Geographic Information Systems Applications Notebook

United States
Environmental Protection Agency
Region III - Philadelphia

September, 1991

Produced by
The Geographic Information Center
Information Resources Management Branch

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Introduction

Geographic Information Systems (GIS) is a rapidly developing technology that allows users the capability of collecting, managing, displaying, and analyzing large volumes of data from various environmental media. By better understanding the spatial relationship between natural resources, human populations and potential sources of contamination, the Region can more effectively accomplish the Agency's mission.

Region III obtained GIS capabilities in December of 1988. The Geographic Information Center (GIC) was established within the Information Resources Management Branch (IRMB) to provide GIS expertise and support to EPA programs, and to manage GIS related hardware and software. Since that time, GIS projects have been completed in almost all EPA program areas. This document contains brief descriptions and sample GIS output from some of the Region's most successful GIS efforts. Unless stated otherwise, GIS technical and cartographic support was provided by Region III's GIC.

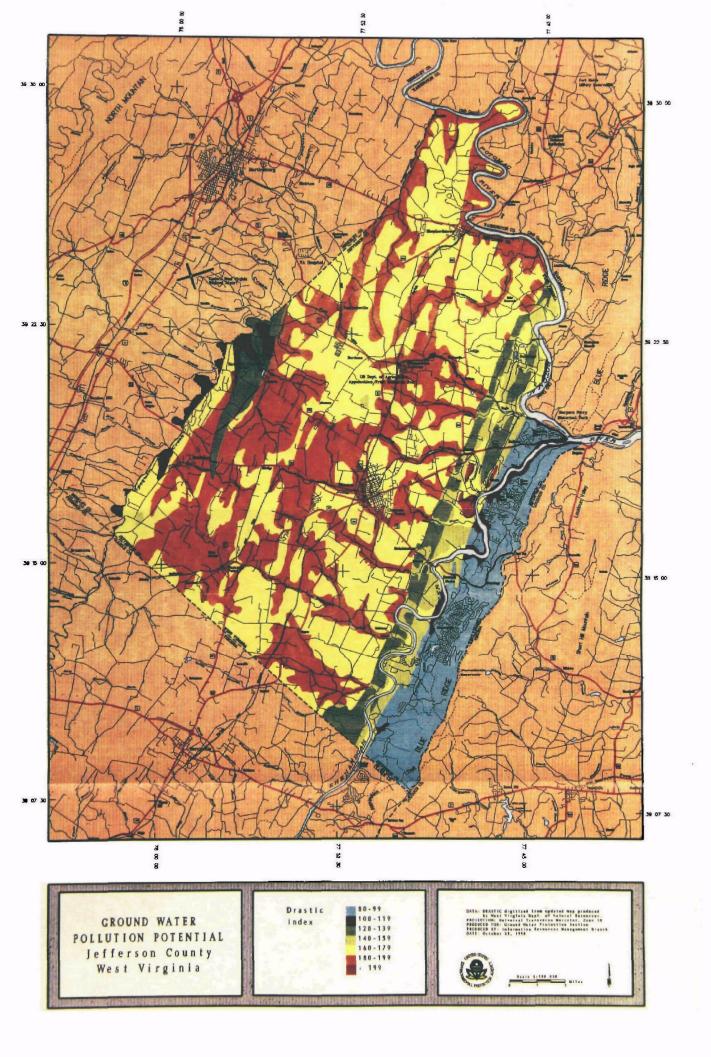The maps contained in this document are color xerox reproductions of originals produced on a Calcomp 5800 series color electrostatic plotter. The majority of the maps were originally designed to be printed at a 40 inch by 34 inch format, and were reduced prior to xeroxing. As a result, there may be some loss of resolution and readability. We hope this document will provide an insightful overview of GIS activities in Region III.
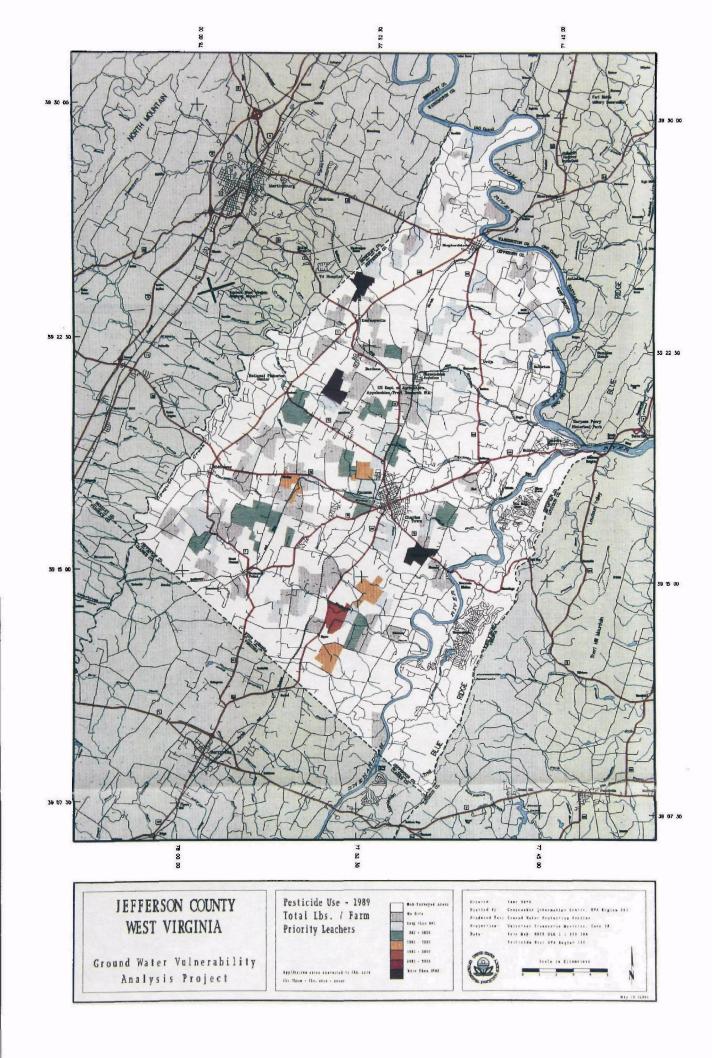
Non-point Source Pollution
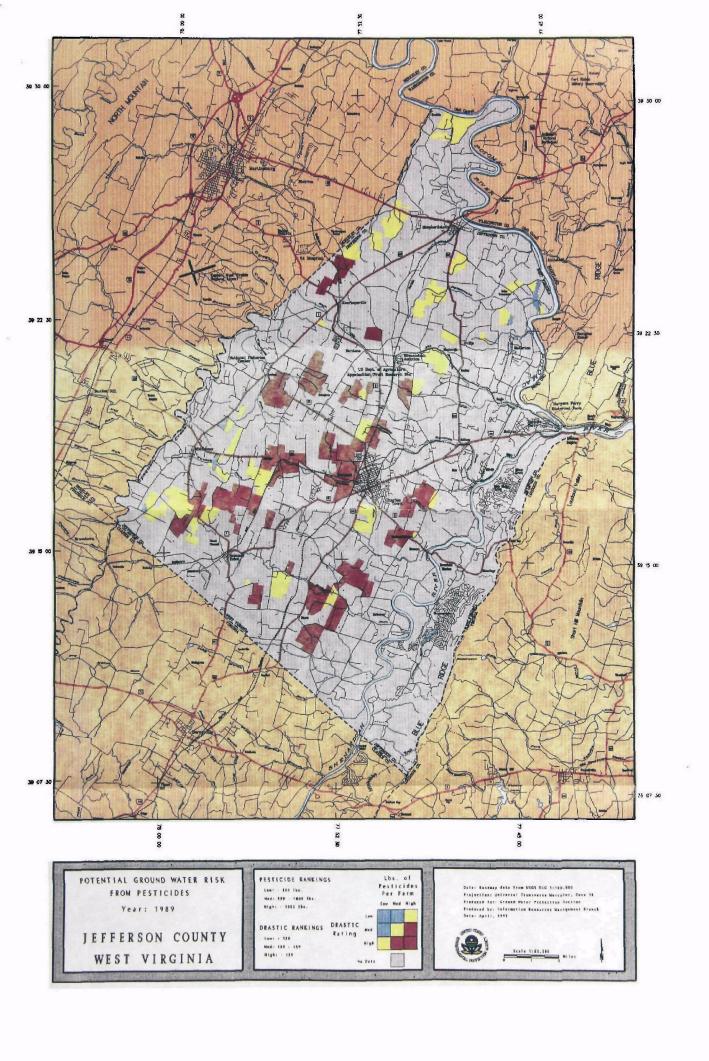# From Agricultural Practices

EPA Region III's Ground Water Protection Section is using GIS to assist Jefferson County, West Virginia and the State Department of Agriculture in developing their Pesticide in Ground Water Management Plan. An interagency workgroup of federal, state, and local agencies was established to help in this effort. Each agency has contributed important data layers to the project and a detailed agricultural practices survey of 118 farmers was conducted by EPA and the County Planning Council.

Several different types of analysis are being conducted by EPA staff using GIS. The maps on the following pages were created to identify areas where pesticides are being applied to vulnerable ground water areas. Vulnerability was determined by the State Department of Natural Resources using EPA's "DRASTIC" methodology (see map on the following page). "DRASTIC" is an acronym representing the most important factors controlling ground water pollution potential. GIS will allow EPA to further refine the vulnerability model by considering soil leaching properties, pesticide leaching properties, ground water flow directions, and the locations of sink holes, cavernous zones, and faults. The second map displays pesticide usage in pounds per farm as determined from by the agricultural practices survey. In the third map, the vulnerability and the pesticide usage maps were combined in GIS to identify where large amounts of pesticides are being applied to areas of high ground water vulnerability.

EPA is seeking funds to compare predictions regarding the effects of agricultural practices on ground water quality made using GIS with actual ground water monitoring data. The USGS National Water Quality Assessment of the Potomac River Basin is a potential source of funding for this proposed validation effort.

GROUND WATER
POLLUTION POTENTIAL
Jefferson County
West Virginia

Drastic
Index

▉	80 - 99
▉	100 - 119
▉	120 - 139
▉	140 - 159
▉	160 - 179
▉	180 - 199
▉	· 199

DATA: DRASTIC digitized from updated map produced
by West Virginia Dept. of Natural Resources.
PROJECTION: Universal Transverse Mercator, Zone 18
PRODUCED FOR: Ground Water Protection Section
PRODUCED BY: Information Resources Management Branch
DATE: October 23, 1990

Scale 1:100 000
Miles

JEFFERSON COUNTY
WEST VIRGINIA

Ground Water Vulnerability
Analysis Project

Pesticide Use - 1989
Total Lbs. / Farm
Priority Leachers

POTENTIAL GROUND WATER RISK
FROM PESTICIDES

Year: 1989

JEFFERSON COUNTY
WEST VIRGINIA

PESTICIDE RANKINGS

Low : 350 lbs.
Med: 500 - 1000 lbs.
High: 1000 lbs.

