

## **An Overview of the Floyd Shale & Chattanooga Shale Gas Play In Alabama (July 2009)**

During the past four years, more than twenty wells were drilled or re-entered in Lamar, Pickens, Tuscaloosa, Blount, and Cullman Counties, Alabama, to attempt completions in the Mississippian Floyd Shale or Devonian Chattanooga Shale. The Floyd Shale is a black marine shale located stratigraphically below the Mississippian Carter sandstone and above the Mississippian Lewis sandstone. Although the Carter and Lewis sandstones have historically been the most prolific gas-producing zones in the Black Warrior Basin Region of Alabama, there has been no prior production history reported for the Floyd Shale. The Chattanooga Shale is located below the Floyd and is separated from it in most areas by the Tuscumbia Limestone and the Fort Payne Chert.

Denbury Onshore, LLC, has drilled two wells in southern Lamar County to test the Floyd Shale. The first well was the Burns 29-9 No. 1, Permit No. 14303-BH, in Section 29, Township 17 South, Range 15 West. The Burns well was directionally drilled to 7,089 feet (measured depth) in early 2005. Denbury drilled horizontally for approximately 2,000 feet in a southeasterly direction in the Floyd Shale. Production casing was set, and the horizontal portion of the hole was perforated from 5,350 to 6,820 feet (measured depth). The true vertical depth of the perforated interval in the horizontal hole ranged from approximately 4,856 to 4,885 feet. The well was acidized and hydraulically fractured in several stages. The initial production test for the well was conducted in June 2006. During the 24-hour test, the well produced at a rate of 80 thousand cubic feet (Mcf) of gas per day through an open choke with a final tubing pressure of 100 psi. The Burns well produced 11,435 Mcf of gas from December 2006 through August 2007. Jabsco Oil Operating, LLC, became operator of the well in November 2008. The well was connected to a gas pipeline in April 2009 and produced 936 Mcf during seven days that month.

The second Denbury well to test the Floyd Shale was the Crowley 26-7 No. 1, Permit No. 14665-BH, located in Section 26, Township 16 South, Range 14 West. The

Crowley well was directionally drilled to 6,223 feet (measured depth) in the fall of 2006. Denbury drilled horizontally in a northerly direction for about 2,000 feet in the Floyd Shale. Production casing was set, and the horizontal section was perforated from 5,719 to 6,121 feet (measured depth). The true vertical depth of the horizontal section is approximately 3,840 feet. Denbury attempted to hydraulically fracture the perforated interval in February 2007, but was unsuccessful. However, in July 2007, Denbury hydraulically fractured an interval in the horizontal hole at measured depths of 5,118 to 5,122 feet, 5,318 to 5,322 feet, and 5,518 to 5,522 feet after isolating the initial perforated interval. The Crowley well produced about 1,000 Mcf of gas from September 2007 through January 2008. Jabsco Oil Operating, LLC, became operator of the Crowley well in November 2008. The well is not yet connected to a gas pipeline. Upon Jabsco's request, the well was granted shut-in status by the Board for one year ending in March 2010.

In April 2005, Elysium Energy, LLC, drilled the Gulf States 29-11 No. 1 well, Permit No. 13985, located in Section 29, Township 18 South, Range 13 West, Pickens County. The well was drilled to 5,267 feet, and production casing was set to that depth. The production casing was perforated in the Floyd Shale from 5,010 to 5,013 feet, from 5,064 to 5,068 feet, and from 5,107 to 5,111 feet. Elysium hydraulically fractured this zone, but no tests were conducted. David H. Arrington Oil & Gas, Inc., became operator of the well in February 2008; however, there has been no further activity.

Murphy Exploration & Production Company-USA has drilled and completed three wells as Floyd Shale tests in Pickens County. The first well was the Exum Trust 6-16 No. 1, Permit No. 14065, in Section 6, Township 21 South, Range 15 West. The well was spudded in July 2005 and was drilled to 7,250 feet, and production casing was set to that depth. The well was perforated in the Floyd Shale discontinuously from 6,438 to 6,617 feet. These perforations were hydraulically fractured in December 2005. Since that time, no test results have been filed with the Board. Earlier, Murphy had perforated a Devonian interval from 7,130 to 7,148 feet in this well. Those perforations were isolated by a bridge plug without any test results being submitted to the Board prior to evaluating

the Floyd Shale. Vantage Energy Black Warrior, LLC, became operator of the well in June 2008. There has been no further activity on the well. Upon Vantage's request, the well was granted temporary abandoned status by the Board for one year ending in April 2010.

