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## 2014 Re-Validation of the SANSMIC Solution Mining Code

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### Abstract

The U.S. Strategic Petroleum Reserve (SPR) has employed the solution mining code SANSMIC to simulate changes in salt cavern geometry due to fresh water injection throughout the lifetime of the project. Sandia National Laboratories adapted SANSMIC from the SMRI code SALT77 to support cavern development at SPR in the early 1980's. The direct and reverse leach capabilities were validated at that time with the available data. With the evolution of operating systems and source code from the 1980's to current day, Sandia determined that SANSMIC should be re-validated in its current operating environment, and the results are summarized in this paper. This validation process has utilized reports generated in the mid-eighties resulting in some overlap with the prior validation work as a means of comparison. It has also used the data generated by recent operations including a 30 MMB drawdown in 2011 and subsequent leaching efforts to increase storage capacity across the SPR complex. The quality of the data provided in the 1980's reports presents challenges in modeling the leaching activities and comparing to prior validation work. Recent leaching operations, however, are supported by much better data, and provide a more informative look at code performance. SANSMIC appears to slightly overestimate the volume in the direct leach configuration, but this effect may be amplified by uncertainty within the injection data. SANSMIC both under and over predicts the volume generated when in reverse leach configuration, but does have a general pattern to under predict the leaching near the oil-brine interface and over predict the leaching near the injection depth. SANSMIC predicts the withdrawal leach configuration very well and even models the event of a string break well.

**Key words:** Cavern Dissolution Modeling, Caverns for Liquid Storage, Computer Modeling, Domal Salt, Strategic Petroleum Reserves

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