DRASTIC RANKINGS

Low : 120
Med: 120 - 159
High: 159

Lbs. of
Pesticides
Per Farm

DRASTIC
Rating

No Data

Data: Basemap data from USGS DLG 1:100,000
Projection: Universal Transverse Mercator, Zone 18
Produced for: Ground Water Protection Section
Produced by: Information Resources Management Branch
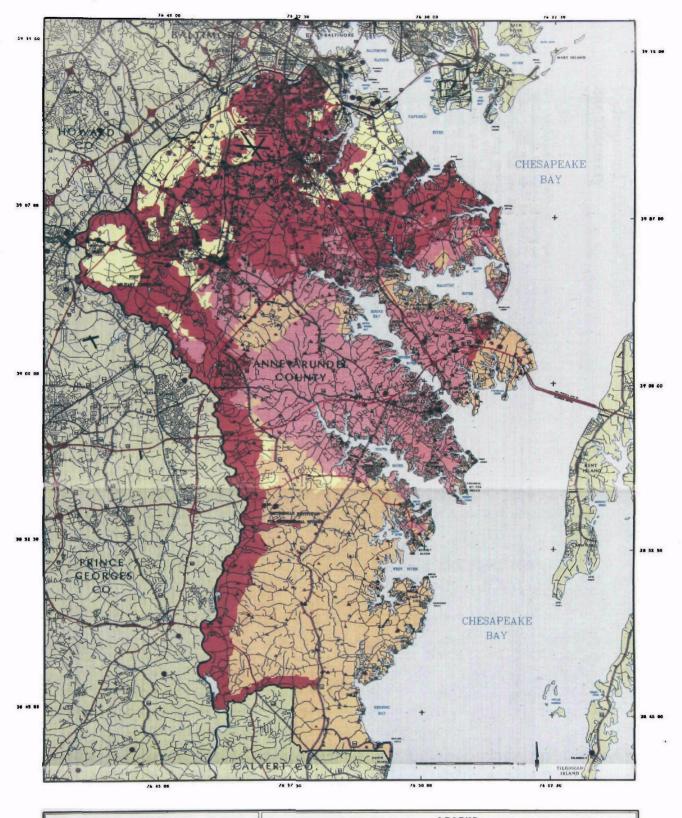Date: April, 1991

Scale 1:62,500

Miles

Targeting Areas
for Wellhead Protection

In the interest of assisting Region III states in developing Wellhead Protection Programs, the Ground Water Protection Section (GWPS) is using GIS technology to gather data and produce high quality GIS maps designed to stimulate interest in wellhead protection on the part of state and local officials. As seen in the following example, GWPS and the Geographic Information Center (GIC) produced an intriguing map that targeted areas in Anne Arundel County, Maryland for wellhead protection. The map shows the spatial relationships between potential sources of contamination and public water supply wells. These features were overlaid with a relative ground water vulnerability assessment map. The relative vulnerability was based on the weighted ranking of seven key hydrogeologic factors, referred to as DRASTIC by the National Water Well Association (NWWA).

Maps showing potential for ground water contamination were provided to state and county officials along with data necessary for delineating wellhead protection areas. GIS served as the catalyst in bringing together key state and local officials. They have now formed a workgroup to delineate wellhead protection areas using GIS as one of the primary tools.

CHESAPEAKE BAY

HOWARD CO

ANNE ARUNDEL COUNTY

PRINCE GEORGES CO

CHESAPEAKE BAY

KENT ISLAND

CALVERT CO

TILGHMAN ISLAND

TARGETING AREAS FOR

WELLHEAD PROTECTION

ANNE ARUNDEL COUNTY

MARYLAND

LEGEND

▲ DOMESTIC WELLS
▲ PUBLIC WATER SUPPLY WELLS
▲ ABANDONED WELLS
▲ INDUSTRIAL WELLS
● CERCLA
● NPL
● RCRA STORAGE SITES
● RCRA DISPOSAL SITES

N RAILROADS
N COUNTY BOUNDARY
N STREAMS
N LOCAL ROADS
N STATE HIGHWAYS
N INTERSTATES
N U.S. HIGHWAYS

Drastic Scores

100-119
120-139
140-159
160-179

Underground Injection Control Site Discovery

The Underground Injection Control Section is responsible for regulating the discharge of waste to the subsurface through injection wells. GIS was used to identify certain industrial facilities for inspection that are not regulated by EPA but that may be contaminating ground water. Sewered and unsewered areas were compared with locations for industrial facilities, gasoline service stations, and automobile related businesses. Since those located in unsewered areas are not discharging to publicly owned treatment facilities, it is possible that some of them may be discharging waste through Class V injection wells into shallow aquifers.
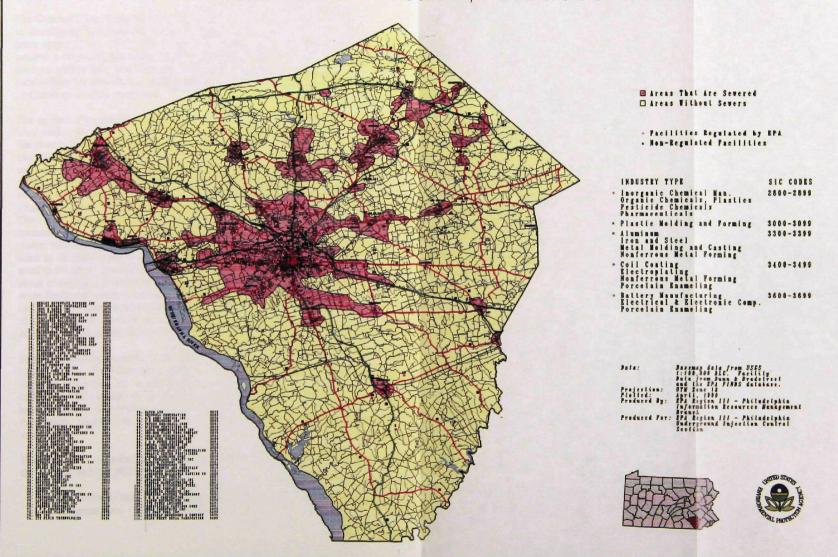
Seven counties in southeastern Pennsylvania that rely heavily on ground water as a drinking water source were selected for this study. For each county, maps of sewered and unsewered areas were obtained from the county planning commissions and digitized. Data from EPA's FINDS database and from a Dun and Bradstreet database were used to identify the locations of certain types of industries, and gasoline service stations.

Six maps were created for each county: industrial facilities, industrial facilities with twenty or more employees, industrial facilities with sales of $1,000,000 a year or more, gasoline service stations, automobile related industries with twenty or more employees, and automobile related industries with sales of $1,000,000 or more. These maps were used by inspectors to prioritize the facilities that they inspected. The two maps on the following pages are included as examples. The first identifies gasoline service stations located in unsewered areas. The second identifies industrial facilities for selected SIC codes that are located in unsewered areas.

The results were very favorable and numerous violations were encountered. Prioritizing the facilities for inspection allowed the Underground Injection Control Section to achieve significant cost savings and they are currently repeating the process for additional counties. In addition, they are using GIS to determine the spatial relationship between the identified injection wells and municipal and residential wells.

GASOLINE SERVICE STATIONS
IN LANCASTER COUNTY, PENNSYLVANIA

□ Areas Without Sewers

■ Areas That Are Sewered

Data: Basemap data from USGS
1:100,000 DLG. Automobile
related data from Dunn &
Bradstreet.
Projection: UTM Zone 18
Plotted: August, 1990
Produced By: EPA Region III – Philadelphia
Information Resources Management
Branch
Produced For: EPA Region III – Philadelphia
Underground Injection Control
Section

INDUSTRIAL FACILITIES
IN LANCASTER COUNTY, PENNSYLVANIA

Areas That Are Sewered
Areas Without Sewers

▲ Facilities Regulated by EPA
• Non-Regulated Facilities

INDUSTRY TYPE	SIC CODES
Inorganic Chemical Man. Organic Chemicals, Plastics Pesticide Chemicals Pharmaceuticals	2800-2899
Plastic Molding and Forming	3000-3099
Aluminum Iron and Steel Metal Molding and Casting Nonferrous Metal Forming	3300-3399
Coil Coating Electroplating Nonferrous Metal Forming Porcelain Enameling	3400-3499
Battery Manufacturing Electrical & Electronic Comp. Porcelain Enameling	3600-3699

Data: Basemap data from USGS 1:100,000 DLC. Facility Data from Dunn & Bradstreet and the EPA FINDS database.
Projection: UTM Zone 18
Plotted: April, 1999
Produced By: EPA Region III - Philadelphia Information Resources Management Branch
Produced For: EPA Region III - Philadelphia Underground Injection Control Section

Ground Water Pollution
Potential Assessment

The Ground Water Protection Section is charged with assisting states in developing Wellhead Protection Programs. Limited funding has been appropriated to the states for these activities and the Region needed a technical assistance vehicle. GIS filled this void and was used to gather data and stimulate interest on the part of state and local offices by providing a management tool that would be useful in wellhead protection programs.

The project also sought to demonstrate an application on a county-level scale. New Castle County, Delaware was selected and areas in the county that are at high risk for ground water contamination were identified and prioritized for further action. Over sixty data layers were converted from New Castle County Water Resource Authority's (NCC WRA) GIS system to Region III's system. Locations of potential sources of contamination were obtained from various EPA databases. These data were used to produce the maps on the following pages. The first map illustrates the location of potential sources of contamination with respect to wellhead protection areas and ground water recharge areas. In the second map the DRASTIC index was used to identify areas of high ground water vulnerability. GIS was used to identify areas of high vulnerability within recharge protection areas or within two miles of a public water supply well. These areas were further prioritized by using GIS to identify and attach weighing factors to potential sources of contamination located in proximity to these vulnerable ground water areas. The third map shows the algorithm used to prioritize the areas and the results of the analysis.
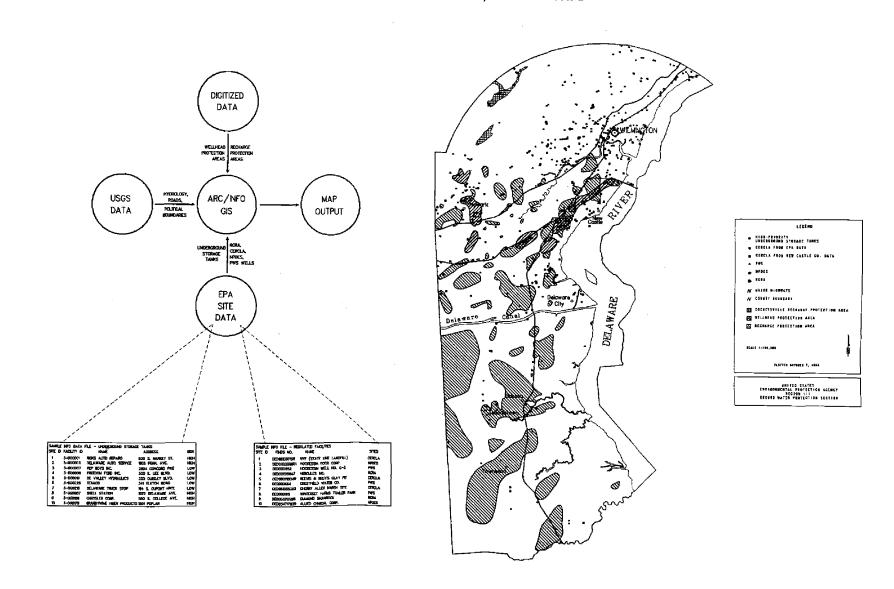
Maps and databases produced for this project were provided to NCC WRA officials. They have since modernized their own GIS capabilities and are using GIS for a wide variety of environmental activities, including the passage of a Wellhead Protection Ordinance. The methodologies developed were later used by the Ground Water Protection Section to conduct a regional ground water risk assessment.