Murphy began drilling operations on the O'Bryant 6-15 No. 1 well, Permit No. 14045, in October 2005. The O'Bryant well is located in Section 6, Township 22 South, Range 14 West. The well was drilled to 7,407 feet, and production casing was set to that depth. Perforations were made discontinuously from 7,018 to 7,133 feet in the Floyd Shale. This interval was hydraulically fractured in January 2006. Again, no test results have been submitted to the Board. Vantage Energy Black Warrior, LLC, became operator of the well in June 2008. There has been no further activity on the well. Upon Vantage's request, the well was granted temporary abandoned status by the Board for one year ending in April 2010.

Murphy began drilling the Parker 3-16 No. 1 well, Permit No. 14371, in February 2006. The well is located in Section 3, Township 22 South, Range 16 West. The well was drilled to 8,800 feet, and production casing was set to that depth. During May 2006, Murphy perforated and hydraulically fractured an interval in the Floyd Shale and also an interval in the Chattanooga Shale. The Floyd Shale perforations were from 8,451 to 8,467 feet. Perforations in the Chattanooga Shale were from 8,644 to 8,657 feet. No test results have been submitted to the Board. Vantage Energy Black Warrior, LLC, became operator of the well in June 2008. There has been no further activity on the well. Upon Vantage's request, the well was granted temporary abandoned status by the Board for one year ending in April 2010.

Jim Walter Resources, Inc., began drilling the JWR 29-16-1 well, Permit No. 14298, in December 2005. The well is located in Section 29, Township 20 South, Range 7 West, Tuscaloosa County. Drilling was completed in February 2006 after reaching a

total depth of 8,529 feet. Production casing was set to a depth of 6,500 feet. Initially, a conventional completion was attempted by perforating from 5,803 feet to 5,832 feet and from 5,852 feet to 5,856 feet in the Fort Payne Chert. After perforating the Fort Payne, a bridge plug was set at a depth of 5,765 feet to isolate the perforations. The Floyd Shale was then perforated from 5,621 feet to 5,626 feet and from 5,645 feet to 5,650 feet. In February 2006, Jim Walter attempted to hydraulically fracture the Floyd Shale perforations, but the “frac” screened out. The well was classified as temporarily abandoned in May 2007. In September 2007, the Chattanooga Shale was perforated from 5,946 feet to 5,961 feet, and the zone was hydraulically fractured. These perforations were isolated with a bridge plug. In early October, Jim Walter hydraulically fractured an expanded interval (5,468 feet to 5,650 feet) in the Floyd Shale. Upon request by Jim Walter, the well was classified as temporarily abandoned by the Board for one year ending in May 2009. However, the well was plugged and abandoned in April 2009.

The JWR 28-5-2 well, Permit No. 14971, was spudded in November 2006 and reached a total depth of 6,030 feet in January 2007. The well is located in Section 28, Township 20 South, Range 7 West, Tuscaloosa County. Production casing was set to a depth of 6,015 feet, again attempting a conventional completion by perforating in the Fort Payne Chert from 5,726 feet to 5,770 feet. The Fort Payne was then acidized. At the October 2007 meeting of the Board, petitions were granted to reform the original 40-acre drilling unit to a 320-acre drilling unit and to approve an exceptional location for the well. Jim Walter filed the petitions in order to drill approximately 2,100 feet of horizontal hole in the Floyd Shale. The permit for the horizontal wellbore, bearing Permit No. 14971-BH, was issued on October 5, 2007, and drilling commenced on October 8 at a kickoff point of 5,112 feet measured depth. The well was drilled to a total measured depth of 7,517 feet (5,778 feet true vertical depth). A liner was run to total depth, and during November and December 2008, the horizontal portion of the hole was hydraulically fractured through perforations in the Floyd Shale from 5,930 to 5,932 feet, 6,135 to 6,136 feet, 6,290 to 6,291 feet, 6,535 to 6,536 feet, 6,703 to 6,704 feet, 6,865 to 6,867 feet, 7,025 to 7,027 feet, and 7,185 to 7,187 feet. During an extended production test lasting from May 23, 2008, until July 1, 2008, using a gas lift system, the well

