Program with Abstracts

April 20, 2000
Argonne National Laboratory
Argonne, Illinois

Illinois Groundwater Association Spring 2000 Meeting Agenda

Time		Speaker	Title
From	To		
8:00	9:00		**Registration**
9:00	9:15	Paul Kesich, Chair Bob Wynveen, ESH Division Director	**Welcome**
9:15	9:45	V. Batu/D. Hendron, GeoSyntec	Evaluation of TCE Remediation by Ground Water Flow and Transport Modeling under Complex Extraction Well Conditions
9:45	10:15	D. Korth, Earth Tech	Site Hydrogeologic Characterization in Glaciated Areas Using Improved Field Data Analysis Techniques
10:15	10:30	**Break**	
10:30	11:00	J. Quinn, ANL	The Effect of Deep-Rooted Hybrid Poplars on the Groundwater Flow System at the ANL Phytoremediation Site
11:00	11:30	Jim Wozniak, ANL	Tour of Phytoremediation Site
11:30	1:00	**Lunch**	
1:00	1:30	**Business Meeting**	
1:30	2:00	P. Lynch, ANL	ANL Offsite Seep Project/Water Fall Glen Forest Preserve
2:00	2:30	W. Shilts, ISGS	The Latest Developments in the Campaign to "Flesh Out" and Finance the Central Great Lakes Geologic Mapping Coalition
2:30	2:45	**Break**	
2:45	3:15	W. Dey, ISGS	Overview of a Statewide Pesticide Monitoring Network
3:15	3:45	R. Locke, ISWS	Mining Impacts to Lake in the Hills Fen Nature Preserve, Southeastern McHenry County
3:45	4:15	TBA	TBA
4:15		**Adjourn/Executive Meeting**	

EVALUATION OF TCE REMEDIATION BY GROUND WATER FLOW AND TRANSPORT MODELING UNDER COMPLEX EXTRACTION WELLS CONDITION

Vedat Batu, GeoSyntec Consultants, Chicago, Illinois
David M. Hendron, GeoSyntec Consultants, Chicago, Illinois

ABSTRACT

During the time period between 1965 and 1980 approximately 30,000 kg of TCE was released accidentally from an industrial plant to an alluvial aquifer which is underlain by an aquitard that is underlain by the Ogallala Aquifer. The Ogallala Aquifer is approximately 400 ft thick at the Site and covers a large area in the Central United States. Water has been pumped continually from the aquifer for domestic purposes using several large capacity wells near the TCE release area since mid 1960s with individual rates ranging approximately from 30 gmp to 900 gpm. Since the mid 1980s three remediation extraction wells around the TCE release area have been used in order to clean up the aquifer, i.e. to reduce TCE concentrations to less than 5 μg/L. This remediation effort has been scheduled to continue at least two more decades. The purpose of the modeling study was to evaluate the efficiency of the remediation effort and make recommendations regarding the future extraction schedules. For this purpose, three-dimensional ground water flow and transport modeling studies were carried out by conducting ground water flow calibration under no-extraction and complex extraction well conditions; and TCE transport calibration under complex extraction well conditions as well. There are 153 monitoring wells in the release area that were used for calibration of the numerical models. Calibration of the models was extremely successful. Using the calibrated models, future predictions regarding the TCE migration were carried out. The models are being revisited, as new data are available.

SITE HYDROGEOLOGIC CHARACTERIZATION IN GLACIATED AREAS USING IMPROVED FIELD AND DATA ANALYSIS TECHNIQUES

Daniel P. Korth, Earth Tech, Inc., Oak Brook, Illinois
Daniel L. Kelleher, Earth Tech, Inc., Plymouth, Minnesota
Tim J. Kemmis, Earth Tech, Inc., Sheboygan, Wisconsin
Paul M. Kesich, Fermilab, Batavia, Illinois

ABSTRACT

Accurate site hydrogeologic characterization requires three-dimensional mapping of site geologic units. This can only be accomplished when sufficient high quality field data are available. As commonly practiced today, site characterization in glaciated areas is often insufficient due to inadequate training of field geologists, the over-reliance on engineering soil classifications for characterizing glacial deposits, and the usual procedure of analyzing the data after the fieldwork is completed. To improve site characterization in glaciated areas, delineation of geological units should be based on depositional environments rather than relying solely on engineering soil classifications. A properly trained field geologist will use good field techniques to preserve the clues to the depositional environments contained in the field samples and will be able to interpret those clues to differentiate stratigraphic units in the field based on depositional environments. Field data acquisition, data analysis, and data interpretation should all be performed as an integrated process in the field while the drilling program proceeds. The most important advantage to this approach is when unanticipated conditions are encountered, as is usually the case, the work plan can be adapted in the field to address the uncertainties. This approach will produce a superior site characterization. This approach is also more efficient, because uncertainties can be recognized and resolved while still in the field and because the site characterization is essentially complete when the fieldwork is complete.