The GIS Project resulted in both tangible and intangible benefits to the Region and the NCC WRA:

- A true federal/local partnership was developed to work towards a common goal - with little money involved.

- EPA provided a technical assistance vehicle for states/locals in a program where resources are limited.

- The development of a management tool to assist managers in determining environmental program priorities.

- The Region's understanding and assessment of the scope and nature of environmental problems was dramatically improved.

LOCATION OF POTENTIAL SOURCES OF CONTAMINATION
RELATIVE TO GROUND WATER RECHARGE AREAS AND WELLHEAD PROTECTION AREAS
NEW CASTLE COUNTY, DELAWARE

POTENTIAL VULNERABILITY BASED ON DRASTIC INDEX

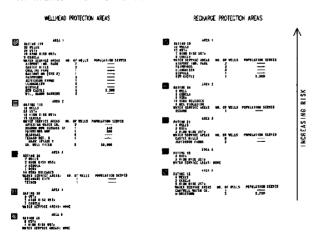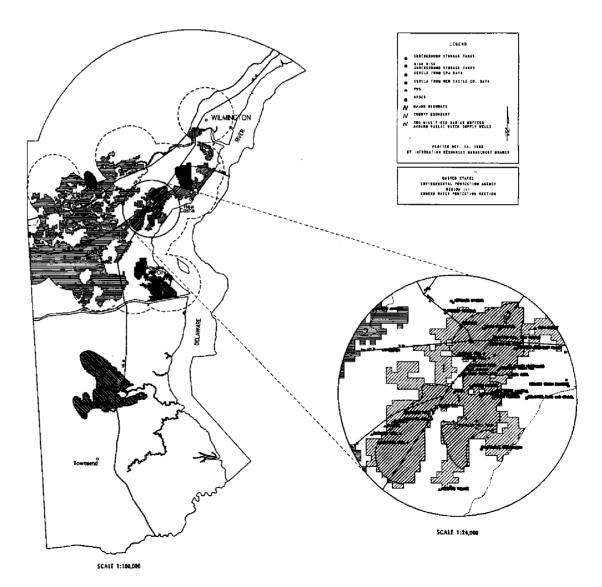# TARGETING OF HIGH RISK GROUND WATER AREAS

RANKING OF HIGH RISK AREAS

Those portions of the Wellhead and Recharge Protection Areas determined by DRASTIC Index to be highly vulnerable to ground water pollution were selected for analysis. These areas were evaluated relative to each other by the equation shown below. The equation incorporates a range of risk-related factors including potential sources and known incidents of contamination. This map shows the 10 areas at highest risk for groundwater contamination. Their characteristics are summarized in the table below.

RATING · 2(MCL VIOLATIONS) · 2(RCRA RELEASES)

· 2(USTs 15 YEARS OR OLDER)

· CERCLA · 2(RCRA) · 3(USTs)

TEN GEOGRAPHIC AREAS
AT HIGHEST RISK FOR GROUND WATER CONTAMINATION

WELLHEAD PROTECTION AREAS

RECHARGE PROTECTION AREAS

INCREASING RISK

WILMINGTON

RIVER

New Castle

DELAWARE

Townsend

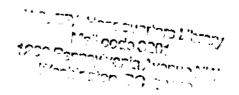LEGEND

SCALE 1:100,000

SCALE 1:24,000

Regional Ground Water
Risk Assessment

One of the earliest GIS projects in Region III, this study's purpose was to collect various program-related data and to combine them in such a way as to reveal the spatial variation of existing or potential ground water quality problems. The project was accomplished by Temple University Lab for Geographic Information Systems under an FY'89 grant from the Drinking Water/Ground Water Branch. The entire region was examined using counties as the basic study units to identify particular problem areas or "hot spots" needing further attention.
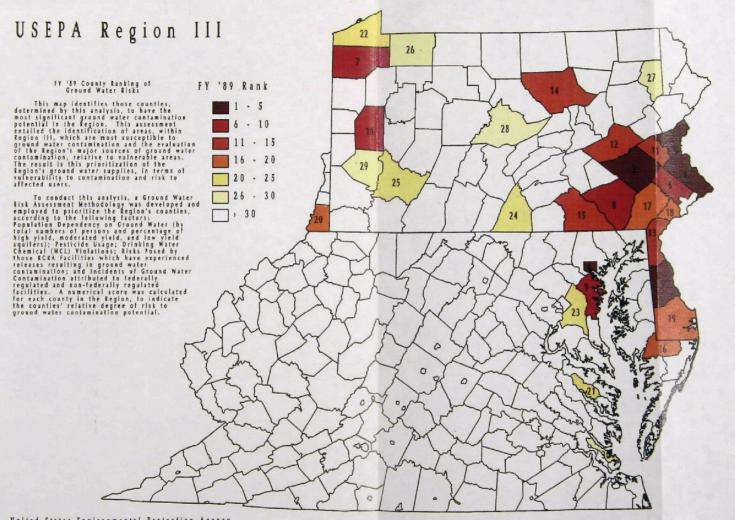
To prioritize those counties in need of the greatest EPA effort and resources, various layers of the USGS 1:2,000,000 Digital Line Graph data were combined with retrievals made from a variety of EPA program databases associated with drinking water quality and potential sources of contamination. For each database, summary statistics were generated by county and related to the digital county map in ARC/INFO. Program data included in the GIS were:

- Public Water Supply (PWS) systems primarily dependent on ground water
    - Population Served by each system
    - Maximum Contaminant Level Violations for each system
- DRASTIC score (to estimate vulnerability to contamination)
- Soluble Pesticides Usage value for each county
- Superfund NPL Sites
- RCRA Treatment, Storage and Disposal Sites
- Class V Underground Injection Wells
- Known ground water contamination incidents

To estimate each county's relative degree of risk to ground water contamination, a weighted ranking scheme was developed to combine all of these factors into a single summary score. The map on the following page shows those counties determined to be at greatest potential risk to ground water contamination.

FY '89 RANKING OF EPA REGION III COUNTIES, BASED UPON GROUND WATER CONTAMINATION RISKS

USEPA Region III

FY '89 County Ranking of Ground Water Risks

This map identifies those counties, determined by this analysis, to have the most significant ground water contamination potential in the Region. This assessment entailed the identification of areas, within Region III, which are most susceptible to ground water contamination and the evaluation of the Region's major sources of ground water contamination, relative to vulnerable areas. The result is this prioritization of the Region's ground water supplies, in terms of vulnerability to contamination and risk to affected users.

To conduct this analysis, a Ground Water Risk Assessment Methodology was developed and employed to prioritize the Region's counties, according to the following factors: Population Dependency on Ground Water (by total numbers of persons and percentage of high yield, moderated yield, and low yield aquifers); Pesticide Usage; Drinking Water Chemical (MCL) Violations; Risks Posed by those RCRA Facilities which have experienced releases resulting in ground water contamination; and Incidents of Ground Water Contamination attributed to federally regulated and non-federally regulated facilities. A numerical score was calculated for each county in the Region, to indicate the counties' relative degree of risk to ground water contamination potential.

FY '89 Rank

■	1 - 5
■	6 - 10
■	11 - 15
■	16 - 20
■	20 - 25
■	26 - 30
□	> 30

United States Environmental Protection Agency
Region III
Drinking Water/Ground Water Protection Branch

Sub-Regional Ground Water Risk Assessment

As in the Regional Ground Water Assessment, a grant from the Drinking Water/Ground Water Protection Branch was issued to the Temple University Lab for Geographic Information Systems. Building on the experience gained in the Regional Assessment, this effort examined the state of Pennsylvania in greater detail. The goal of the project was to synthesize various EPA program data and to identify areas with existing or potential ground water quality problems.
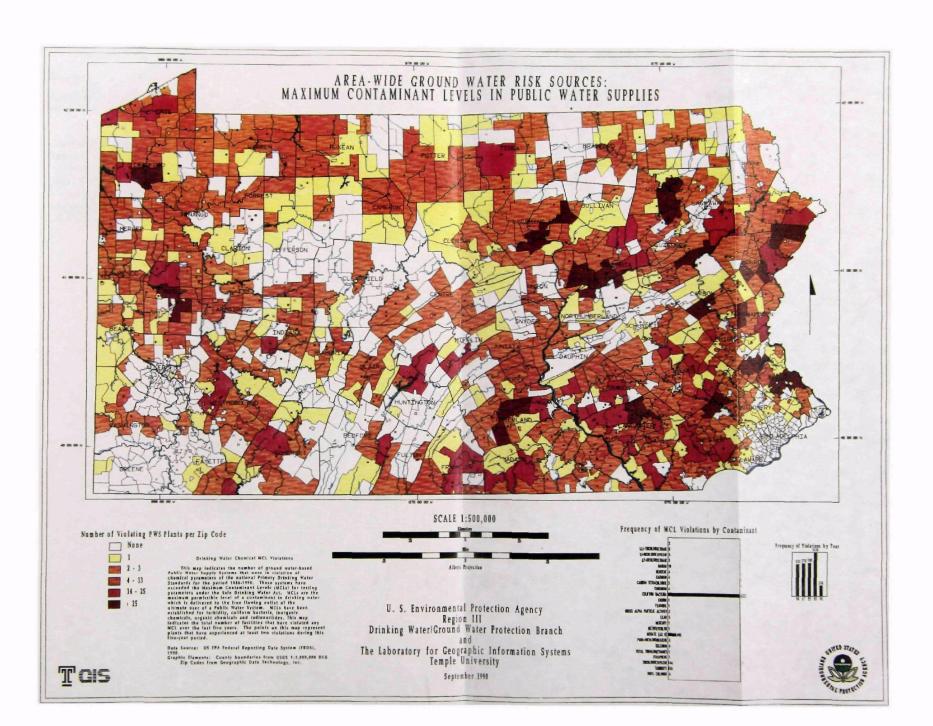
Many layers of data were included in the analysis. Political boundaries and Land Use/Land Cover data layers were built from the USGS 1:250,000 digital data. Program data included in the GIS were:

- Public Water Supply (PWS) systems primarily dependent on ground water
  - Population Served by each system
  - Maximum Contaminant Level Violations for each system
- DRASTIC score (to estimate vulnerability to contamination)
- Soluble Pesticides Usage value for each county
- Superfund NPL Sites
- RCRA Large Quantity Generators and Treatment, Storage and Disposal Sites
  - Groundwater and Land Ban Violations
- Sites reporting to the Toxic Release Inventory System SARA Title III)
- Class V Underground Injection Wells
- A select set of businesses from the Dun & Bradstreet Conquest File

Another objective of the project was to try to analyze the data on a site-by-site basis, rather than aggregated by county. Wherever possible, attempts were made to retrieve program data at a more detailed level than was done in Regional Assessment. Although the regional level of analysis was considered better than county aggregates, the quality of the locational data contained within the various program databases proved to be inadequate for the intended analysis. Therefore, zipcode areas were chosen as the basic unit of analysis.

