

14.3 Hydrogeology of the Colony Mine Site

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Experimentation with the various elements of the Electrofrac™ in situ oil shale retorting technology at the Colony Mine site requires a comprehensive understanding of the hydrology and hydrogeology of the site. This evaluation has included review of prior hydrologic work, a new hydrologic study, increased sampling for water chemistry and water levels, addition of water monitoring wells, and evaluation of fracture permeabilities within the Mahogany Zone. Water entering the ground surface on the mesa tops surrounding the mine site percolates through fractures in the uppermost Uinta Formation and the upper portions of the Parachute Creek member of the Green River Formation to reach the saturated water table. This water table is at about 7400 ft elevation north and west of the mine bench but drops substantially to about 7100-7000 ft upon approaching the mine bench and the valley of the Middle Fork of Parachute Creek. At the mine bench, the Mahogany Zone, where experimentation is being conducted, is within this unsaturated zone. However, there is active water flow within the A-Groove, immediately above the Mahogany Zone. Within the mine, this zone actively flows water into the mine workings near and above the Mahogany Marker to supply a flow rate of about 20 GPM to a stream flowing out of the mine. All water in both the saturated and unsaturated zones is stored within and travels through fractures and vug-related porosity. Vugs are from the dissolution of nahcolite. The kerogen-rich Mahogany Zone acts as a leaky aquitard with water transmission by fractures through the unit. Many fractures exhibit little flow while others exhibit very good water flow. The groundwater passing through the Mahogany Zone enters the fractures and vugs of the B-Groove and the top of the R6 interval of the Parachute Creek member. There is additional flow by seeps and springs from this interval into the canyon and canyon-fill alluvial aquifer. The alluvial aquifer has good permeability but limited storage capacity due to limited thickness. Water travel times from the Colony mine to the property boundary are estimated to be 80 years.