

Abandoned Well Plugging Protects Parks' Resources

By Leslie Vaculik

Natural gas wells blowing out, winter winds whipping rig workers, quick conferences with state oil and gas inspectors – are these scenes from the television show *Dallas*? No, these incidents are taking place in Mammoth Cave National Park and Cuyahoga Valley National Recreation Area. Mammoth Cave and Cuyahoga have established ongoing programs to plug and properly abandon old oil and gas wells that exist within the parks. The procedures being followed are applicable for any park with unplugged wells.

The plugging is done to prevent damage to natural resources and to remove safety hazards. Several of the wells found in Mammoth Cave are close enough to the mapped cave systems that the potential existed for natural gas to escape from the wellbores into the caves. Though no natural gas was detected during testing of some passages, trapped methane is a potential fire, explosion, and asphyxiation hazard. In addition to the potential for gas migration, the wellbores could allow brine and contaminated water from deeper formations to mix with fresh waters of the cave. Pollution of the underground rivers could seriously damage the fragile ecosystems that exist in the darkness of the caves. Cave dwellers, including the endangered cave shrimp, then would be threatened.

At Cuyahoga park visitors have easy access to many wells where deserted pumping units and tanks pose a safety hazard. Other wells, at both Mammoth and Cuyahoga, are in the floodplain of rivers where oil or brine water leaking from the wells could degrade water quality.

The wells exist unplugged in the parks because both parks are in areas of proven petroleum with shallow producing formations, easy drilling and clean gas. Also, when the wells were drilled there were few laws or regulations requiring plugging. Tracts were purchased by the NPS often without the realization that an unplugged well was on the property. One of the first wells plugged in Mammoth Cave supplied gas to a hotel that was demolished when its site was acquired in the 1920s. The well was simply shut off with a surface valve and subsequently forgotten.

Both parks are approaching the unplugged well problem with similar techniques which consist of the following steps:

Identifying the wells – Either the well site and equipment or old records such as deeds, survey plats or state records are found that indicate a well exists. In addition to state records, well information was acquired on visits with the old timers living around the park. Locating some well sites was not always an easy task, especially when 50 years worth of vines and shrubs have covered a 3 foot high gas wellhead.

Planning the Plugging – The collected data are reviewed by the NPS Energy, Mining and Mineral Division and the state's Oil and Gas Divisions to establish the depth of the old wells, the possible equipment downhole, and potential problems that may occur during the plugging work. In Mammoth Cave one problem with cementing that was identified in the early planning stage was the wells' inability to hold cement through the zone of cave development. Any cement pumped into that zone could have leaked into caves. So the interval had to be left void.

The parks are using higher standards for plugging procedures than are required by Ohio or Kentucky state regulations. Both parks planned to plug the wells from bottom to top with cement, except for the cave interval. The continuous cement plug will prevent migration of gas, oil or brine water into fresh water zones or to the surface.

Another aspect of the planning considered the clearing of the old access routes and well pads so that the plugging work could be accomplished. Finally, plans are made to remove any remaining surface equipment and recontour the pad and road to blend with the natural terrain and to reclaim the site. The reclamation standards used by the parks also are higher than is typically required by state regulations.

Contracting – The actual work to plug the wells was contracted out. Cuyahoga Valley let one contract which included the plugging of 12 wells, the grading of an access route, and the follow-up reclamation. Mammoth Cave let separate contracts for the well



Plastic lined pit in foreground catches excess cement or groundwater.

plugging and access and site preparation. In most cases, Mammoth Cave accomplished clearing and reclamation using service personnel and equipment, thereby reducing costs.

Despite the preplanning, actual work to plug the wells rarely went smoothly. One of the wells in Mammoth Cave blew out while the contractor was trying to pull an old packer and string of tubing. The decision was made to allow the well to blow itself down since the gas was methane, which is lighter than air and would disperse. The flow of gas from the well forced the contractor to wait three days while the gas pressure died down enough to continue work on the well. While the well was blowing, a ranger was stationed near the well site 24 hours a day to ensure no park visitors came near the wellhead.

At Cuyahoga the contractor on the first well plugged decided to try to use the old tubing in the well to pump cement to the bottom of the well instead of a newer pressure tested string of work tubing. The old tubing popped a hole and was cemented in place. Fortunately, the tubing was off center in the wellbore, and the contractor was able to subsequently run a 1-inch diameter string of tubing past the blocked area and fill the well and the old tubing string with cement from the bottom up.

Further information on the plugging projects or assistance on similar projects may be had from the author, from Phillip Veluzat at Mammoth Cave, or from Garree Williamson at Cuyahoga Valley.

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Mammoth Cave Ranger Henry Holman pulls sample of cement used to set surface marker.