Although a weighted ranking (similar to the Regional Assessment) has not been completed, the data sets and resulting maps created for this project have supported various management-level investigations into existing or potential ground water problems within Pennsylvania. Several different agencies within the state will be receiving the digital data sets to support their own program needs.

The map on the following page shows maximum contaminate level (MCL) violations in drinking water supplies aggregated by zipcode areas and is representative of various maps produced for the project.
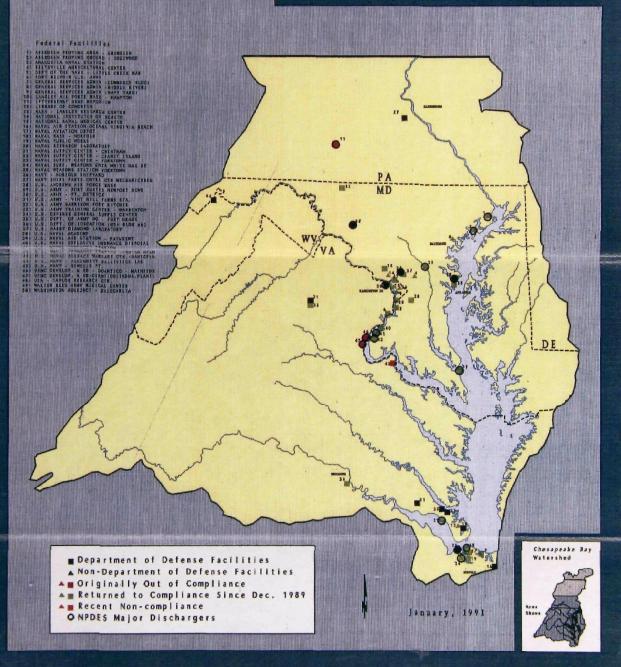
AREA-WIDE GROUND WATER RISK SOURCES:
MAXIMUM CONTAMINANT LEVELS IN PUBLIC WATER SUPPLIES

SCALE 1:500,000

Kilometers

Miles

Albers Projection

Number of Violating PWS Plants per Zip Code

- None
- 1
- 2 - 3
- 4 - 13
- 14 - 25
- > 25

Drinking Water Chemical MCL Violations

This map indicates the number of ground water-based Public Water Supply Systems that were in violation of chemical parameters of the national Primary Drinking Water Standards for the period 1986-1990. These systems have exceeded the Maximum Contaminant Levels (MCLs) for testing parameters under the Safe Drinking Water Act. MCLs are the maximum permissible level of a contaminant in drinking water which is delivered to the free flowing outlet of the ultimate user of a Public Water System. MCLs have been established for turbidity, coliform bacteria, inorganic chemicals, organic chemicals and radionuclides. This map indicates the total number of facilities that have violated any MCL over the last five years. The points on this map represent plants that have experienced at least two violations during this five-year period.

Data Source: US EPA Federal Reporting Data System (FRDS), 1990.
Graphic Elements: County boundaries from USGS 1:2,000,000 DLG
Zip Codes from Geographic Data Technology, Inc.

Frequency of MCL Violations by Contaminant

Frequency of Violations by Year

U. S. Environmental Protection Agency
Region III
Drinking Water/Ground Water Protection Branch
and
The Laboratory for Geographic Information Systems
Temple University

September 1990

T GIS

Federal Facilities
Compliance Initiative

The Permits Enforcement Branch of the Water Management Division created a series of Chesapeake Bay Watershed maps. These maps show the locations of all facilities encompassed by the Chesapeake Bay Watershed. The accompanying maps were used in various executive briefings and public meetings. The first presents status of compliance for federal facilities. The second shows the locations of all NPDES permitted facilities in the Chesapeake Bay Watershed.
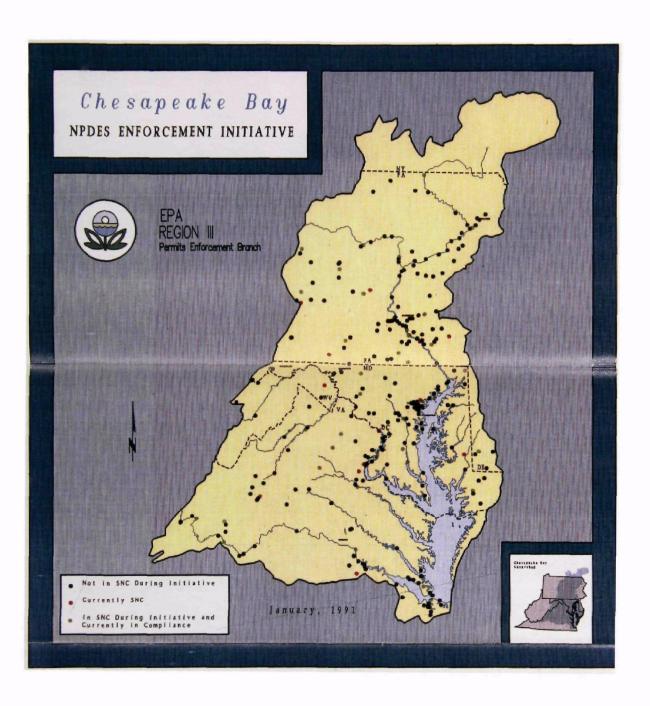
EPA REGION III

PERMITS ENFORCEMENT BRANCH

Chesapeake Bay
FEDERAL FACILITIES COMPLIANCE INITIATIVE

Federal Facilities

1) ABERDEEN PROVING AREA - ABERDEEN
2) ABERDEEN PROVING GROUND - EDGEWOOD
3) ANACOSTIA NAVAL STATION
4) BELTSVILLE AGRICULTURAL CENTER
5) DEPT OF THE NAVY - LITTLE CREEK NAB
6) FORT BELVOIR U.S. ARMY
7) GENERAL SERVICES ADMIN (COMMERCE BLDG)
8) GENERAL SERVICES ADMIN (MIDDLE RIVER)
9) GENERAL SERVICES ADMIN (NAVY YARD)
10) LANGLEY AIR FORCE BASE - HAMPTON
11) LETTERKENNY ARMY DEPOT VIEW
12) LIBRARY OF CONGRESS
13) NASA - LANGLEY RESEARCH CENTER
14) NATIONAL INSTITUTES OF HEALTH
15) NATIONAL NAVAL MEDICAL CENTER
16) NAVAL AIR STATION-OCEANA VIRGINIA BEACH
17) NAVAL AVIATION DEPOT
18) NAVAL BASE - NORFOLK
19) NAVAL PUBLIC WORKS
20) NAVAL RESEARCH LABORATORY
21) NAVAL SUPPLY CENTER - CHEATHAM
22) NAVAL SUPPLY CENTER - CRANEY ISLAND
23) NAVAL SUPPLY CENTER - YORKTOWN
24) NAVAL SURF. WEAPONS CNTR WHITE OAK ST
25) NAVAL WEAPONS STATION YORKTOWN
26) NAVY - NORFOLK SHIPYARD
27) NAVY SHIPS PARTS CNTRL CTR MECHANICSBRG
28) U.S. ANDREWS AIR FORCE BASE
29) U.S. ARMY - FORT EUSTIS NEWPORT NEWS
30) U.S. ARMY - FT. DETRICK
31) U.S. ARMY - VINT HILL FARMS STA.
32) U.S. ARMY GARRISON FORT RITCHIE
33) U.S. ARMY TRAINING CENTER - WARRENTON
34) U.S. DEFENSE GENERAL SUPPLY CENTER
35) U.S. DEPT. OF ARMY HQ - FORT MEADE
36) U.S. DEPT. OF EDUCATION (GSA BLDG #4)
37) U.S. HARRY DIAMOND LABORATORY
38) U.S. NAVAL ACADEMY
39) U.S. NAVAL AIR STATION - PATUXENT
40) U.S. NAVAL EXPLOSIVE ORDNANCE DISPOSAL STATION
41) U.S. NAVAL SURFACE STATION - INDIAN HEAD
42) U.S. NAVAL SURFACE WARFARE CTR - DAHLGREN
43) U.S. NAVY - ALLEGHENY BALLISTICS LAB
44) U.S. NAVY - SEWELLS PT
45) USMC DEVELOP. & ED - QUANTICO - MAINSIDE
46) USMC DEVELOP. & ED QUANTICO(INDUS.PLANT)
47) USN - TAYLOR RESEARCH CTR
48) WALTER REED ARMY MEDICAL CENTER
50) WASHINGTON AQUEDUCT - DALECARLIA

Legend

■ Department of Defense Facilities
▲ Non-Department of Defense Facilities
▲ ■ Originally Out of Compliance
▲ ■ Returned to Compliance Since Dec. 1989
▲ ■ Recent Non-compliance
○ NPDES Major Dischargers

January, 1991

Chesapeake Bay Watershed

Area Shown

PA
MD
WV
VA
DE

Chesapeake Bay
NPDES ENFORCEMENT INITIATIVE

EPA
REGION III
Permits Enforcement Branch

NY
PA

PA
MD

WV
VA

DC

DE

N

- Not in SNC During Initiative
- Currently SNC
- In SNC During Initiative and
  Currently in Compliance

January, 1991

Chesapeake Bay
Watershed

CERCLA
Site Discovery

The Ground Water Protection Section (WMD) and the Site Assessment Section (HWMD) with GIS technical support from the Geographic Information Center (GIC) are conducting a joint effort in Allegheny County, Pennsylvania to assist in the CERCLA Site Discovery process. The methodology uses aerial photography for the Allegheny County area interpreted by the Environmental Photographic Interpretation Center (EPIC) to identify potential hazardous waste disposal sites. EPIC examined aerial photography as far back as the 1930's and 1940's up to the present and interpreted the photography for the signature patterns typically associated with the disposal of hazardous waste. The locations for the waste disposal areas were transferred from the aerial photographs to topographic basemaps and digitized into ARC/INFO. Since EPIC identified over 800 areas of possible hazardous waste disposal a ranking scheme will be applied to prioritize sites for further investigation. This prioritization methodology, based conceptually on the Superfund Hazard Ranking System (HRS), calculates the number of people who rely on ground water for their source of drinking water supply, living within a four mile radius of each of the EPIC-identified sites.

