

BRYAN MOUND SPR STORAGE CAVERNS FEATURES AND THE INTERNAL STRUCTURE OF THE DOME

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ABSTRACT

The intent of this study is to examine the internal structure of the Bryan Mound salt dome utilizing the information obtained from graphical representations of sonar survey data. While this work culminates a study of the four Strategic Petroleum Reserve (SPR) salt dome sites, it is the first to examine cavern configurations through the several stages of the cavern leaching. The Bryan Mound caverns consist of existing commercial caverns purchased for use by the SPR program and new caverns constructed purposely for the SPR. This facility was the first solution mined cavern storage developed by the SPR. It reflects some of the initial evaluation of construction and solutioning techniques in that both three-well and two-well configurations were used. This facility also has had the greatest number of hanging string events, which are believed to be related to salt falls. This report attempts to analyze the dome structure, material behavior, and construction variations in well configuration and in leaching flows. Based on the evidence, it is not clear that the well configuration plays a part in the response of a given cavern, since both two-well and three-well configurations can lead to salt remnants in some of the wells. These remnants are probably the result of leaching practice, although even the leaching configuration itself does not necessarily play a major role in the cavern geometry, contrary to whatever one might perhaps expect. One of the distinct features of the leaching in Bryan Mound is that it shows broad flow channels not seen in the other three SPR facilities. Although the reason for this is not known definitively, the differences in the type of insolubles may offer an explanation. Bryan Mound, while similar in total insoluble content, has a higher fraction of shale (clay), as opposed to anhydrite. The distribution of the shale is locally uniform throughout the salt layers, rather than in discrete interbed layers. In another important aspect of behavior, it is clear mechanical creep behavior of the salt affects cavern closure response markedly. Moreover, the impurity content of the salt may influence the creep behavior of the salt or the details of the solutioning of the cavern. This suggests that in any new cavern development more attention should be given to early core sampling and laboratory creep testing. However, at this point, the important relationship between cavern creep closure and material failure which leads to salt falls is not clear.

*Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.