

GEOLOGY AND GEOGRAPHY

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ABSTRACTS

The pH of Precipitation in Indianapolis. KONRAD J. BANASZAK, Office of Surface Mining, Indianapolis, Indiana 46204.—The acid pH of precipitation in the north-eastern United States has been a matter of some concern. An automatic precipitation collector was located on the campus of IUPUI at 949 West New York Street, Indianapolis to ascertain the pH and anionic composition of precipitation. From September of 1978 to August of 1979, the pH of 73 individual precipitation events averaged 4.58 with a standard deviation of \pm 0.59. The other measured constituents averaged and had standard deviations of 4.16 ppm \pm 1.51 for sulfate, 1.61 ppm \pm 1.63 for nitrate, and 0.89 ppm \pm 0.79 for ammonium. No correlation of pH with either sulfate or nitrate was found. Nor was there any apparent correlation of the chemistry of the precipitation with the chemistry of the lower atmosphere as measured by the Environmental Protection Agency at the two sites within 0.1 kilometer of the precipitation collector. Although this study lasted only one year and lacks cationic data, it would appear that urban atmospheres, being more complex than rural atmospheres, have more complex patterns of acidic precipitation.

A Social Impact Assessment of the Brookville Reservoir on Union County, Indiana. THOMAS J. GALLAGHER, MARGARET M. KIMMEL, and GARY W. BARRETT, Institute of Environmental Sciences, Miami University, Oxford, Ohio.—The Brookville Reservoir, located in Franklin and Union Counties, Indiana, has already manifested both positive and negative impacts on the residents of this area. In an effort to evaluate these impacts, the Institute of Environmental Sciences (IES), Miami University, Oxford, Ohio, and the Whitewater Valley Jaycees, Union County, Indiana, cooperated on a social impact investigation.

Traffic was monitored six times (twice each on holiday weekends, average weekends, and average weekdays) during the summer of 1976. Out-of-state vehicles ranged from 11.2% (regular weekday) to 23.7% (holiday weekend) of the total traffic volume on Indiana SR 101 and from 27.8% (regular weekday) to 35.5% (holiday weekend) on US 27.

Questionnaires were distributed to visitors at the reservoir to determine the origin of people using this facility, the distance and routes traveled, and the economic and recreational activities in which they participated. A total of 957 questionnaires was returned for analysis. Interestingly, only 42.2% of the respondents were residents of Indiana compared to 53.9% for Ohio. Only 1.3% of the visitors were from Union County, whereas 33.8% traveled through Union County to reach the reservoir. The highest frequency responded that they traveled 26 to 50 miles to reach the reservoir. Economic-wise, only 11.2% of these visitors made purchases in Union County.

Residents of Union County were surveyed to determine the perception of and

desires for the future of both the reservoir and Union County. Of the 800 questionnaires mailed to residents, 203 (25.4%) were completed and returned. Expansion of local water facilities ranked as the most desirable need for change in the future. Loss of agricultural lands and loss of natural areas were ranked as the most undesirable changes.

Engineering Geology of an Operating Area Strip Mine, Southwestern Indiana. GERALD E. GREENGOLD and TERRY R. WEST, Department of Geosciences, West Lafayette, Indiana 47907.—Area strip mining of coal with concurrent reclamation (Pike County, Indiana) has involved some soil instability in spoil piles and vertical cuts. Overburden (50 to 180 feet thick) generally has a 1:3 to 1:6 ratio, soil to rock. Increases toward 1:2 yield spoil instability as rock volume is insufficient to retain the soil.

Surface soils are ice-contact and glacial lacustrine sands, silts, and clays with extreme variability. Company-supplied drill logs plus borings for the authors, provided data for plan maps and cross sections to correlate units and define their extent.

Stratigraphy is dominated by organic-bearing lacustrine clays and loose, fine to medium, saturated sands. Sands and clays range from small pockets to others > 50' thick and hundreds of feet across. Larger deposits have an E-W elongation. Area partially covered by two distinct units ranging from 5 to 20 feet thick each: lower deposit-glacial drift, upper-windblown silt. Bedrock is gray, shale to sandy shale, interbedded with yellow and gray sandstone, and some limestone. The irregular bedrock surface presumably was formed by normal processes of erosion without glacial influence. Where soil overburden is thickest, sections contain more gray clay and/or saturated sand.