The following map of the Allegheny County area displays locations of EPIC-identified sites and CERCLA sites from the CERCLIS database. The locations will be compared to determine if any EPIC-identified sites are already represented in the CERCLIS database.

The second map covers the Pittsburgh East Quadrangle in Allegheny County. It includes census tract shaded by population and public water supply well locations with associated population served. As mentioned previously, this information will be used to calculate the number of people residing within a four mile radius of each of the EPIC-identified sites who rely on ground water as their drinking water source.

CERCLA LOCATIONS
ALLEGHENY COUNTY

LEGEND

Strip Mines
Sewered Areas
Potential Hazardous
Waste Sites
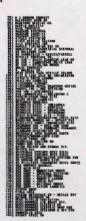
. CERCLA Locations
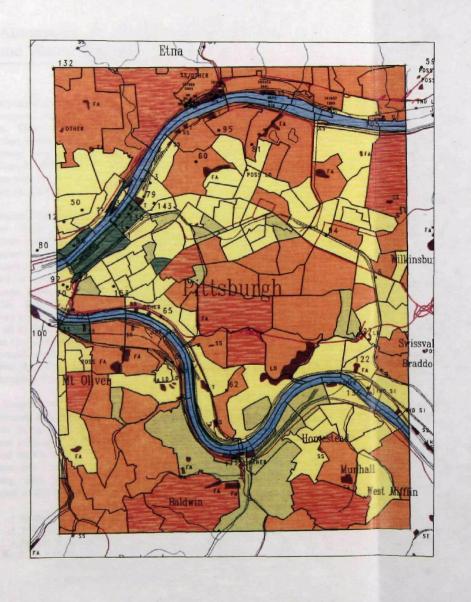
PITTSBURGH EAST
QUADRANGLE

CENSUS TRACT POPULATION

- 0 - 500
- 501 - 1000
- 1001 - 2500
- 2501 - 5000
- 5001 - 10000

PUBLIC SUPPLY WELLS

WELL ID #:   101071
POPULATION: 3991
WELL NUMBER: W1

POTENTIAL HAZARDOUS WASTE SITE INVENTORY

FA   Fill Areas   IND/WT   Industrial Effluent
LD   Land Disposal Sites   Treatment Plants
SI   Surface Impoundments   OTHER   Other Environmentally
SS   Scrap Salvage Yards   Significant Features
T   Tank Farms   IND   Industrial Modifier To
                                       Any Above Category

*   Highest Potential for
      Hazardous Waste

      Strip Mines

      Potential Hazardous
      Waste Sites

.   CERCLA Location

CERCLA Facility Names:
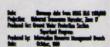
GIS Automation of Hazard Ranking System Ground Water Migration Pathway

The purpose of this project was to evaluate the feasibility of using GIS as a support tool in the Hazard Ranking System (HRS) scoring process. This project was a joint effort between the Ground Water Protection Section of the Water Management Division and the Site Assessment Section of the Hazardous Waste Management Division. The Temple University Laboratory for Geographic Information Systems was given a grant to perform all GIS-related work over the summer of 1990.

The Hazard Ranking System is a scoring system used to assess the relative threat associated with actual or potential releases of hazardous substances at sites (Federal Register, 40 CFR Part 300, December 14, 1990). To assist a user with little GIS experience in characterizing the potential for contamination from a particular site, a series of programs and graphical menus, written in Arc Macro Language, allow the user to interact directly with the data stored in the GIS. Individual procedures from the Ground Water Migration Pathway scoring process were automated so that the user could access them all in their proper order in the scoring process, or individually, so that the user could examine the effect a particular variable has on the overall score. The controlling procedures keep track of all variables that affect the flow of operations within the scoring process, thus keeping the user from improperly scoring a site.

The Targets section of the scoring process accounts for the populations and resources potentially at risk from contamination at the site being considered. Given that the Targets tend to have the greatest influence on the overall pathway score, the GIS data layers focused on the data needed to characterize populations at risk from a given site. As this was a demonstration project with limited funding, data sets were built for Bucks County, Pennsylvania. Included in the GIS analysis are the following layers:

- Updated locations of sites from the CERCLIS database
- 1980 Census tracts and associated total population values
- Public Water Supply (PWS) Intake locations
  - Populations served by Public Water Supply systems
  - PWS Service Area Boundaries
  - Associated Wellhead Protection Areas

Waterbodies and roads data layers (at an input scale of 1:24,000) from the Pennsylvania Department of Transportation were incorporated for the purpose of providing the user with some regional context for each site during a scoring session.

The graphic on the following page represents a "snapshot" of the computer display at one point in a typical user scoring session. In this image, four different graphic elements perform specialized functions. The largest window is a map displaying the location of the site and all potential targets within four miles. The bottom window is a dialogue area where the user responds to various prompts throughout the session. The large blue "Text Window" is the Scoresheet which summarizes all sub-scores within the Pathway score. This is accessed by choosing the appropriate option from the forth graphic element, the main "Pulldown Menu" .

GW Score | Modify | Scoresheet | Overall Score | Plot | Detail Data | Quit

Text Window

GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor Categories and Factors

	Likelihood of Release to an Aquifer	Maximum Value	Value Assigned
1.	Observed Release	550	550
2.	Potential to Release		
2a.	Containment	10	0
2b.	Net Precipitation	10	0
2c.	Depth to Aquifer	5	0
2d.	Travel Time	35	0
2e.	Potential to Release (lines 2a × (2b + 2c + 2d))	500	0
3.	Likelihood of Release (higher of lines 1 or 2e	550	550

Waste Characteristics

4.	Toxicity/Mobility	*	4500
5.	Hazardous Waste Quantity	*	4550
6.	Waste Characteristics	100	56

Targets

7.	Nearest Well	50	50
8.	Population		
8a.	Level I Concentrations	**	0
8b.	Level II Concentrations	**	0
8c.	Potential Contamination	**	1223.7
8d.	Population (lines 8a + 8b + 8c)	**	1223.7
9.	Resources	5	5
10.	Wellhead Protection Area	20	20
11.	Targets (lines 7 + 8d + 9 + 10)	**	1298.7

Ground Water Migration Score for an Aquifer

12.	Aquifer Score ((lines 3 × 6 × 11)/82,500)***	100	100.0

36   101241-010 PERKASIE
37   100133-003 NO PENN
38   101241-008 PERKASIE
39   101243-014 SELLERSV
40   100496-002 GROUSE G
Is the above information co

PLEASE SELECT AN OPTION FRO

Delaware River Water Trends Report

The Environmental Services Division (ESD) initiated an assessment of water quality, sediment quality and biological integrity of the Delaware River as a pilot to a regional Water Quality Trends Report. GIS was used to display monitoring stations along the Delaware River and the level of their dissolved oxygen, fecal coliform bacteria, and the water quality trends for each monitoring station.

For the purposes of the Water Trends Report, the Delaware River was divided into two sections; the Delaware Bay to Trenton, NJ and Trenton, NJ to Hancock, NY. For each of these sections, Two maps were created and included in the Water Quality Trends Report. One displayed the readings for fecal coliform, the second dissolved oxygen. Both indicate trends in water quality.

TRENDS IN FECAL COLIFORM DENSITY

Trenton, NJ to Hancock, NY

↑ Increasing levels   ↓ Decreasing levels

Fecal Coliform
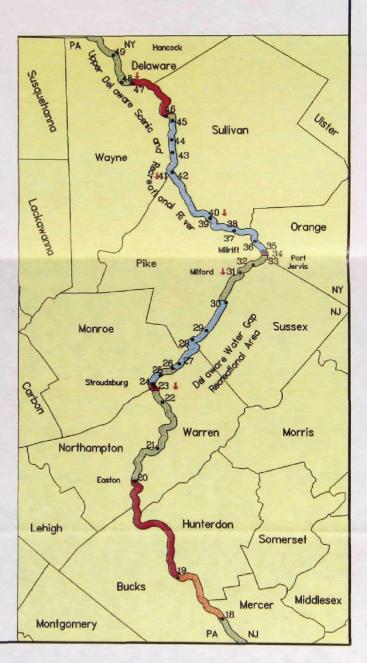
- ▨ Less than 100
- ▨ 100 - 500
- ▨ 501 - 900
- ▨ Greater than 900

Station	Percentile*
18	260
19	790
20	1300
21	260
22	170
23	316
24	1600
25	68
26	108
27	80
28	49
29	63
30	68
31	200
32	120
33	170
34	458
35	1008
36	56
37	88
38	69
39	28
40	35
41	30
42	81
43	90
44	44
45	54
46	484
47	1004
48	164
49	280

*90% of Values ≤
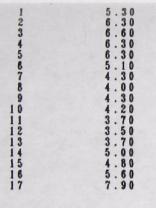
DISSOLVED OXYGEN CONCENTRATION TRENDS
Delaware Bay to Trenton, New Jersey

↑ Increasing levels

↓ Decreasing levels

Dissolved Oxygen 10th Percentile
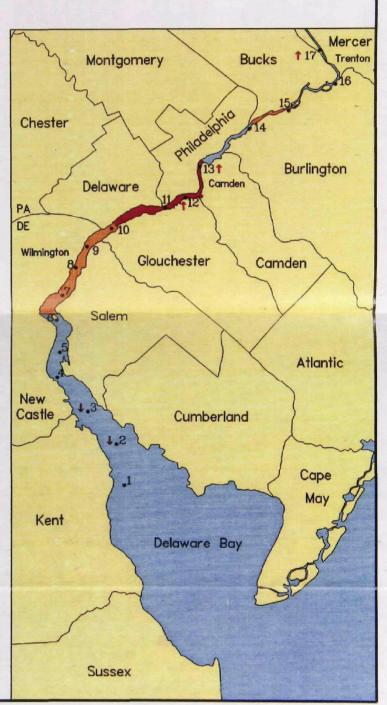
■ Greater than or equal to 5.00
■ 4.0 - 4.99
■ Less than 4.00

Station Percentile*

Station	Percentile*
1	5.30
2	6.30
3	6.60
4	6.30
5	6.30
6	5.10
7	4.30
8	4.00
9	4.30
10	4.20
11	3.70
12	3.50
13	3.70
14	5.00
15	4.80
16	5.60
17	7.90

