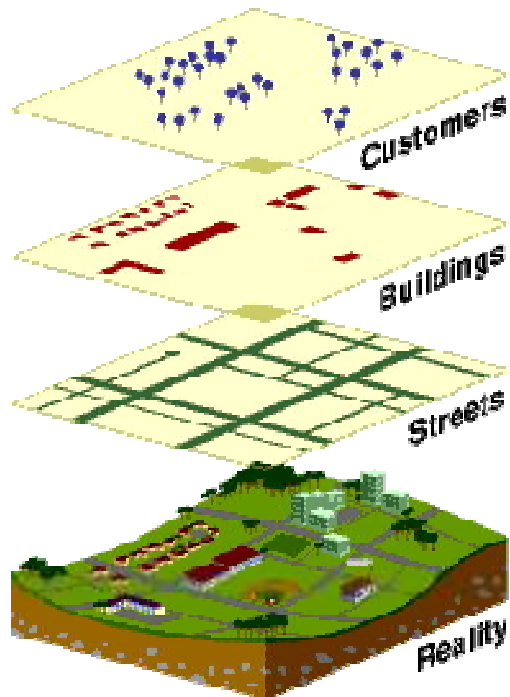


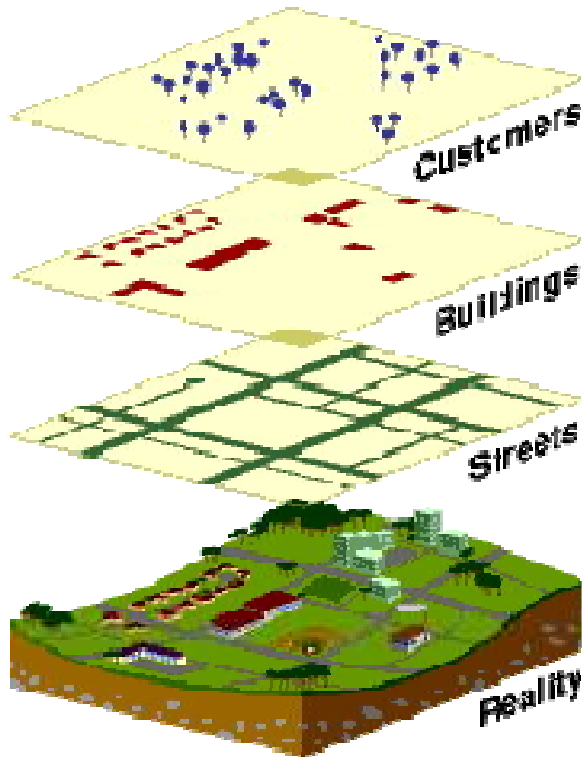
# Overview of Geographic Information System (GIS) and Its use for Environmental Remediation

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# What is a Geographic Information System (GIS)?



- GIS = **G**eographic **I**nformation **S**ystem

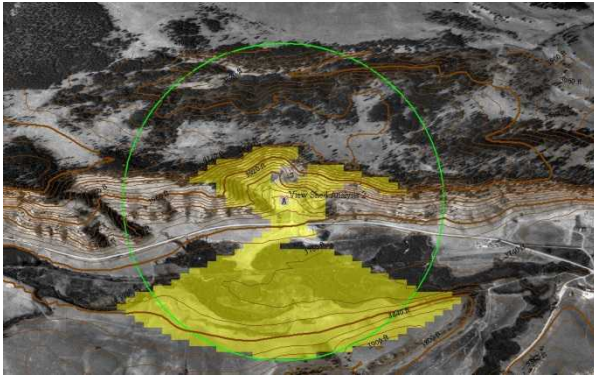
A **G**eographic **I**nformation **S**ystem is a set of computer tools that provide for collecting, storing, retrieving, transforming and displaying spatial data.

*Or, more simply,*

A computer system capable of holding, using, analyzing and describing data about places on the earth's surface.

