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Construction and testing of Shell's freeze wall

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To demonstrate that ground water can be effectively excluded from a subsurface shale oil producing area by a subsurface frozen barrier, Shell is constructing and testing a freeze wall on private property in Rio Blanco County, Colorado. This barrier is created by circulating a common refrigerant through a closed-loop pipe system installed in dedicated freeze holes causing the water in the surrounding rock to freeze forming an underground impermeable barrier. Building on the successful results from the much smaller and shallower Mahogany Isolation Test, the Freeze Wall Test (FWT) consists of a rectangular pattern of 136 freeze holes spaced approximately eight feet apart. Freezing progress is monitored in each freeze hole by an optical fiber and by numerous pressure monitoring holes located within and outside the area enclosed by the freeze wall. This paper will review freeze wall design, construction, and results to date.