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**Spacing, Scheduling, and Scaling:
Field Development Planning for Stratiform Evaporite
Solution Mining**

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Abstract

Field development in stratiform evaporite deposits presents a distinct challenge in solution mining: how to efficiently extract resources across broad horizontal areas while maintaining long-term geomechanical stability and managing surface infrastructure requirements. Unlike domal salt formations, which support vertically oriented cavern designs with relatively independent wellheads, stratiform deposits force operators to make tightly coupled decisions about spacing, scheduling, and scaling. However, despite the growing number of projects targeting these bedded salt deposits, few technical publications offer planning frameworks specific to their constraints.

This paper presents a practical, field-oriented guide for optimizing cavern placement and development in horizontally extensive, thinly bedded, solution mineable evaporite formations. Drawing from real-world projects and engineering experience, the tradeoffs between cavern spacing, pillar width, drilling cost, and resource recovery were examined. Subsurface layout options and operational considerations are discussed herein, highlighting their implications for subsidence risk and long-term stability. In parallel, surface infrastructure factors such as flow distribution, water sourcing, and pad placement efficiency were also evaluated, which interact closely with drilling and leaching schedules.

To illustrate the framework, screening tools have been introduced for recovery factor estimation, subsidence risk assessment, and hydraulic performance. These examples show how technical checks can be integrated early in the planning phase to guide design decisions. Supported by visual schematics and development flow summaries, this framework highlights where adjustments in spacing, scheduling, or scaling can be adopted to minimize costly redesigns and improve project outcomes.

This paper synthesizes planning strategies and layout principles drawn from multiple projects and operational experience. By linking technical and operational considerations, it provides decision tools broadly applicable to large-scale solution mining in stratiform evaporite settings.

Key words: Bedded Salt Deposits, Cavern Design, Cavern Development, Cavern Spacing, Field Development Planning, Rock Mechanics, Solution Mining, Salt, Subsidence, Trona

Background: Field Development in Stratiform Evaporites

Historically, salt domes have received substantial technical attention in solution mining because their thick, concentrated resources yield large quantities of salt, and they are widely used in building storage caverns. These domes are concentrated in specific geologic provinces; therefore, their distribution is geographically limited [U.S. Department of Energy, 2022].