# How GIS Works

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Area in yellow is visible from the center of the site

**A GIS doesn't hold maps or pictures -- it holds a database of spatially related information.**

**The database concept is central to a GIS and is the main difference between a GIS and drafting or computer mapping system, which can only produce good graphic output.**

# Questions a GIS Can Answer

**Location**-- What is at...? Where is ....?

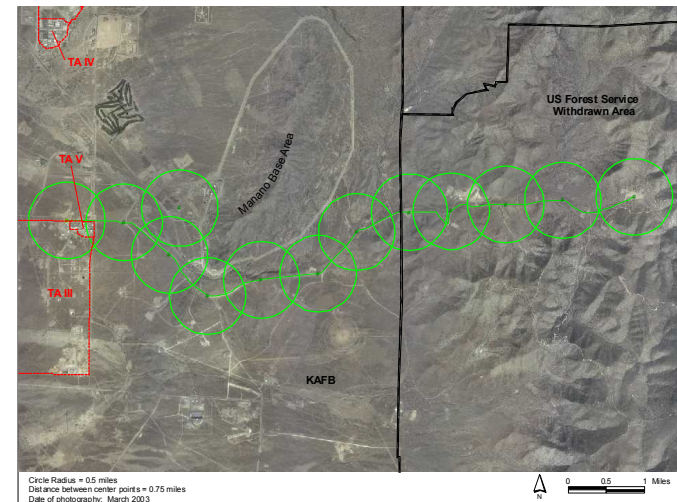
**Condition** -- Where is it?

**Trends** -- What has changed since....?

**Patterns** -- What spatial patterns exist?

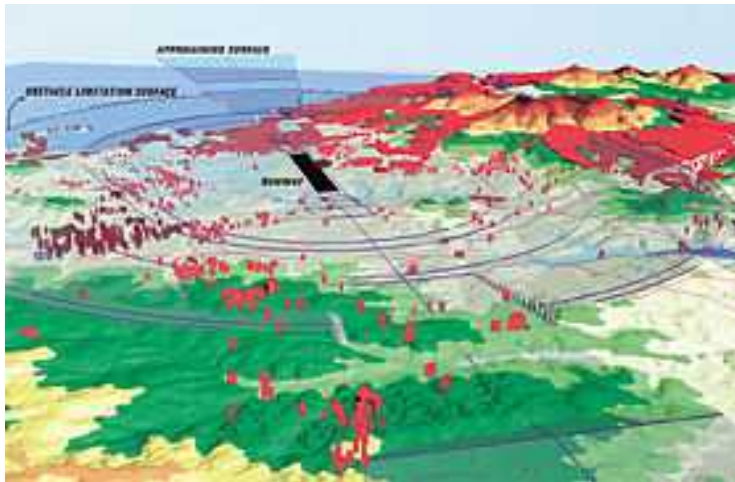
**Modeling** -- What if....?

A GIS can perform all these operations because it uses geography, or space, as the common key between the data sets. Information is linked only if it relates to the same geographic area.



