GROUNDWATER REALITIES

Performance Standard 12B/13B/11A.J

Students will apply the processes of scientific inquiry to research the sustainability of water resources through an environmental impact study accordingly:

- *Knowledge:* Describe the impacts of human activity in a real-world ecosystem.
- *Application:* Analyze an environmental impact study.
- *Communication:* Role-play the circumstances and deliberations of an actual groundwater impact study.

Procedures

1. ***In order to know and apply concepts that describe how living things interact with each other and with their environment (12B), the concepts, principles and processes of scientific inquiry (11A), and the concepts that describe the interaction between science, technology and society 13B,*** students should experience sufficient learning opportunities to develop the following:
   - Review existing scientific research associated with water supply recharge/deficit/surplus and groundwater infiltration.
   - Examine applicable groundwater surveys, impact studies and models.
   - Describe the design and procedures used in environmental impact studies. Design an issue investigation model through the use of appropriate simulations and role-playing.
   - Project possible viewpoints, variables, applicable data sets and formats for class presentation.
   - Use appropriate technologies.
   - Compare methods for minimizing pollution or procedures for monitoring environmental quality.
   - Test applicable simulation models.
   - Evaluate data sets and trends to explore unexpected responses and data distractors.
   - Evaluate validity and reliability factors.
   - Substantiate basis of inferences, deductions and perceptions.
   - Synthesize the process and findings of groundwater issue investigation and justify actual recommendations.
   - Critique findings.
   - Generate further questions or issues for consideration.
   - Evaluate comparable issue resolutions or responses for action.
   - Generalize public opinion responses.

   Note to teacher: This activity relates to knowledge associated with standard 12B, while addressing the performance descriptors for stage J within standard 11A. The process of the investigation can be directed through the performance descriptors from 13B more specifically.
2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. Set the stage for this issue investigation with foundational information about the groundwater system, generally and specifically in your school's area. In October, 2001, The Illinois Department of Natural Resources, Groundwater Education Division awarded three Shining Star Groundwater Protection Awards to local communities for outstanding leadership and teamwork in protecting Illinois' groundwater. Materials and resources are provided about the actual events and research associated with the groundwater contamination and resulting efforts in East Alton, IL. Students should identify the science concepts and scientific research questions, impact study processes and findings from this specific example. The premise of this activity is to investigate the study that was completed, the roles of community leaders and groundwater professionals, the scientific background and data associated with this issue and how this community dealt with the decision-making process. Students are expected to role-play the scenario as a town meeting to receive this award, reliving the issues, deliberations, research, and action responses. Students may be grouped into news media reporters for interviews and write editorials, narratives and future planning projections. Preparatory work can be done in class and/or out of class. An extension can include the investigation of the local groundwater supply, policies which protect it and potential threats to its safety. *The village of East Alton was able to correct its MTBE problem through application of scientific principles.
4. Evaluate the student's performance using the Science Rubric as follows and add the scores to determine the performance level:

- *Knowledge:* The descriptions of the human activity impacts and effects in an ecosystem were complete and correct.
- *Application:* The analysis, interpretation and critiques were thorough, well-reasoned and well-detailed.
- *Communication:* The group presentation's content research and roles were appropriate to the assigned roles and individual critiques of the impact of human activity were accurate and insightful.

Examples of Student Work not available

Time Requirements

- 1-2 weeks for research and preparations (in and out of class); 2 days for role-playing and reflections.
- St. Louis Post Dispatch, July 30, 2001: City Wants Oil Companies to Pay for Contamination.
- The Alton Telegraph, November 23, 2001, article by Cynthia M. Ellis
- American Chemical Society, August 30, 2001: Pipelines, storage containers may spread MTBE throughout the Midwest
- IEPA-99, Groundwater Section: East Alton PWS Capture Zones with potential sources of contamination; Methyl Tertiary Butyl Ether (MtBE) in Illinois publication; Wellhead Protection Planning Map for East Alton (1190200)
- IDNR maps: Principle Aquifers in Illinois, Potential for Aquifer Recharge in Illinois
- Press Release from Governor's Office, July 24, 2001: Governor Ryan Signs Law to Eliminate MtBE
- National Institute of Environmental Health Sciences, Index of Health Topics: MTBE (in gasoline)
- Illinois Groundwater Protection Act: A safeguard for Illinois Water Supply (brochure)
- Illinois Pollution Control Board: http://www.ipcb.state.il.us/Archive/dscgi/ds.py/Search

- Science Rubric.