

CLUES TO THE UTICA/POINT PLEASANT

Sierra Resources analyzed more than 100 wells before assembling a lease position of some 75,000 acres in this eastern Ohio play. Here's what the team found.

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**Sierra
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The Utica/Point Pleasant shale play in eastern Ohio has attracted the attention of both large and small E&Ps in the past year. Sierra Resources LLC, a Denham Capital-backed E&P headquartered in Houston, through its subsidiary, Sierra Buckeye LLC, acquired approximately 75,000 acres in the Utica/Point Pleasant shale play over the past two years. Sierra targeted its lease position based on geological and geochemical analyses of more than 100 wells. Because it was an early mover in the play, Sierra was successful in acquiring acreage it believed to be the most technically sound and favorable for unitization. Its experience provides a template of how companies analyze reservoir potential.

Based on wells drilled for the Trenton-Black River formations in Indiana during the late 2000s, Sierra Resources became interested in the Utica shale in early 2010. It reviewed wells in eastern Ohio that had penetrated the Utica/Point Pleasant. This showed that the reservoir had the thickness, porosity and acceptable water saturation necessary to warrant further investigation.

The team went to the Ohio Geologic Survey, where it analyzed cuttings from old wells that helped determine the physical and geochemical characteristics of the formation. The team members found that the area had an impressive level of high organic content coupled with a high hydrogen index—both indicators of high-quality deposits.

Encouraged by these initial findings, along with the familiarity that contractor GeoMark Research had with the area through an extensive year-long proprietary geochemical analytical study, Sierra

decided to move forward with a more extensive geologic and geochemical study. The primary target for evaluation was the Point Pleasant formation of the Utica shale, which is stratigraphically located between the Utica shale proper and the underlying Trenton limestone.

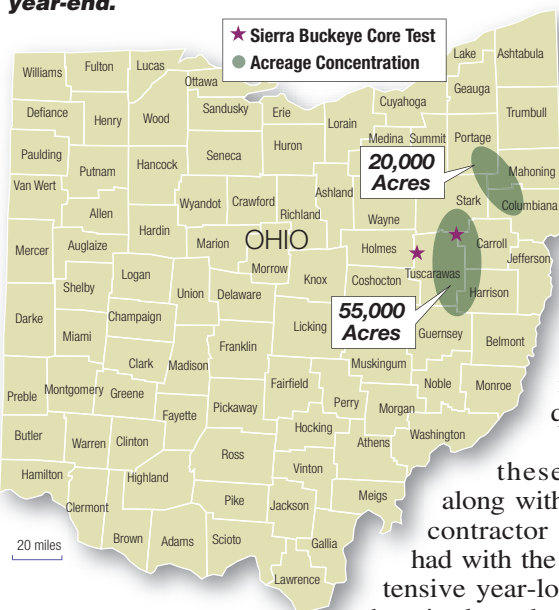
Sierra's leasing strategy was driven by technology, using logs from the more than 100 wells that were correlated and incorporated into structure and isopach maps, along with the geochemical analyses of the cuttings. These analyses helped determine the location of phase windows, areas of highest organic content and thickest reservoir. Using the results of the geological and geochemical study, Sierra began to take leases in the third quarter of 2010, targeting the organic- and liquids-rich, thickest part of the shale.

As the evaluation progressed, Sierra decided that whole cores and modern logs would be useful in verifying the work to date. Last year, Sierra drilled, logged and whole-cored its first two vertical wells: the McDade #3 in April, and the Deam #1 in June. The McDade #3 well is in far northeast Tuscarawas County, while the Deam #1 well is in the far western portion of the same county. The wells were drilled as stratigraphic tests to gather as much information as possible from the Utica/Point Pleasant. All subsequent analyses supported the earlier analyses and very few changes to the maps were necessary.

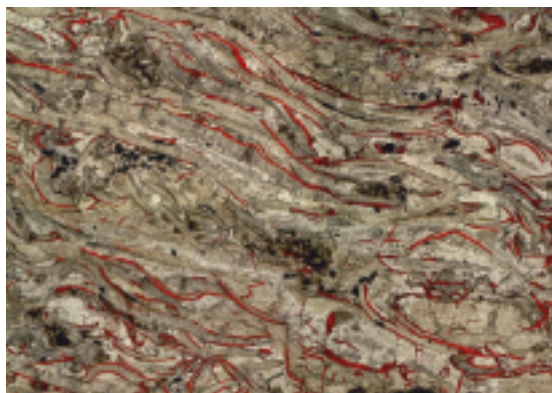
Throughout 2011 and early this year, Sierra continued to analyze the Utica/Point Pleasant formation to determine its geochemical, physical and mechanical reservoir characteristics. The results indicated that the Utica/Point Pleasant could be a very successful shale reservoir.

