**Marathon Oil Company**
**NDIC Petroleum Research Council**
**Vertical Seismic Profiling Test of a Seismic Fault and Fracture Detection in the Bakken Formation**
**G-07-021**
**Final Summary Report**
**February 18, 2008**

Marathon Oil Company is greatly appreciative of the support given to this project. The purpose of the project was to acquire vertical seismic profile data in a Bakken well so that a correlation of the Bakken interval seismic signature and proper time depth relationships could be made to understand the Bakken seismic acoustic nature better. The ability to tie seismic signatures of the Bakken formation will help to reduce uncertainty of the depth that the Bakken occurs and potentially recognize some controls on the Bakken productive system.

The VSP survey was performed on the Marathon Klatt 31-14H well in Dunn County, North Dakota. This well was drilled to a measured depth of 18,100' MD with a 7378' horizontal section in the Middle Bakken. The survey was run in May 2007 by Baker Hughes and the processing followed. The data was recovered by lowering the acoustic listening tools (geophones) into the down hole curve of the well to listen to the seismic signals originating from near the surface location, at a surface location one-half way down the horizontal path and at a surface location near the end of the horizontal path.

The data that was acquired in the vertical seismic profile is considered good for making an accurate time-depth correlation at the well. Additional work, seismic processing, on the reflectors that are associated with the Bakken interval, will be needed to understand how this high quality data images the Bakken interval along the well path of the Klatt 31-14H.

The data and subsequent interpretations of the data are being applied to structural mapping by Marathon from seismic data in the area. The confidence of the depth of the Bakken is greatly improved with this data. Comparisons of the vertical seismic profile to other well results, like the mudlog and image data, along the well path are in progress.