*10% of Values ≤

Montgomery
Bucks
Mercer
Trenton
Chester
Philadelphia
Burlington
Delaware
Camden
PA
DE
Wilmington
Glouchester
Camden
New Castle
Salem
Atlantic
Cumberland
Cape May
Kent
Delaware Bay
Sussex
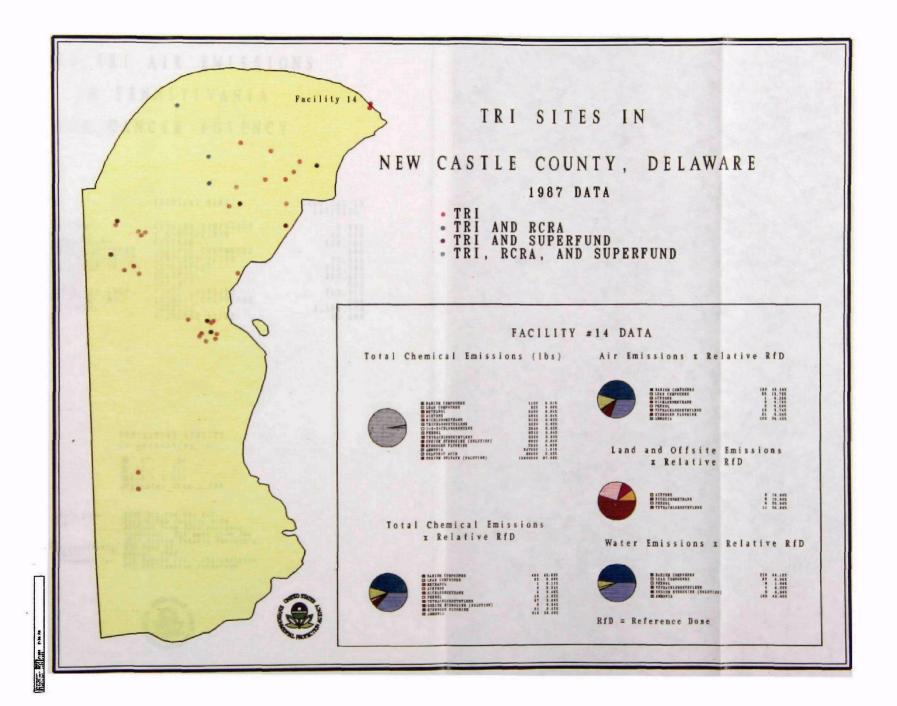
Assessing Toxicological Impacts

The Emergency Planning Community Right-to-Know Act (EPCRA) requires that certain industries report their emissions and off-site transfers for specified chemicals each year. This data is contained in the Toxics Release Inventory (TRI) database. Region III utilized the information in TRI and the available information regarding the toxicological impacts of these chemicals to provide a "weighted" emission for each of the sites. Based on the results of this approach, the accompanying maps were generated using the Region's GIS capabilities.

The first map indicates the location of facilities in New Castle County, Delaware, that reported to the TRI database for 1987, and their relationship with other EPA programs. The pie charts indicate the relative importance of the emissions for one of the facilities. Similar charts can be created for all of the facilities using a program that was written to interface the TRI database with GIS.

Using 1988 TRI data, the top fifty facilities in terms of weighted emissions for air and land disposal were identified. The weighting factor took into consideration the toxicity of each of the chemicals emitted at the individual facilities. The second map in the series shows the air facilities in Pennsylvania with population density to indicate risk to human health. The legend contains the name of each facility and the reported emission for each chemical. The third map shows the land disposal facilities with ground water vulnerability to indicate potential threat to drinking water supplies.

TRI SITES IN

NEW CASTLE COUNTY, DELAWARE

1987 DATA

- • TRI
- • TRI AND RCRA
- • TRI AND SUPERFUND
- • TRI, RCRA, AND SUPERFUND

Facility 14

FACILITY #14 DATA

Total Chemical Emissions (lbs)

Air Emissions x Relative RfD

Land and Offsite Emissions
x Relative RfD

Total Chemical Emissions
x Relative RfD

Water Emissions x Relative RfD

RfD = Reference Dose

1988 TRI AIR EMISSIONS
IN PENNSYLVANIA
FOR CANCER POTENCY

FACILITY	CHEMICAL NAME	CHEMICAL IN LBS/YEAR
3. AMERICAN ZINC CORP.	CADMIUM COMPOUNDS	3,090
4. BASF CORP.	1,3-BUTADIENE	68,920
6. BETHLEHEM STEEL CORP.	BENZENE	540,000
10. CORNING ASAHI VIDEO PRODU	ARSENIC COMPOUNDS	500
18. GRIFFITH MICRO SCIENCE IN	ETHYLENE OXIDE	90,364
20. INTERNATIONAL PAPER CO.-E	CHLOROFORM	315,700
22. LTV STEEL CO.INC.	BENZENE	858,508
23. LUKENS STEEL CO.	ARSENIC	500
27. OCCIDENTAL CHEMICAL CORP.	VINYL CHLORIDE	214,810
28. OI-NEG TV PRODUCTS INC.	ARSENIC COMPOUNDS	750
36. USS CLAIRTON WORKS	BENZENE	1,400,770
37. WEST CO.	ETHYLENE OXIDE	38,800

POPULATION DENSITY
in persons/sq. mi.
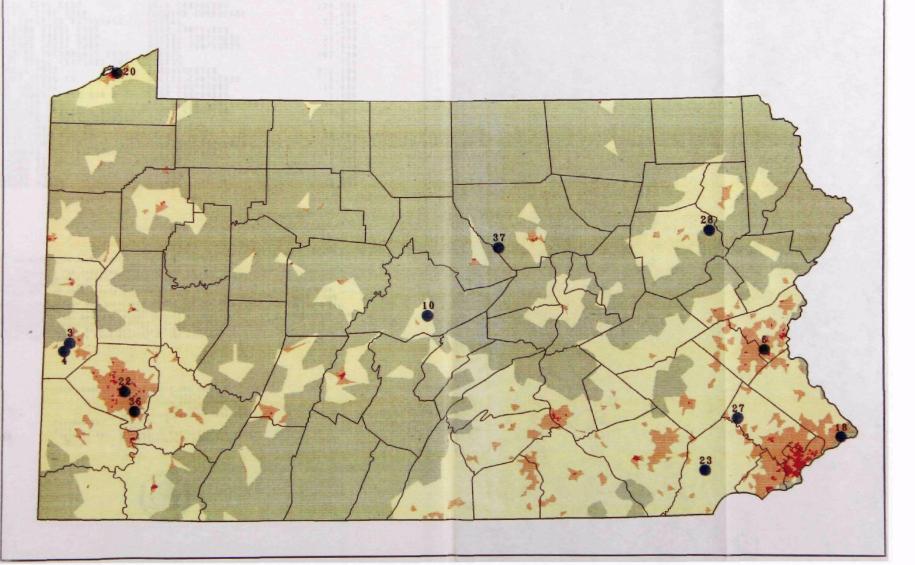
■ 0 - 50
▨ 50 - 500
■ 500 - 1,000
■ greater than 1,000

1988 TRI AIR EMISSIONS
IN PENNSYLVANIA FOR CANCER POTENCY

1988 TRI LAND RELEASES
IN PENNSYLVANIA FOR CANCER POTENCY

FACILITY	CHEMICAL NAME	CHEMICAL IN LBS/YR
1. AMERICA ZINC CORP.	LEAD COMPOUNDS	120,000
2. AMERICAN ZINC CORP.	CADMIUM COMPOUNDS	2,400
3. ARMCO ADVANCED MATERIALS	NICKEL	75,000
5. BETHLEHEM STEEL CORP.	LEAD COMPOUNDS	1,300
6. BETHLEHEM STEEL CORP.	NICKEL COMPOUNDS	20,000
7. BETHLEHEM STEEL CORP.	NICKEL COMPOUNDS	11,000
10. CARPENTER TECHNOLOGY CORP	NICKEL	187,700
12. EMPIRE STEEL CASTINGS INC	NICKEL	750
14. GRINNELL CORP.	FORMALDEHYDE	310,000
16. LATROBE STEEL CO.	NICKEL COMPOUNDS	9,700
18. LENOX CRYSTAL	LEAD COMPOUNDS	16,000
19. LOWER WORKS - BAR ROD & W	LEAD COMPOUNDS	1,900
22. NGK METALS CORP.	BERYLLIUM COMPOUNDS	12,000
23. OCCIDENTAL CHEMICAL CORP.	VINYL CHLORIDE	1,930
25. PENNSYLVANIA STEEL FOUNDR	NICKEL	250
26. PENNTECH PAPERS INC.	CHLOROFORM	750
27. RAYMARK FRICTION CO.	LEAD	23,891
28. RENZER FILMS CORP.	CADMIUM COMPOUNDS	10
29. ST. GEORGE CRYSTAL LTD.	LEAD COMPOUNDS	22,320
30. STANDARD STEEL	NICKEL	1,431
31. STANDARD STEEL	NICKEL	6,088
32. TELEDYNE INC.	NICKEL	250
33. TELEDYNE VASCO	NICKEL	10,000

Potential Vulnerability to Contamination, Based on DRASTIC

This map indicates the relative vulnerability of the region, by county, to ground water contamination, as indicated by a "DRASTIC" (AGDRASTIC) score. The scores represent an aggregated assessment of each county's vulnerability range.
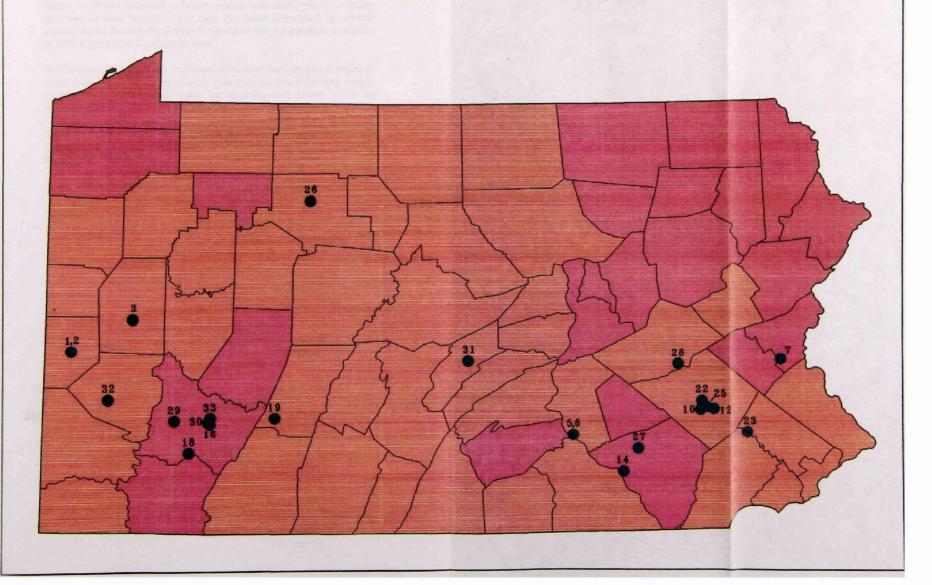
The DRASTIC methodology was developed by EPA and the NWWA to evaluate ground water pollution potential. "DRASTIC" is an acronym representing the most important factors controlling ground water pollution potential, including: Depth to water, net Recharge, Aquifer Media, Soil media, Topography, Impact of the vadose zone, and hydraulic Conductivity of the aquifer.