produced an average of 98 Mcf of gas per day and 780 barrels of water per day from the Floyd Shale. The well was connected to a gas pipeline from March 2008 through November 2008 and produced approximately 18,000 Mcf of gas during that time. The well was plugged and abandoned in April 2009.

Jim Walter Resources, Inc., received a permit to drill the JWR 25-14-03 well, Permit No. 15824-BH, a directional horizontal Mississippian test well in September 2008 to a proposed measured depth of 9,434 feet (5,282 feet true vertical depth). The well is located in Section 25, Township 20 South, Range 8 West, Tuscaloosa County. The well was spudded in September 2008 and drilled to a measured depth of 5,994 feet and logged. The drilling permit was amended to drill to a Devonian target in November 2008. After reaching a measured depth of 7,162 feet in a sidetrack hole, drilling problems were encountered. Following the successful recovery of a fish from the sidetrack hole, the permit was further amended in January 2009 to target the Mississippian zone in a horizontal hole. Further drilling problems were encountered in the second sidetrack hole at 5,669 feet, and the well was plugged and abandoned in March 2009.

Wagner and Brown, Ltd., re-entered two wells in Pickens County during 2006 to test the Floyd Shale. The first well re-entered was the McShan-Timberlands 11-3 No. 1 well, Permit No. 13274-A, located in Section 11, Township 19 South, Range 16 West. The well was originally drilled by Moon-Hines-Tigrett Operating Co., Inc., in 2004 to a depth of 5,785 feet. The well was plugged and abandoned later the same year. Wagner and Brown re-entered the well in January 2006 and deepened the well to 7,000 feet. The Floyd Shale was cored from approximately 6,322 to 6,500 feet. Production casing was set to total depth, but no completion attempt was made in the Floyd Shale. Instead, conventional completions were made in three Pennsylvanian sands by perforating and hydraulically fracturing in the following intervals: 3,942 to 4,004 feet, 4,345 to 4,428 feet, and 4,930 to 5,076 feet. Initial production tests of 72 hours duration were conducted for three of these Pennsylvanian sands during 2007. The zone from 4,930 feet to 5,076 feet produced at a rate of 198 Mcf of gas per day and 220 barrels of water per day. The zone from 4,345 feet to 4,428 feet produced at a rate of 59 Mcf of gas per day and 28

barrels of water per day. Upon Wagner and Brown's request, the well was granted temporary abandoned status by the Board for one year ending in June 2009. Saga Petroleum Limited Liability Company of Colorado became operator of the well in May 2009. The well had not been connected to a gas pipeline as of July 2009.

In early 2006, Wagner and Brown also re-entered the Shaw Unit 10-10 No. 1 well, Permit No. 2511-A, located in Section 10, Township 18 South, Range 15 West. The well had originally been drilled to 5,169 feet by Pruet & Hughes Operating Company in 1978 and was plugged and abandoned the same year. Wagner and Brown re-entered the well and set 5,167 feet of production casing. The Floyd Shale was perforated and hydraulically fractured from 4,954 to 4,966 feet. In a 72-hour initial production test conducted in November 2006, the well produced 11 Mcf per day and 8 barrels of water per day. Upon Wagner and Brown's request, the well was granted temporary abandoned status by the Board for one year ending in June 2009. Saga Petroleum Limited Liability Company of Colorado became operator of the well in May 2009. The well had not been connected to a gas pipeline as of July 2009.

In 2006, Samson Resources Company recompleted the H. L. Patrick 32-10 No. 1 well, Permit No. 2906, in the Floyd Shale. The well is located in Section 32, Township 16 South, Range 15 West, Lamar County, in the McGee Lake Field. The Patrick well was drilled in 1980 and initially completed in the Lewis Sand and later in the Carter Sand. Samson perforated the Floyd Shale from 4,538 to 4,590 feet; however, the well was plugged and abandoned in April 2007 without the Floyd Shale being tested.