ANL-EAST OFFSITE SEEP PROJECT/WATER FALL GLEN FOREST PRESERVE

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ABSTRACT

At least five groundwater seeps are present in a network of steeply eroded ravines in the Waterfall Glen Forest preserve south of the 300 Area at Argonne National Laboratory-East (ANL-E). Analytical results of of samples of seep water, collected during a Resource Conservation and Recovery Act Facility Investigation in the 300 Area indicated that two of the five seeps contained detectable levels of volatile organic compounds, and seep water from a third seep contained detectable levels of tritium. The results of a conservative preliminary risk assessment showed that the discharged of contaminated water from these seeps present a very low risk to human health and wildlife.

To ensure that risks associated with the contaminated seeps are properly understood and managed, an extensive subsurface investigation of the seep vicinity was conducted. The investigation consisted of shallow soil, subsurface soil, and groundwater sampling, as well as utilization of geophysical methods (including in-situ conductivity, EM-31, EM-34-3, and ground-penetrating radar), geologic mapping of ravine exposures, and aquifer pump testing. Due to the sensitive nature of the forest preserve area where the subsurface investigation was conducted, the Forest Preserve District management required Argonne to conduct investigation activities that would impact the environment as little as possible. Therefore, innovitive technologies were employed, including Geoprobes mounted on all-terrain vehicles for soil boring, in-situ conductivity testing, and installation of "mini"-monitoring wells. Field data was integrated to create a model of the subsurface geology and hydrogeology in the vicinity of the seeps and to identify possible sources of contamination found at the seeps.

THE EFFECT OF DEEP-ROOTED HYBRID POPLARS ON THE GROUNDWATER FLOW SYSTEM AT THE ARGONNE NATIONAL LABORATORY PHYTOREMEDIATION SITE

John J. Quinn, Argonne National Laboratory, Argonne, Illinois

ABSTRACT

Phytoremediation is becoming a viable technology for remediating volatile organic compounds (VOCs) and other contaminants in groundwater and soil. Phreatophytes such as poplars transpire VOCs through their leaves during the growing season, metabolize VOCs in the rhizosphere through the biotic activity of fungi and bacteria growing symbiotically along the roots, and depress water levels in an aquifer by removal of groundwater through transpiration. One technique is the use of engineered systems of hybrid poplars with roots directed to relatively deep aquifers.

In 1999, approximately 450 such poplars were planted in a groundwater remediation project at Argonne National Laboratory, near Chicago. Trees were planted in large-diameter boreholes drilled through approximately 30 ft of glacial tills and perched saturated zones to a contaminated sand and gravel unit. The boreholes were lined with plastic and filled with mixtures of topsoil, manure, and sand to constrain the developing roots downward.

Groundwater modeling was performed to evaluate the anticipated effects of the trees on the groundwater flow system. Initially the modeling determined best estimates of input parameters and boundary conditions to provide a suitable match to pre-remedial transient conditions. Then the future effects of mature, deep-rooted hybrid poplars on the flow system were modeled, including transient seasonal effects. Estimates of the transpirative stresses of the poplars were developed to model the month-by-month water use of the developing trees. The modeling suggests that the mature trees will provide containment of groundwater from the upgradient source areas despite the trees' dormant winter periods, and groundwater will have a residence time of 5 to 17 months in the microbially active rhizosphere of the poplars. During the summer, dewatering of portions of the aquifer is likely due to the high water demand of the trees combined with the decreased flux of water into the aquifer.