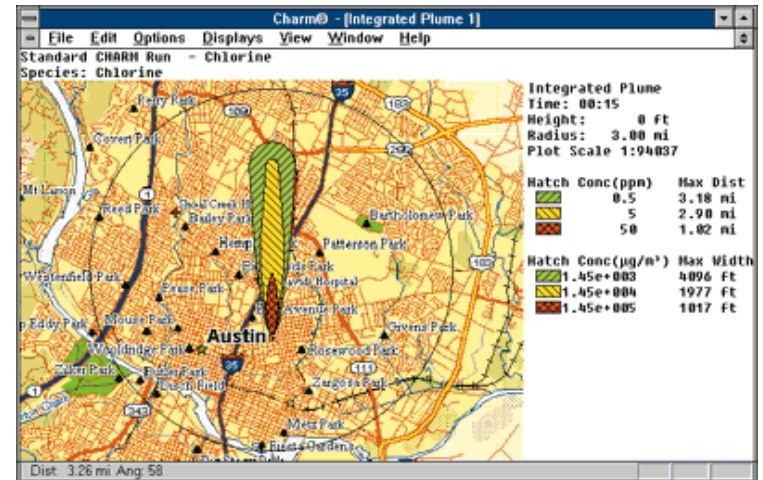
# How GIS Is Used

## Mapping Where Things Are



This map shows the location of man-made objects such as buildings, antennas and towers, as well as landscape features that can pose dangers to aircraft leaving or approaching airfields.

## Finding What's Nearby

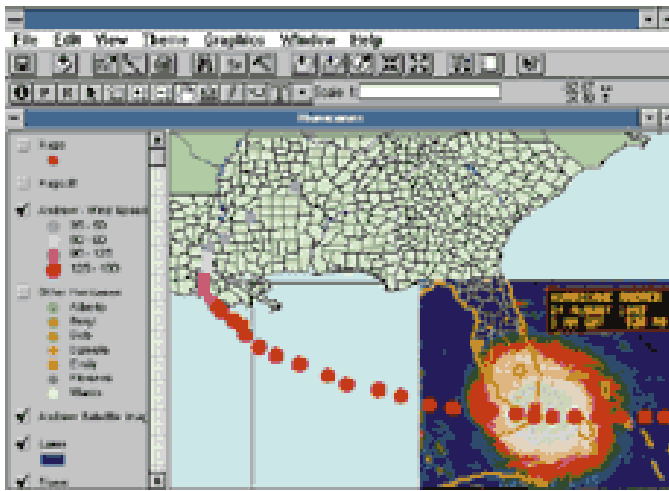


This map shows all properties within three miles of the path of a chlorine plume.

Emergency response teams can use this to follow the path of the plume and notify or evacuate nearby properties if needed.

# How GIS is Used

## Mapping Change



This map shows the path of Hurricane Andrew as it moved across the Gulf of Mexico on August 24, 1992. The different color dots represent the maximum wind speed of the hurricane at different times. Speeds range from 35-50 miles per hour (light blue dots) to 125-150 miles per hour (red dots).