In February 2007, BWNR, LLC, received a permit to drill a Devonian test well, the Weyerhaeuser No. 2-43-2402 Well, Permit No. 15075-B, located in Section 2, Township 24 North, Range 2 East, Greene County. The original drilling permit application was to drill a directional horizontal well. The well was not intentionally directionally drilled, but the wellbore did drift to the northwest during the drilling of the well. The well was spudded in March 2007, and intermediate production casing was set to a depth of 7,636 feet. The well was then drilled to a total depth of 8,360 feet, and a

liner was set from 7,315 to total depth. Huber Energy, LLC, became operator of the well in September 2008 and perforated the well and hydraulically fractured the Chattanooga Shale in the interval from 8,193 feet to 8,222 feet during the same month. From mid-November until December 5, 2008, Huber conducted an initial production test which lasted a total of 402 hours. A jet pump was utilized to move fluid out of the well. At the beginning of the test, the Weyerhaeuser well was producing at a rate of 40 Mcf per day, but the production declined to 15 Mcf per day by the end of the test. The well was shut-in as of July 2009.

In May 2008, Energen Resources Corporation received a permit to drill a Paleozoic test, the Lamb 1-3 No. 1 well, Permit No. 15668, in Section 1, Township 23 North, Range 3 East, Greene County. Chesapeake Appalachia, L.L.C., became operator of the well in June 2008. The Lamb well was spudded in June and drilled to a total depth of 9,450 feet. Production casing was set to total depth. In August 2008, Chesapeake received a permit to sidetrack the Lamb 1-3 well in order to drill the Lamb 1-3H Well, Permit No. 15668-B, as a horizontal well of approximately 2,700 feet in length in the Chattanooga Shale. The Lamb 1-3H well was drilled to a total depth of 11,560 feet and a liner was set from 8,400 feet to 11,560 feet. By November 2008, Chesapeake had hydraulically fractured the Chattanooga Shale in four intervals from 9,647 feet to 11,569 feet in the horizontal hole. No initial production test was filed with the Board. The well was plugged and abandoned in June 2009.

In June of 2007, Shannon J. Flicklinger drilled the Hudson 16-7 No. 1 well, Permit No. 15232, in Section 16, Township 10 South, Range 2 East, Blount County. The well was a Chattanooga Shale test drilled to a total depth of 1,516 feet. Production casing was never set and the well was plugged and abandoned in May 2008. The well is about 100 feet from a well of the same name, bearing Permit No. 2795, drilled to a depth of 8,350 feet by Saga Petroleum U.S. Inc., in 1980. The Saga well was plugged and abandoned in 1980.

In September 2007, GeoMet, Inc., drilled the Wittmeier 19-15-1 well, Permit No. 15386, in Section 19, Township 12 South, Range 1 East, Blount County. The well was permitted as a generic Paleozoic test and drilled to a depth of 1,923 feet, and production casing was then set to that depth. After setting the production casing, the well was drilled to a total depth of 2,060 feet. The portion of the wellbore below the production casing, which includes the Chattanooga Shale from 1,924 feet to 1,954 feet, was stimulated with nitrogen in October 2007, and a pumping unit was then installed. GeoMet conducted a 24-hour initial production test for the well on October 27, 2007, with a reported flow rate of 75 Mcf of gas per day with 10 barrels of water per day from the Chattanooga Shale interval. In July of 2008, GeoMet began producing the well into a pipeline. The well had produced 11,155 Mcf of gas through May 2009.

GeoMet, Inc., drilled a Paleozoic test in Blount County during November 2007. The Wittmeir 30-03-02 well, Permit No. 15436, located in Section 30, Township 12 South, Range 1 East, was drilled to a total depth of 2,121 feet and production casing was set to 1,970 feet. The Chattanooga Shale, which occurs at a depth of 1,980 feet to 2,020 feet, was hydraulically fractured in December 2007. Following the stimulation, GeoMet ran a 24-hour initial production test on December 18, 2007, and the well produced 57 Mcf of gas per day with 10 barrels of water per day. The well was hydraulically fractured again in June 2008. The well began producing into a pipeline in July 2008 and had produced 7,947 Mcf of gas through May 2009.