THE LATEST DEVELOPMENTS IN THE CAMPAIGN TO "FLESH OUT" AND FINANCE THE CENTRAL GREAT LAKES GEOLOGIC MAPPING COALITION

William Shilts, Illinois State Geologic Survey, Champaign, Illinois

ABSTRACT

The Great Lakes Geologic Mapping Coalition is a cooperative agreement between the Illinois State Geological Survey, the Indiana Geological Survey, the Michigan Geological Survey, the Ohio Division of Geological Survey, and the U.S. Geological Survey. It addresses their desire to cooperate in joint investigations and scientific exchanges concerning the earth sciences (including geology, geochemistry, geochronology, geophysics, geotechnical and geological engineering and related investigations) on topics of mutual interest. This agreement is specifically undertaken to advance the understanding of the three-dimensional distribution of the glacial, periglacial, and proglacial deposits that overlie the bedrock of the glaciated Midwest. It recognizes the fact that several continental glaciations of the last million years have profoundly affected the geology and the natural environment of all four States – Illinois, Indiana, Michigan and Ohio – thereby establishing a commonality of interests among the organizations and citizens of these states. These organizations agree that reaching a fuller understanding of the three-dimensional framework of the glacial sediment of the region is needed to provide regional and national policymakers with the earth-science information required to make wise decisions regarding urban and agricultural land use, the protection of aquifers, and the environmental well-being of the citizens of this geologically unique region.

OVERVIEW OF A STATEWIDE PESTICIDE MONITORING NETWORK

William Dey, Illinois State Geological Survey, Champaign, Illinois

ABSTRACT

A statewide network of groundwater monitoring wells was designed to provide data to test the utility of a statewide map of aquifer sensitivity to contamination by pesticide leaching. The map was created by combining soils and geologic data and was designed as a predictive tool for groundwater quality. The map may be used in Illinois' Pesticide Management Plan (PMP) for regulating pesticide use. A second goal of the network is to provide data on the variability of the occurrence of selected agricultural chemicals within selected units of the aquifer sensitivity map. A third goal was to guide sampling to determine if the occurrence of selected agricultural chemicals in groundwater varies seasonally or over longer periods of time.

Installation of the monitoring well network began in 1995. By December of 1999, 170 monitoring wells had been installed. The completed network will have 225 wells, with 75 wells in each of the three most sensitive map units. Well locations are selected randomly within each map unit.

Beginning in the Fall of 1997, six wells have been sampled monthly. Three of the six wells are in geologic settings mapped as having an excessive potential for aquifer contamination from pesticide leaching and three are in settings mapped as having a moderate potential for aquifer contamination from pesticide leaching. In addition, a one-time sampling of 120 wells was started in September 1998. Ten wells are being sampled each month over a year. The 120 wells sampled are divided among the three map units being monitored. Both groups of samples are analyzed for 14 pesticides and 10 ions. Preliminary results show detectable levels of pesticides in 18% and nitrate-nitrogen concentrations above the 10 mg/L in 28% of all samples.

Hydrologic Characterization of Lake in the Hills Fen Nature Preserve, Southeastern McHenry County

Randall A. Locke II, Illinois State Water Survey, Champaign, Illinois

ABSTRACT

Lake in the Hills Fen Nature Preserve is a 207-acre site in Southeastern McHenry County that retains much of its pre-settlement character. The site was formally dedicated to the Illinois Nature Preserve System in 1990 to protect the nine native communities present: calcareous floating mat, calcareous seep, graminoid fen, low shrub fen, marsh, perennial stream, dry gravel prairie, mesic gravel prairie, and sedge meadows.

Because of concern about the influence of sand and gravel mining on fen communities in the northern part of the preserve, the Illinois State Water Survey and Illinois State Geological Survey have been monitoring ground-water levels and chemistry in and adjacent to two fen communities since May of 1999. Persistent geochemical trends have been identified in the preserve along a ground-water flow path downgradient of an inactive mine face. On the upgradient side of the flow path, total dissolved solids (TDS) concentrations averaged 274 mg/L. At fen one (520 feet downgradient) where flowing artesian conditions occur, TDS averaged 389 mg/L. Along the flow path, ground water was increasingly oversaturated with respect to calcite. In addition, average dissolved calcium concentrations increased from 60 mg/L to 77 mg/L. Calcium trends on flow path one are indicative of other cation (e.g., magnesium, sodium) trends. By documenting current hydrologic and geochemical conditions at the fens in the preserve, changes to these conditions can be identified.