☐ No Data
■ 88 - 100
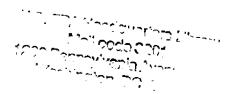■ 101 - 141
■ Greater than 141

1988 TRI LAND RELEASES
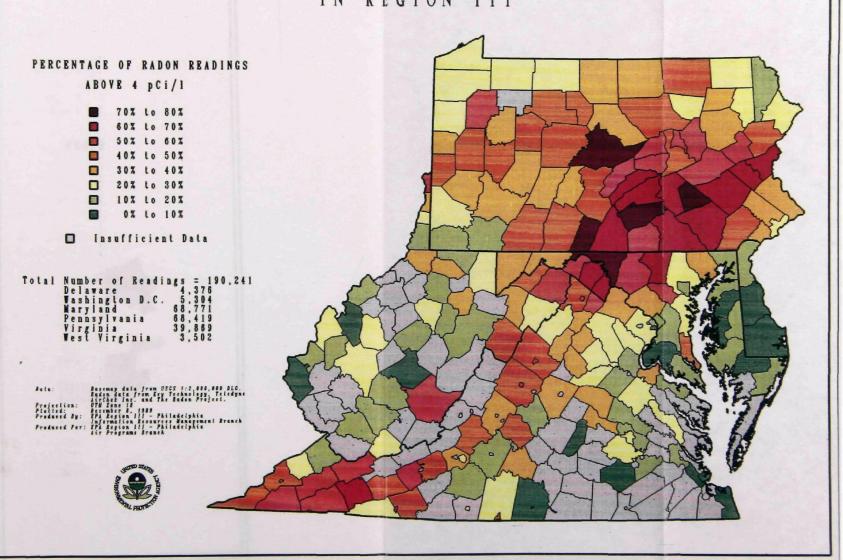# IN PENNSYLVANINA FOR CANCER POTENCY

Monitoring Radon Levels

The Air, Radiation and Toxics Division has been using GIS as the centerpiece of their radon outreach program for the last two years. Radon levels are collected as home owners voluntarily place sampling canisters in their homes. This data has been assembled by several private radon testing firms who have made the information available to EPA aggregated by zipcode area.

The Region III Geographic Information Center has produced regional maps with radon levels by county (see map on the following page), county maps with radon levels by zipcode, and radon levels by congressional districts (see second map). Congressmen were provided with radon level maps for their districts to make them aware of environmental conditions in their districts. The maps have been effective in media presentations and as visual aides in testimony before state legislatures.

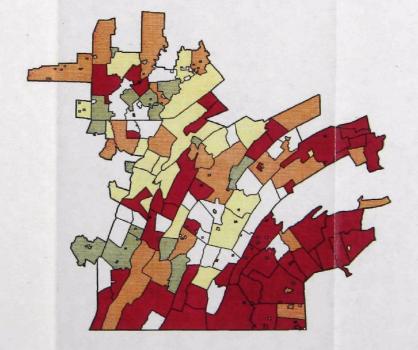# PERCENTAGE OF RADON READINGS ABOVE 4 pCi/l
IN REGION III

**PERCENTAGE OF RADON READINGS
ABOVE 4 pCi/l**

- ■ 70% to 80%
- ■ 60% to 70%
- ■ 50% to 60%
- ■ 40% to 50%
- ■ 30% to 40%
- ■ 20% to 30%
- ■ 10% to 20%
- ■ 0% to 10%

- ☐ Insufficient Data

Total Number of Readings = 190,241
Delaware	4,376
Washington D.C.	5,304
Maryland	68,771
Pennsylvania	68,419
Virginia	39,869
West Virginia	3,502

PERCENTAGE OF RADON READINGS ABOVE 4 pCi/l
PENNSYLVANIA CONGRESSIONAL DISTRICT 9
REPRESENTATIVE BUD SHUSTER

PERCENTAGE OF RADON READINGS
ABOVE 4 pCi/l

- Over 60%
- 40% to 60%
- 20% to 40%
- 0% to 20%

Insufficient Data

Data: Radon data from Key Technology, Teledyne, AirChek Inc. and The Radon Project.
Projection: UTM Zone 18
Plotted: July 1990
Produced By: EPA Region III – Philadelphia Information Resources Management Branch
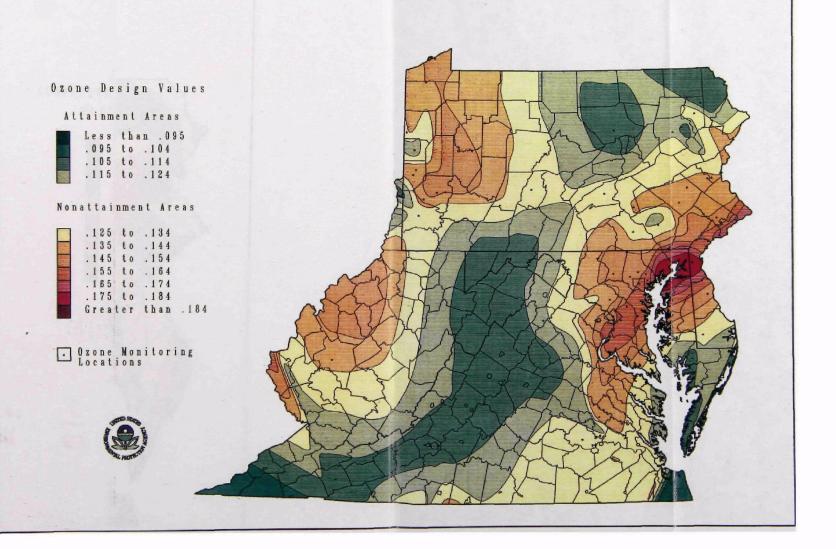Produced For: EPA Region III – Philadelphia Air Programs Branch

Air Quality Monitoring

GIS has been used over the last two and a half years to monitor air quality in the region. Data from the AIRS database is periodically downloaded into the GIS and ARC/INFO's contouring capabilities are utilized to create concentration isopleths for various pollutants. The maps on the following two pages were created for ozone concentrations and total suspended particulates (TSP) and were included in the Air Quality Trends Report. The next map in this series identifies counties in the northeastern United States that are designated as non-attainment and do not meet minimum ozone standards.
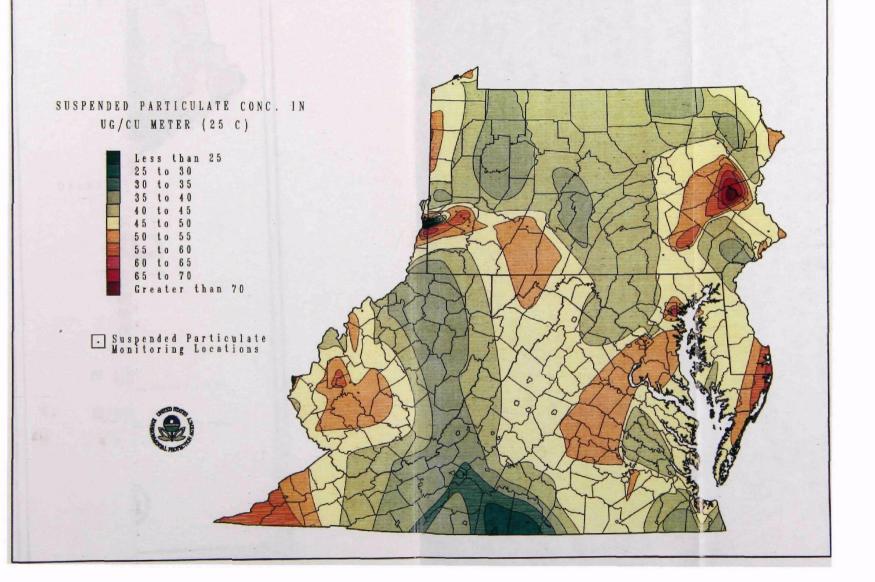
The New Source Review Section of the Air Enforcement Branch used GIS to help visualize the impact of SO2 from recently permitted or proposed sources in Virginia. The fourth map in this series shows the locations of proposed or permitted sources indicated by a colored circle. The diameter of the circle indicates the amount of proposed SO2 emissions in tons per year.
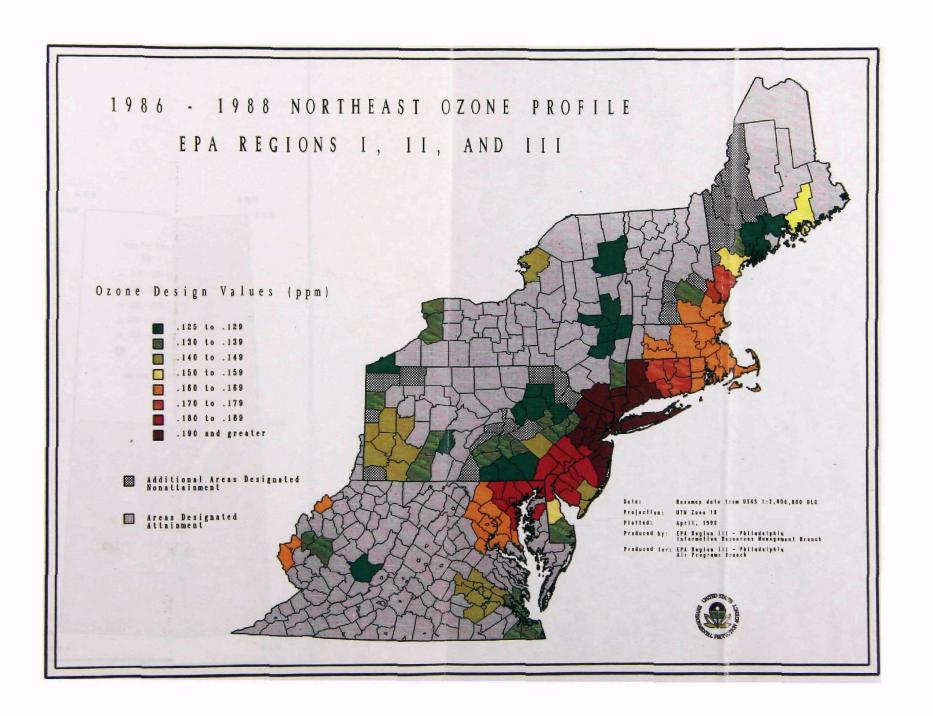
ARC/INFO was used to display the output from air dispersion models by the Technical Assessment Section of the Air Programs Branch. SO2 emissions from two General Services Administration power plants were modeled under various atmospheric and operational scenarios. The final map in this series shows the dispersion plume for the worse case scenario. This project successfully used GIS running on a mini-computer as a preprocessor and post processor for a PC air dispersion model.