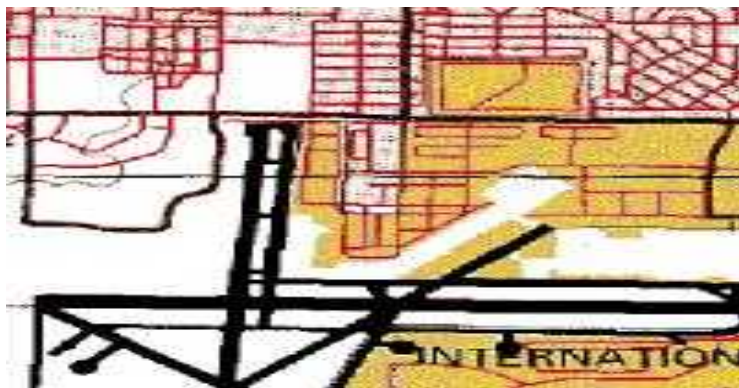
## Analyzing Relationships



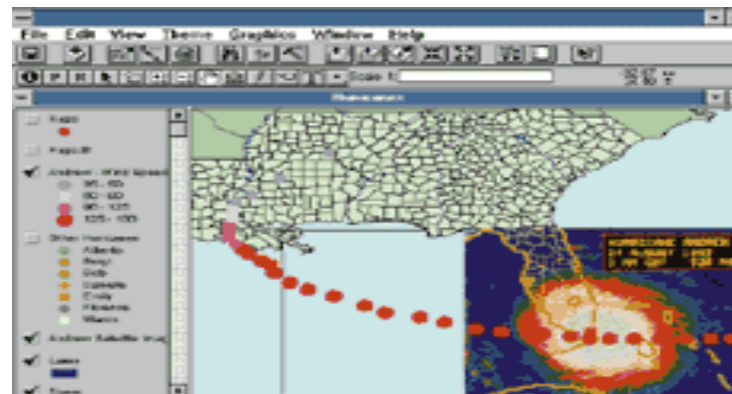
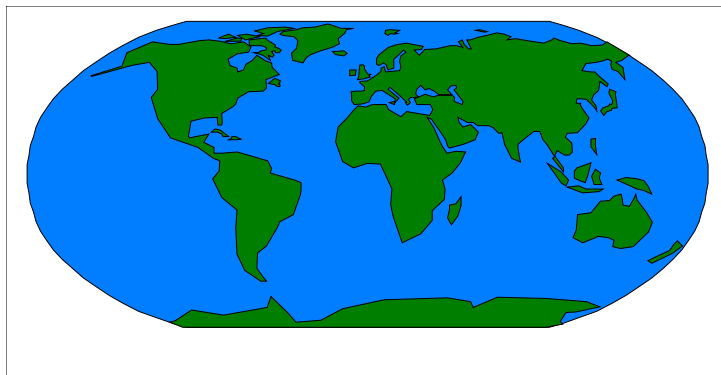
This map shows schools, highways, sirens and other features within a 10-mile radius of the Palo Verde Nuclear Generating Station. This map is used for Emergency Planning.

# Types of Information a GIS Uses

## Line data



## Imagery Data



## Area data

## Point data



# GIS and Decisions

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*Better information leads to  
better decisions*



**A GIS is a tool to query, analyze  
and map data in support of the  
decision making process**



# History of GIS Use For Clean-up Activities

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In 1991, the Environmental Restoration (ER) Project at Sandia National Laboratories (SNL/ER) was expanded to meet US Department Of Energy (DOE) objectives for clean-up of hazardous waste sites at its facilities.

Part of the SNL/ER Project strategy was to use Geographic Information Systems (GIS) as a primary database for spatial and hazardous site clean-up information.



# Environmental GIS Mission Statement

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**EGIS provides environmentally related scientific data support and analysis through the implementation of an integrated Geographic Information System (GIS), a relational database management system and associated analytical software.**



# Environmental GIS (EGIS) Goals:

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- **EGIS is the primary database for all geo-referenced ER Data**
- **EGIS is a platform for the ER Data: providing access to the database for ER personnel and for other interested parties**
- **EGIS provides tools for interfacing the database with hydrologic and contaminate transport models**
- **EGIS provides tools and expertise for visualizing the data and models output**
- **EGIS provides tools and expertise for spatial statistics, spatial modeling and contouring of data**
- **EGIS provides QA guidelines and procedures for the management of GIS data, including data entry, data verification, and data validation.**



# How GIS is being Used

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## To provide maps for:

- field activities
- working drafts
- draft reports
- final reports
- interactions with the public

## Modeling Support:

- Soil Vapor Analysis
- Borehole Location
- Contaminate Transport
- Erosion Analysis

## Site Wide Characterization

- Monitoring well network
- Hydrogeological unit mapping and analysis
- Hydrologic analysis