Added borings had split spoon samples at 5' intervals to bedrock and some Shelby Tubes in zones thought to affect slope stability. Laboratory tests provided natural water contents and Atterberg limits. Shelby Tubes yielded natural densities and unconfined compressive strengths. Correlations between borings having spoons and Shelby Tubes with those of only split spoons allowed for characterization of materials. Clay strengths ranged widely from 0.04 to > 1.40 TSF. Sensitivities averaged 1.7. Based on the stratigraphy and properties of the materials, potential problem areas were delineated.

Recommendations being considered for slope stability: removal of some soils in thickest sections prior to production excavation, dewatering of sands where applicable and benching in thick soils to reduce cut-slope failures and to allow greater selectivity for soil-type placement in spoil piles.

Groundwater Chemistry in Vigo County, Indiana. JOSEPH G. HAILER, Indiana Geological Survey, Bloomington, Indiana 47405.—As part of an environmental geologic study of Vigo County, Indiana, 108 groundwater samples were collected and analyzed for major, minor, and trace element composition. Water from wells developed in the Pennsylvania-age sandstone aquifers of the eastern and northwestern sections of the county are highly alkaline Na-HCO₃ water. Fluoride, carbonate, and chloride are the major secondary constituents in this water. Water from the more productive, unconsolidated sands and gravels of the Wabash River Valley is a Ca-HCO₃-SO₄ water having high correlations with magnesium, strontium, silica, and nitrate. The occurrence of nitrate is likely related to human habitation and agricultural activity. Most chemical constituents are the result of the in-

teraction with aquifer minerals. The thermodynamic equilibrium model, WATEQ, is used to describe mineral stability based on chemical composition of water.

The Sedimentation of Lumsden Pond, Vigo County, Indiana. ERIC KOGLIN, Department of Water and Natural Resources, South Dakota Geological Survey, Science Center, University, Vermillion, South Dakota 57069 and DONALD W. ASH, Department of Geography and Geology, Indiana State University, Terre Haute, Indiana 47809.—Lumsden pond is located in a 10 acre drainage basin underlain by eolian derived soils. By determining the sediment accumulation over the pond's depositional history, calculations were made to estimate the yearly rate of sediment yield. The east-west trending pond had ten north-south traverse lines plotted at equal distances along one side. Along each line, stations were established to record water depth and sediment thickness. Sediment thickness was determined by pressing a steel probe into the sediment until a density change was noted. Two maps were plotted, one of the original bottom and another of the present bottom. Two-foot contour intervals were then drawn of the sediment thickness. Each contour was planimetered and the resulting data was used in the Modified Dobson Prismoidel Formula. The final result indicates that the average yearly sediment yield is 0.053 acre-feet. From this figure it was determined that the pond had lost 1.06 acre-feet of storage over its twenty-year depositional history. By comparing these results with other surveyed ponds it was observed that accumulation in Lumsden Pond can be considered normal. Assuming nothing is done to modify the rate of sedimentation, the life expectancy of the pond is 82 years.

Outlook for Shale-Oil Recovery from New Albany Strata in Indiana. JOHN B. PATTON and RICHARD K. LENININGER, Indiana Geological Survey, Bloomington, Indiana 47405.—Within the upper half of the New Albany Shale of southeastern Indiana, at least for sections so far analyzed, an interval of 30 to 40 feet contains an average of more than 10 percent organic carbon. According to data published concerning similar material, this interval should yield more than 20 gallons of shale oil per ton of rock when processed by hydrogen retorting. Large tonnages of the material are present at or near the surface, especially in Scott and Jennings Counties, and possibly Clark County, Indiana, and additional resources are accessible to underground mining where rock overburden is thick. Satisfactory reclamation of mined land, and other environmental measures such as protecting surface water quality, appear to be feasible. Ventures in shale oil recovery, with or without byproducts, are likely to be undertaken soon; and only the practical test of production at commercial level can establish the economic feasibility.