US Environmental Protection Agency

# *Photogeologic Analysis for Environmental Assessment*

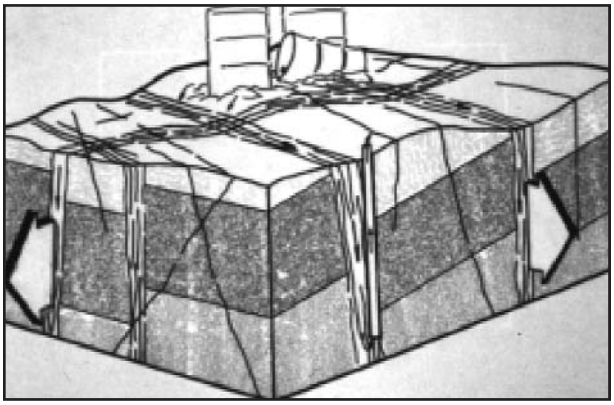
## Introduction

Photogeology refers to the science of using overhead imagery to obtain qualitative and quantitative geologic information. The environmental objective in application of photogeologic techniques for environmental purposes is to provide information about the geologic, hydrologic and geomorphic conditions which could affect contaminated ground water movement. Photogeology has been used by government agencies and private firms to help define, quantify, and solve environmental problems dealing with ground and surface water contamination.

The EPA's National Exposure Research Laboratory - Las Vegas through its Environmental Photographic Interpretation Center (EPIC) uses four photogeologic techniques: fracture trace analysis, karst feature identification, seep/spring detection, and channel change analysis to support all phases of ground and surface water characterization and remediation efforts at sites across the country.

## Geologic Factors

Photogeologic analysis provides important information regarding the local geologic conditions which may be acting to influence ground water movement around sites that generate hazardous wastes. Ground water movement may be influenced by fracture traces (ground surface expressions of near-vertical zones of fracturing in underlying bedrock) (Figure 1), karst features such as sinkholes (created by the solutionization of carbonate rocks), and aquifer recharge and discharge points such as seeps and springs. An estimation of the susceptibility of a site or facility to flood-related damage can be gained through the analysis of past channel positions and current channel bank scour areas identified on overhead imagery.



## Scope

The presence of geologic features such as fracture traces, karst landforms, and aquifer discharge and recharge points, helps control the hydrologic regime around sites that generate hazardous wastes. Implementation of ground water monitoring or remediation programs around sites which do not take into account all aspects of the geologic setting run the risk of incompletely assessing the ground water contaminant problem. Photogeologic information provided to the EPA site hydrologist during the early stages of site assessment ensures that a site-specific ground water monitoring and sampling program can be designed based on the local geologic setting.

## Advantages and Limitations

Completion of a photogeologic analysis allows the design and implementation of site specific ground water, surface water, and soil sampling and monitoring programs based on the geologic and hydrologic setting of the site. Advantages include: relatively low cost of aerial imagery acquisition; availability of historical coverage from both government and private sources; and ease of non-computer based photogeologic analytical procedures.

Limitations include: inability to accurately analyze certain types of geologic settings such as areas covered by thick unconsolidated sediments, a lack of pre-development or pre-urbanization aerial imagery, and a lack of leaf-off aerial imagery.

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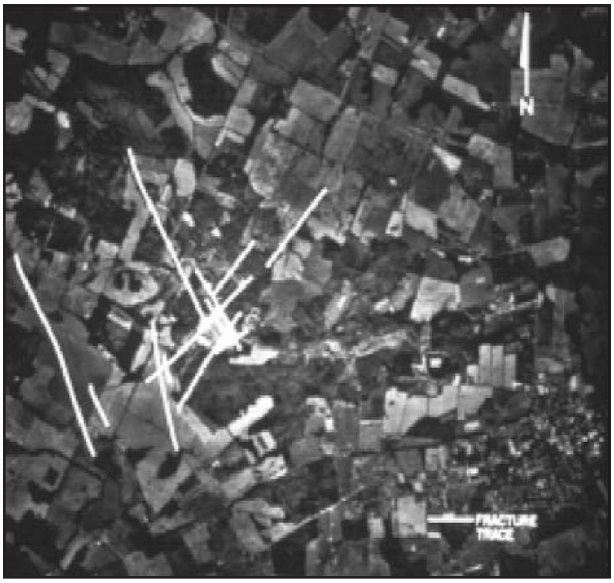



## Methodology

Once the need for photogeologic support is identified, the site is screened for suitability. A determination is made to insure that the site is located within the appropriate geologic terrane for the requested photogeologic technique. Government and private sources of overhead imagery are searched for available coverage while background information on geology, hydrology, and soils is compiled in support of the photogeologic analysis. Close contact with regional requesters and their support staff assures that the results of the analysis will provide the type of geologic information required. If necessary, photogeology staff can travel to the site to assist in the location of monitoring wells, seeps and springs, sinkholes, and soil and ground water sampling points. The results of the photogeologic analysis are compiled into a bound report including figures, maps, and explanatory text.

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