Key findings

First, the geologic age of the Point Pleasant is Ordovician, which is much older than other domestic shale producing formations. The gas-prone terrigenous material associated with land plants did not evolve until after the Ordovician period and thus they are absent in the Point Pleasant. The formation's organic matter is instead quite lipid-rich and liquid-prone, lending itself to superior economics.



A photo-micrograph from a thin limestone bed within the Point Pleasant formation in the McDade #3 well, showing the play's permeability. Stacked fossil material with some clay is present between broken shell fragments. The porosity is filled with red epoxy. The bar scale is 0.4 millimeters.



SOURCE: SIERRA RESOURCES LLC

The thermal maturity geochemical analysis of Sierra's core wells along with cuttings from many other wells across Tuscarawas County—one of the epicenters of Sierra's position—indicate oil in the far western part to wet gas in the eastern part of the county.

Further, the analysis revealed that the Point Pleasant is a calcareous shale, much like the Eagle Ford of South Texas. The calcareous nature of the Point Pleasant lends itself to successful hydraulic fracturing. However, unlike the Eagle Ford, the Point Pleasant contains scores of thin white, porous and permeable limestone beds about 1/4 to two inches thick composed of broken shell material.

Working with Core Lab and using older, well-established conventional techniques, Sierra was able to demonstrate that the thin limestone layers in the Point Pleasant have porosity of between 1% and 3%. The company also discovered, perhaps most important, the layers were 10,000 times more permeable than typical shale reservoirs.

Above is a photomicrograph demonstrating the typical pore structure in the limestone beds. It appears the pores, which are very linear, were developed early in the lithification process and preserved over geologic time. As a result, Stephen Brown from GeoMark Research believes that the Point Pleasant appears to be a 150-foot stack of "mini-Bakken"—permeable layers of rock sandwiched between rich sourcebeds. These limestone beds could serve as "superhighways" through which the hydrocarbons can flow.

An additional characteristic of the Point Pleasant is that it exhibits an unusually low water saturation—in some cases lower than 10%. This very low water saturation will result in more hydrocarbon reserves when compared with other shale reservoirs. Another implication of the low water saturation is that wells which have been shut-in for a period of time after completion perform better than those that were brought on production immediately.

Operators have discovered that "resting" wells for 60 to 90 days following fracture stimulation can increase production rates by up to a factor of five times the rates of the wells that weren't shut in. The theory behind this practice is that the shut-in time allows the frac water to dissipate throughout the formation, thus elimi-

nating the tendency of the low water-saturated reservoir to absorb the water while flowing back the well.

Because the results of the extensive analysis performed by the Sierra team on the Utica/Point Pleasant were so positive, the company is continuing to build its acreage position despite the complexities of doing so in a mature producing area. It has compiled a 75,000-acre position (projected to be at 100,000 acres by the end of this year) centered around Tuscarawas, Harrison, Carroll and Columbiana counties. Sierra plans to drill two wells by year-end with the first expected to spud in late third or early fourth quarter of this year.

Conclusion

Over time we have learned that the opportunities presented by each shale reservoir are unique, and the Point Pleasant is certainly no exception. With a pre-existing midstream infrastructure in place, coupled with highly attractive geologic—and geographic—attributes, it is almost certainly going to be an attractive investment for years to come.

While it's still early to draw too many widespread conclusions about its producing capability, several companies have reported encouraging initial results. Chesapeake Energy Corp. announced that its Buell well in Harrison County produced at a peak rate of 3,010 barrels of oil equivalent per day of natural gas liquids and oil. The company forecasts the well will have an estimated ultimate recovery of at least 575,000 barrels of liquids and 13 billion cubic feet of natural gas. (For more detail, see *Oil and Gas Investor*, January 2012.) The results from these wells (coupled with the geographic distance between them) are promising indicators of an exceptional shale reservoir.

Another indication of the potential the Utica/Point Pleasant offers is the midstream activity that has been announced. Tradition Midstream, another Denham Capital portfolio company, along with MarkWest, Caiman Energy, M3 Momentum, NiSource and others have said they are making or will make significant investments in Utica infrastructure.

The organic-rich shale portions of the Point Pleasant also contain excellent porosity and permeability on par with the Eagle Ford shale, which has proven that liquid-rich shales yield superior economics. Given its geochemistry, permeability, porosity, water saturation, and thickness, along with early well results, it's reasonable to expect the Utica/Point Pleasant to also exhibit excellent economic results. □

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