UTAH GEOLOGICAL SURVEY
a division of
Department of Natural Resources

PLATE 4
SPECIAL STUDY 107
UTAH GEOLOGICAL SURVEY

FRACTURED ROCK, SUBSIDENCE, AND TRACE OF MOAB FAULT MOAB - SPANISH VALLEY GRAND COUNTY, UTAH

by

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2003

SCALE 1:24,000

1 0 1 MILE

1 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET

EXPLANATION

- Fractured rock and potential subsidence
- Potential valley-floor subsidence
- Fault: bar and ball on downthrown side; dotted where concealed
- Inferred trace of fault prior to salt dissolution
- Study-area boundary

Hazard areas derived from geologic mapping by Doelling (2001) and Doelling and others (2002). Moab fault trace from Doelling and others (2002).

Base map from USGS Moab and Rill Creek 7.5 minute quadrangles.

DISCUSSION

Dissolution of salt in the diapir beneath Moab-Spanish Valley and accompanying collapse caused fracturing and displacement of much of the overlying rock. Fractured rock is exposed in and along the base of the cliffs that border Moab-Spanish Valley (the northeast- and southwest-valley-margin deformation belts), and is likely present at shallow depths in the valley floor adjacent to these exposures. The fractured rock may extend to great depths. Numerous faults are present within the deformation belts; while these faults share hazard characteristics with other types of fractures, including possible small subsidence-related displacements, they lack geologic evidence indicating they present a significant hazard from earthquake-related surface fault rupture.

Fractures increase secondary permeability and weaken the rock. Problems associated with fractured rock are unstable conditions in road cuts and tunnels, and increased potential for contamination of aquifers, such as from effluent from individual wastewater disposal systems. Increased permeability due to fractures enables effluent to travel long distances without proper filtering of pathogens. Effluent can contaminate bedrock and shallow unconfined aquifers. Cuts in fractured rock are susceptible to rock fall and slope instability.

Subsidence due to dissolution of salt at depth appears to be an ongoing process in Moab-Spanish Valley that needs further evaluation. A lowering of the ground surface could take place locally anywhere on the valley floor, including within the valley-margin deformation belts. Subsidence could affect development in a number of ways, including tilting and/or damage to structures due to differential settlement, lateral earth pressures, ground cracks or displacements in fractured rock, and ground collapse (sinkhole formation). In general, subsidence due to salt dissolution beneath Moab-Spanish Valley is likely characterized by small, incremental displacements over a broad area, and so the overall hazard is probably low. Also, the absence of sinkholes in Moab-Spanish Valley indicates that the hazard associated with local subsidence or collapse related to underground solution cavities is also low.

This map also shows the trace of the Moab fault for informational purposes only. Although surface fault rupture is possible, the fault is largely buried by Quaternary deposits, making the location of such a rupture difficult to predict. Because of the lack of evidence for late Quaternary displacement, the hazard associated with surface fault rupture is low, as is the hazard associated with ground shaking produced by movement on the fault.

USE OF THIS MAP

This map shows areas where site-specific studies concerning fractured rock are recommended prior to development. The map shows potential hazard areas for planning purposes only, and the boundaries of these hazard areas should be considered approximate. In these areas, site-specific studies are needed to evaluate hazards and, if necessary, recommend hazard-reduction measures. The studies must be prepared by qualified professionals (engineering geologists, geotechnical engineers, hydrologists) and signed by a licensed Professional Geologist or Engineer, as appropriate. Because of the relatively small scale of the map (1:24,000), the possibility exists that some small hazard areas are not shown; studies are therefore recommended for critical facilities even outside the mapped hazard areas. Detailed geologic-hazards studies for critical facilities on the valley floor should particularly look for evidence of subsidence or surface faulting.