30 pm  
Dry cuttings at 120 feet