A Paleozoic test in Blount County was permitted by GeoMet in November 2007. The permit to drill for the Wittmeir 30-02-03 well, Permit No. 15448, also located in Section 30 as described above, was cancelled by the Board upon GeoMet's request on February 28, 2008. A directional horizontal Chattanooga Shale test, GeoMet's Moon 20-05-06, Permit No. 15678-BH, was permitted in June 2008 in Section 20, Township 12 South, Range 1 East, Blount County. This drilling permit was cancelled by the Board at GeoMet's request in July 2008.

GeoMet, Inc., drilled the Fallin 30-07-03 well, Permit No. 15609-BH, in March 2008. The Fallin well is located in Section 30, Township 12 South, Range 1 East, Blount County. The directionally drilled horizontal well was drilled to a measured depth of 3,705 feet. Approximately 1,800 feet of horizontal hole was drilled in the Chattanooga Shale. GeoMet ran an initial production test on the well in May 2008, and the well produced 12 Mcf of gas per day and 10 barrels of water per day during a 24-hour test. This test was done prior to the well being stimulated. The Chattanooga Shale in the horizontal portion of the hole was hydraulically fractured from 2,349 feet to 3,514 feet in August 2008. Production improved significantly after the stimulation. The well began producing into a gas pipeline during July 2008, and has produced 10,995 Mcf of gas through May 2009.

In June 2008, GeoMet, Inc., received a permit to drill a Chattanooga Shale test, the Moon 20-05-06 well, Permit No. 15678-BH, in the northwest quarter of Section 20, Township 12 South, Range 1 East, Blount County. The permit for the well, which was proposed to have a horizontal section approximately 1,900 feet in length, was cancelled by the Board at GeoMet's request in July 2008. The Brittian 20-06-06 well, which is mentioned in the following paragraph, was later drilled in the northwest quarter of said Section 20.

GeoMet, Inc., drilled the Brittian 20-06-06 well, Permit No. 15753-BH, in November and December 2008. The Brittian well, another Chattanooga Shale test, is located in Section 20, Township 12 South, Range 1 East, Blount County. This well is a directionally drilled horizontal well with production casing set to 1,522 feet. The well was sidetracked to drill horizontally to a total depth of 4,228 feet. An additional string of casing was set to 4,208 feet. The Chattanooga Shale was hydraulically fractured in January 2009 through discontinuous perforations in the horizontal hole from 2,256 feet to 4,123 feet. An initial production test had not been submitted to the Board as of July 2009. However, the well began production into the pipeline in March 2009 and had produced 19,013 Mcf of gas through May 2009.

GeoMet, Inc., has also been active in Cullman County. In January 2008, GeoMet drilled the Montgomery 06-07-04 well, Permit No. 15481, in Section 6, Township 12

South, Range 3 West, to a total depth of 1,998 feet. After setting 1,771 feet of production casing, GeoMet hydraulically fractured the Chattanooga Shale in the interval from 1,779 feet to 1,838 feet in January 2008. Geomet conducted an initial production test in February 2008 and reported a test rate of 120 Mcf of gas per day and 166 barrels of water per day. As of July 2009, the well was shut-in.

In June 2008, GeoMet drilled the Mattox 19-05-05 well, Permit No. 15690, in Section 19, Township 12 South, Range 3 West, Cullman County. The well was drilled to a total depth of 2,300 feet, and production casing was set to a depth of 2,069 feet. The Chattanooga Shale, at a depth of 2,080 feet to 2,162 feet, was hydraulically fractured in July 2008. An initial production test had not been submitted to the Board, and the well was shut-in as of July 2009.

GeoMet received a permit to directionally drill the Crawford 07-13-07 well, Permit No. 15758-BH, in August 2008. The proposed well, located in Section 7, Township 12 South, Range 3 West, Cullman County, was to be horizontally drilled in the Chattanooga Shale with the horizontal portion of the wellbore to be approximately 3,000 feet in length. The drilling permit was cancelled by the Board in February 2009 when the permit expired.