## GPS Field Support

- Sample Site locations
- Navigation to existing data points
- Field Mapping

## Environmental Compliance Support

- Environmental Justice Analysis
- Cultural Resources
- Endangered Species

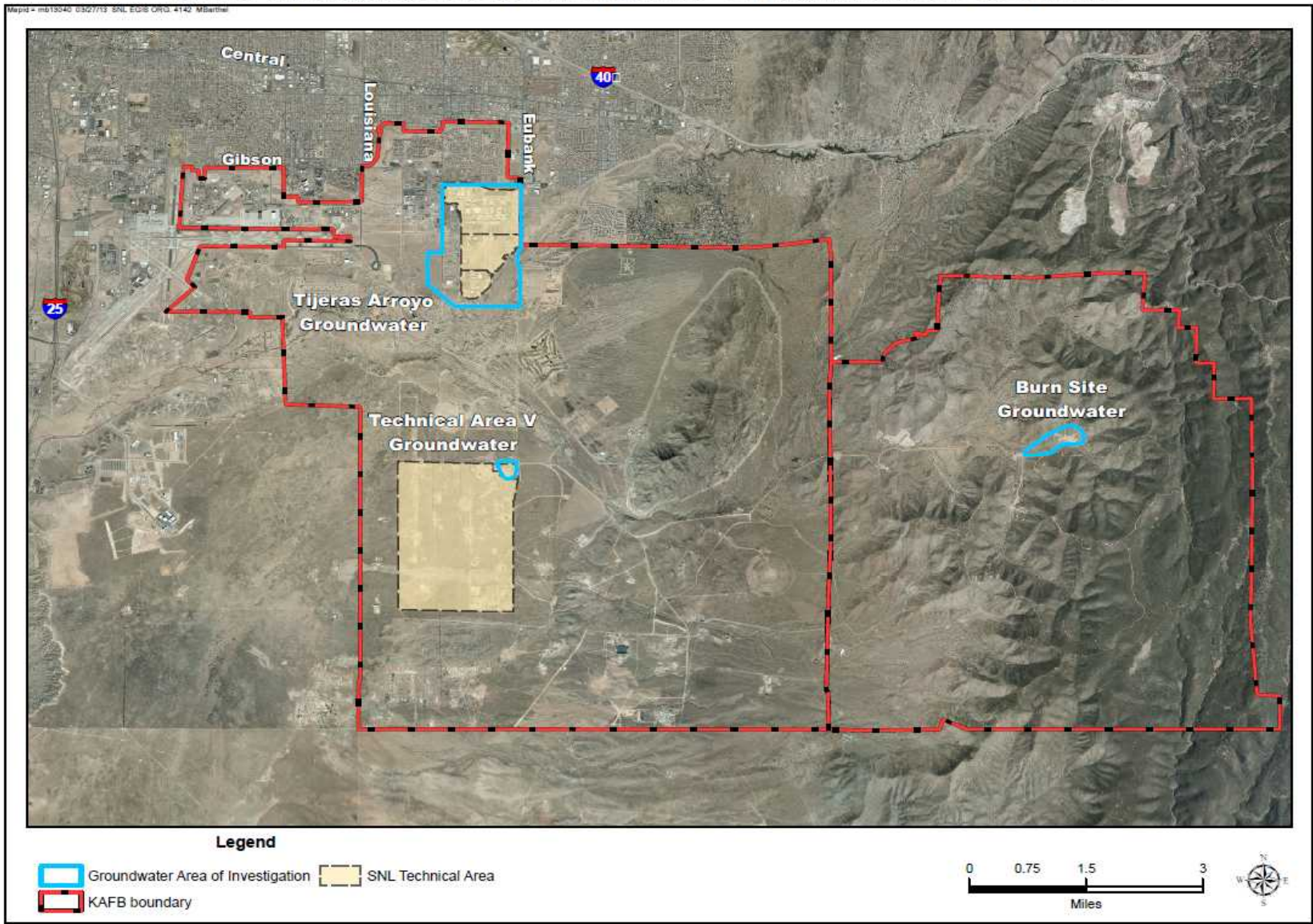


# Examples of GIS products

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- **Individual maps on demand**
- **Geology and hydrology maps and analysis**
- **Digital orthophoto maps with overlays of cultural resources and sensitive species for environmental compliance**
- **GIS/Modflow modeling efforts for groundwater studies**
- **Maps and graphics for regulatory compliance reports**
- **Presentations for regulators and public**

# Sandia National Laboratories, New Mexico - Groundwater Areas of Concern



# Questions?

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