

APPLICATION OF INFRARED IMAGERY FOR THE IDENTIFICATION OF LEAKING HISTORICAL PRODUCTION AND IDLE OIL AND GAS WELLS IN OHIO

J. Daniel Arthur¹, Thomas E. Tomastik¹ and William Green^{2*}

¹*ALL Consulting*

1718 South Cheyenne Avenue, Tulsa, OK 74119

darthur@all-llc.com

²*ALL Consulting, LLC*

47355 Stumptown Road, Cadiz, OH 43907

wgreen@ALL-LLC.com

**Speaker*

Since 1860, over 275,000 oil and natural gas wells have been drilled in Ohio, ranking the state fourth in the number of wells drilled in the United States. In 1884, the discovery of oil and natural gas in the Trenton Limestone along the Lima-Findlay trend led to the first commercial natural gas production in Ohio. Since that time, thousands of wells have been drilled and production has been found in 76 of Ohio's 88 counties.

Well drilling and construction practices have evolved over time, as have well plugging and abandonment (P&A) methods. In some cases these early practices have resulted in ongoing impacts to the environment with well liquids and gases migrating to and flowing at the ground surface and potentially in the subsurface.

With a duty to protect public health and safety and to conserve natural resources, the State's Orphan Well program works diligently to address potential hazards posed by historical production and idle wells. The State seeks to identify the operators of these wells in order to demand remedial efforts. In some instances, a viable operator no longer exists, but the Orphan Well Program does have the ability to finance the P&A of these historical production and idle wells. The State's due diligence efforts to seek out these responsible parties, as well as the P&A work, require both time and precious financial resources. Considering these limited resources and ongoing impacts, it benefits the State to acquire techniques to efficiently identify and prioritize wells that pose immediate concern.

ALL Consulting has used infrared imagery to identify and document the surface expression of well integrity issues. The use of infrared cameras with optical narrow band filters is accepted by both industry and regulatory agencies to screen for the presence of fugitive hydrocarbon emissions. In a limited study of historical production and orphan wells in Ohio, ALL Consulting has observed that more than half of the wells exhibited fugitive gas emissions or liquids, with many of the

gas emissions exceeding the lower explosive limit (LEL). The infrared camera speeds wellhead surveys and helps to guide prioritization of remedial efforts to eliminate environmental impacts due to historical practices.

RADIOACTIVE OILFIELDS: COLD WAR URANIUM EXPLORATION IN AREAS OF HYDROCARBON DEPOSITS

Mary L. Barrett

639 Stephenson Street, Shreveport, LA 71104

mbarrett@centenary.edu

Early 20th century radiation studies related to hydrocarbon deposits were part of the fundamental research on natural materials' radioactivity. U.S. oil company research in the 1930s considered the potential usefulness of radioactive anomalies in hydrocarbon exploration. Development and early usage of the gamma ray (GR) log in the late 1930s and 1940s continued to document anomalous oilfield signatures. With the beginnings of the atomic age (1945), the U. S. Atomic Energy Commission (1946), and the Cold War (1947), there was a strategic need to develop domestic uranium supplies. The United States Geological Survey (USGS) was the main federal agency to assist the AEC in this mission. The oil industry was considered the most knowledgeable about sedimentary-rock-related radioactivity. In 1948, the USGS began a 10,000-GR-well-log review from the major oil company files to identify sedimentary deposits which might contain radioactive minerals. Oilfield study began that same year and included the mid-continent of Kansas and Oklahoma and the Texas gulf coast. Besides log examination, samples of cuttings, oilfield pit sludge, precipitated scale and formation water were also analyzed. The AEC formally requested the assistance of the petroleum industry and began a series of meetings with oil industry executives in 1951. Phillip Merritt of the AEC presented a talk in St. Louis at the 1951 American Association of Petroleum Geologists (AAPG) annual meeting entitled "Uranium and the Petroleum Industry." A program for agency/oil company cooperation was initiated which included data sharing and the AAPG's 1952-56 Advisory Committee on Radioactive Mineral Exploration. The USGS incorporated laboratory safety procedures in 1951 and focused upon dust control during sample preparation of the relatively low-radioactivity samples. In 1952, radon analysis of helium-bearing natural gas of the Panhandle Field indicated that several hundred producing gas wells contained radon 10 times higher than the 1941-established maximum permissible concentration of radon in air. When the oil company operator was informed, the company initially refused permission to release the specific data for fear of lawsuits. However, the USGS suggested comparison to radon safety standards of mining operations where the Public Health