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A summary of recent significant scientific and economic results accompanied by a list of geologic and hydrologic investigations in progress and a report on the status of topographic mapping

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methods. In contrast, surface-mining activities in weak rocks less than 60 m thick commonly extract at least 90 percent of the resource and provide for a more effective and timely restoration of the mined lands than underground mining.

Land subsidence continues in the Houston-Galveston area of Texas

The importation of large supplies of surface water from Lake Livingston has been delayed and subsidence continues in the area between Houston and Galveston as artesian pressures continue to decline, according to R. K. Gabrysch. During 1977, it is expected that deliveries of surface water will be made to all major industries using ground water in the southern part of Harris County. A decrease in ground-water production of about 350 m^3/s, which will allow as much as 35 m of recovery in water levels, is anticipated in the center of the large cone of depression. The possible use of tide gages for monitoring subsidence in the coastal areas is being investigated by the USGS in cooperation with the Harris-Galveston Coastal Subsidence District and the Texas Water Development Board.

Sergio Garza reported that a theoretical investigation of the feasibility of artificially recharging the ground-water reservoir in order to stop subsidence at the NASA Johnson Space Center southeast of Houston has been completed. Hydrologic digital models were developed to determine the quantities of recharge water needed by using a model of the ground-water basin already available. The land surface at the space center was about 4 to 6 m above mean sea level in 1974 and is sinking at an annual rate of more than 0.06 m. Assuming that the regional stresses will remain constant after 1980, Garza estimated that 1 m of local subsidence at the space center can be prevented by an effective and feasible well-injection program. Also, about 0.5 m of local subsidence can be prevented if surface-water importation significantly reduces ground-water pumping.

Compaction measured at Baton Rouge, Louisiana

Three free-pipe extensometers have been installed at a site near the center of pumping and land subsidence at Baton Rouge, La., according to C. D. Whiteman, Jr. The extensometers were designed to continuously record compaction to depths of 254, 518, and 913 m. During the first year of operation, both compaction and rebound were measured. Net compaction for the three depth intervals was 0.013, 0.016, and 0.022 m, respectively.

Semiquantitative analyses of 21 clay samples from the depth interval of 137 to 930 m at the recorder site and 16 clay samples from the depth interval of 125 to 818 m at a site about 5 km to the south indicated that the clays of this area consist predominantly of mixed-layer clays and montmorillonite with minor amounts of kaolinite and illite. The samples also contained an average of about 30 percent fine-grained quartz and minor amounts of potassium and plagioclase feldspars.

Subsidence in New York related to ground-water discharge

Circular areas of land subsidence associated with vents of upwelling, sediment-laden freshwater in the Finger Lakes region of central New York State were investigated by R. M. Waller. Subsidence depressions as large as 100 m in diameter occur along Onondaga Creek in a glaciated valley underlain primarily by proglacial lake deposits. Discharge from the vents varies in time and location and apparently results from water released when the deposits compact. Although subsidence began only in recent years, landowners report that venting has occurred for at least 50 years. Subsidence scarps, some of which are more than 1 m high, are common. A buried petroleum pipeline that has been exposed in the creek bottom in the last 2 years gives evidence of local subsidence in the area.

Solution-type mining of salt from depths greater than 350 m has continued for many years about 3 km upvalley from the areas of subsidence. Also, an abandoned 90-year-old brine well field, with numerous sinkholes and collapse pits, in hummocky terrain resembling glacial kame-and-kettle topography is directly upvalley. Although water discharging from the vents is fresh and the distance between the vents and the mining operations is great, it is possible that the mining operations are causing the subsidence; hydraulic stresses in the saturated glacial deposits can be transmitted considerable distances and may be responsible for the subsidence features.

Hydrogeologic changes in subsidence area of San Joaquin Valley of California

After 40 years of ground-water overdraft, canal imports have generally reversed subsidence trends in most of the San Joaquin Valley of California, according to B. E, Lofgren. In 1976, artesian heads had recovered toward presubsidence levels, and subsidence rates had decreased from an earlier maximum of 0.5 m/yr to near zero in much of the valley. However, increasing irrigation demands, particularly during years of deficient precipitation, pose the threat of increased pumping and another cycle of widespread land subsidence. Because of significant hydrogeologic changes during the 1930–70 overdraft period,