1986 - 1988 OZONE DESIGN VALUES FOR REGION III

Ozone Design Values

Attainment Areas

Less than .095
.095 to .104
.105 to .114
.115 to .124

Nonattainment Areas

.125 to .134
.135 to .144
.145 to .154
.155 to .164
.165 to .174
.175 to .184
Greater than .184

· Ozone Monitoring
  Locations
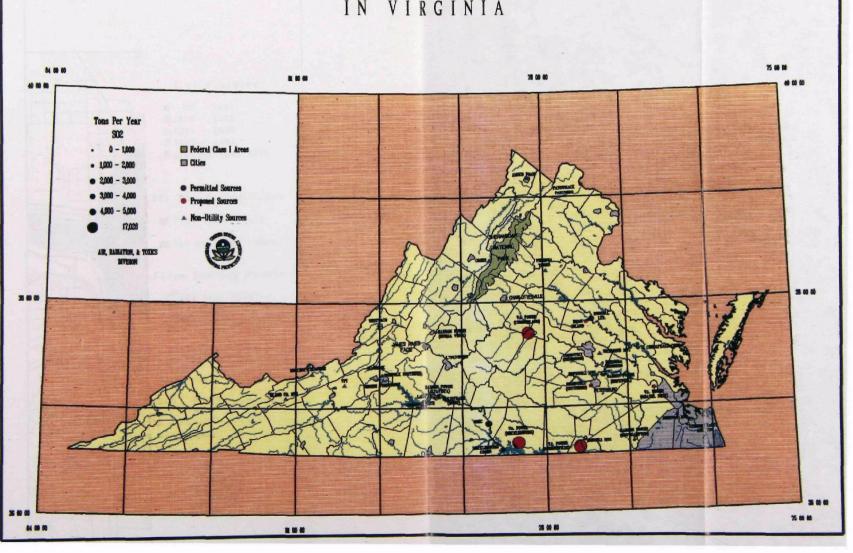
SUSPENDED PARTICULATE CONCENTRATIONS IN REGION III

1988 GEOMETRIC MEAN

SUSPENDED PARTICULATE CONC. IN
UG/CU METER (25 C)

Less than 25
25 to 30
30 to 35
35 to 40
40 to 45
45 to 50
50 to 55
55 to 60
60 to 65
65 to 70
Greater than 70

□ Suspended Particulate
Monitoring Locations

1986 - 1988 NORTHEAST OZONE PROFILE
EPA REGIONS I, II, AND III

Ozone Design Values (ppm)

- ■ .125 to .129
- ■ .130 to .139
- ■ .140 to .149
- ■ .150 to .159
- ■ .160 to .169
- ■ .170 to .179
- ■ .180 to .189
- ■ .190 and greater

▨ Additional Areas Designated Nonattainment

▨ Areas Designated Attainment

Data: Basemap data from USGS 1:2,000,000 DLG
Projection: UTM Zone 18
Plotted: April, 1990
Produced by: EPA Region III - Philadelphia
Information Resources Management Branch
Produced for: EPA Region III - Philadelphia
Air Programs Branch

NEW MAJOR SOURCES
RECENTLY PROPOSED OR PERMITTED
IN VIRGINIA

Tons Per Year
SO2

- 0 – 1,000
- 1,000 – 2,000
- 2,000 – 3,000
- 3,000 – 4,000
- 4,000 – 5,000
- 17,026

AIR, RADIATION, & TOXICS
DIVISION

▣ Federal Class I Areas
▣ Cities

● Permitted Sources
● Proposed Sources
▲ Non-Utility Sources

HEALTH RELATED SO2 STANDARD
MAXIMUM ALLOWABLE EMISSIONS
(ALL ELEVEN BOILERS OPERATING)

% of Standard

- 0% - 100%
- 100% - 200%
- 200% - 300%
- 300% - 400%
- greater than 400%

SO2 Monitoring Sites

West End Library

The Garrison School

Steam Heating Plants

GSA West Plant

GSA Central Plant

1 Km Receptor Grid
(360 Receptor Points per Grid)

U.S. EPA Region III
Air, Toxics & Radiation
Management Division

Superfund Applications

The Hazardous Waste Management Division (HWMD) has used GIS mapping capabilities for a variety of applications. Seven maps representing these applications are contained on the following pages. Numerous maps have been produced to display data contained in CERCLIS and HWDMS databases. The first map shows all of the NPL sites in the region. In addition to this map the Geographic Information Center (GIC) has produced maps of NPL by state, Regional CERCLA, RCRA TSD, and RCRA large and small quantity generators. The second map was prepared for the Regional Administrator and shows all of the hazardous waste sites in the Philadelphia area.

The Eastern Pennsylvania Section of the Superfund Remedial Branch is using GIS to assist in the RD/DA process. ARC/INFO was used to display ground water contaminate concentration data for five Superfund sites in the North Penn area of Montgomery County, PA. The two accompanying maps display TCE for North Penn Area 2 and PCE concentrations for North Penn Area 1. These maps were used to graphically display some of the data contained in the RD/DA workplan. The maps were use in Headquarters briefings and will be used in future public meetings to convey the nature of the problem to the general public.

GIS was an integral part of the RD/RA process at the Berks Sand Pit Superfund Site, PA. An initial GIS map was created from detailed engineering drawings and contains precise well locations, surface water quality monitoring data and analytical results from residential and monitoring wells. This map was use by EPA staff in the field to locate additional monitoring wells and was updated over the course of the sampling phase of the project to reflect new data. By integrating residential, monitoring well, and surface water data on the GIS map, EPA staff were able to base decisions regarding the location of ground water extraction wells. This eliminated the need for an interim report, thereby saving the agency significant resources. The map included in this document contains all of the above data, as well as, the location of the treatment plant (shown in brown) required by the remedial action. The map was also used during a community outreach television broadcast and will continue to be updated as new information becomes available.

The Technical Support Section of the Superfund Programs Branch is conducting an in-house Remedial Investigation at the Berkeley

Products NPL Sites. The GIS system is being utilized to illustrate and aid in the analysis of data collected at the site. Site base maps, derived from the interpretation of aerial photography, as well as, magnetometer and soil gas survey data have been assembled to date. Monitoring well, soil trenching, and ecological characterization data will also be evaluated with the GIS. The last two maps in this series of Superfund applications display magnetometer and soil gas survey data contoured using the GIS.

N P L   S I T E S   —   R E G I O N   I I I

Site Names by State

Total Sites
per County

	No Sites
	1 - 4
	5 - 10
	More than 10

● Verified Locations

● Unverified Locations

PHILADELPHIA AREA
SUPERFUND SITES AND
HAZARDOUS WASTE FACILITIES

- NPL SITES
- REMOVAL SITES
- NPL AND REMOVAL SITES
- TSD FACILITIES
- NPL AND TSD FACILITIES
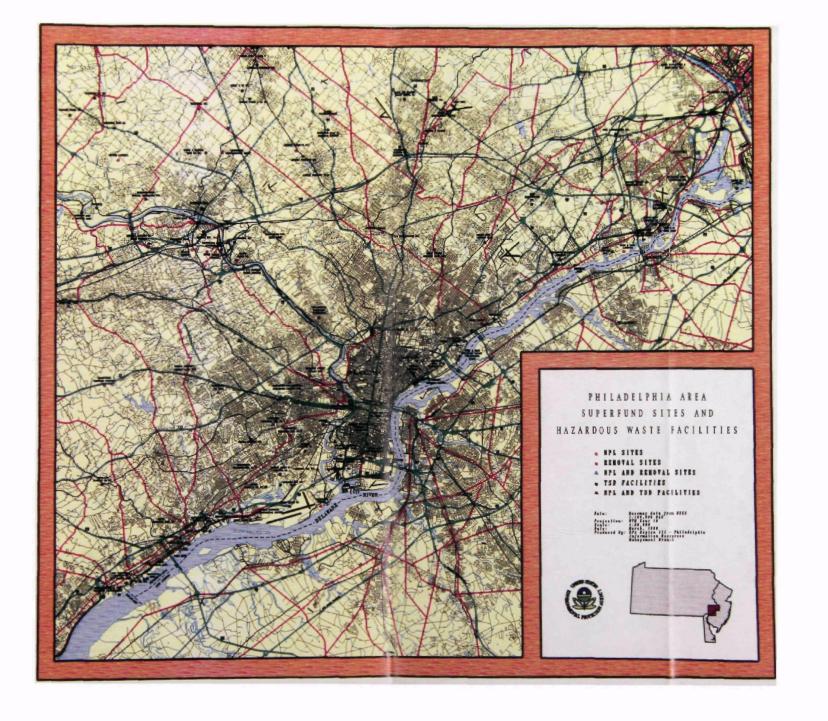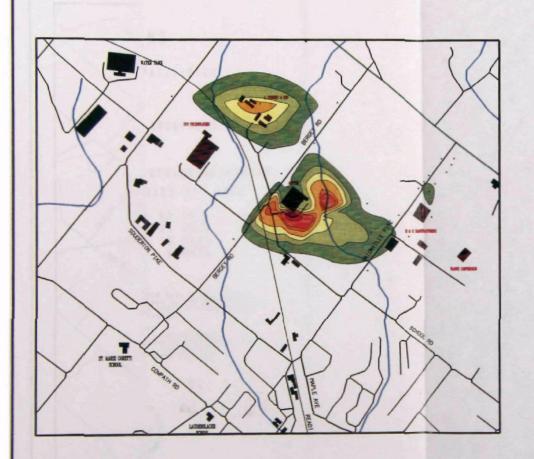
NORTH PENN AREA 2 SUPERFUND SITE
TRICHLOROETHENE CONCENTRATIONS

LEGEND

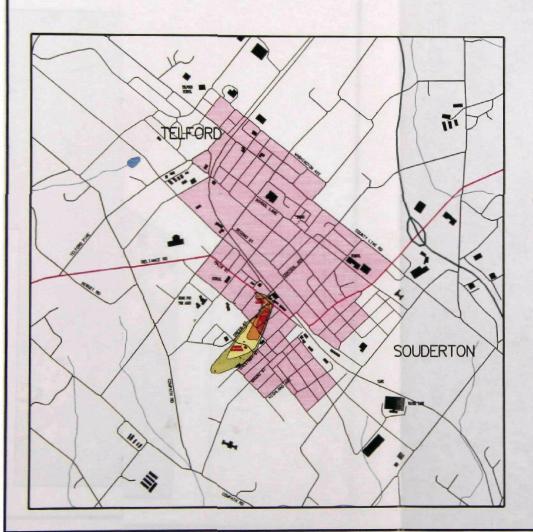■ ALLEGED PRP FACILITIES

- TANKS

- SAMPLED WELL LOCATIONS

CONCENTRATIONS OF TRICHLOROETHENE

■	0.5 -	5 UG/L
■	5 -	25 UG/L
☐	25 -	100 UG/L
■	100 -	500 UG/L
■	500 -	1,000 UG/L
■	1,000 -	5,000 UG/L
■	5,000 -	10,000 UG/L
■	Greater than	10,000 UG/L

NORTH PENN AREA 1 SUPERFUND SITE
TETRACHLOROETHENE CONCENTRATIONS

TELFORD

SOUDERTON

LEGEND

■ ALLEGED PRP FACILITIES

· TANKS

· SAMPLED WELL LOCATIONS
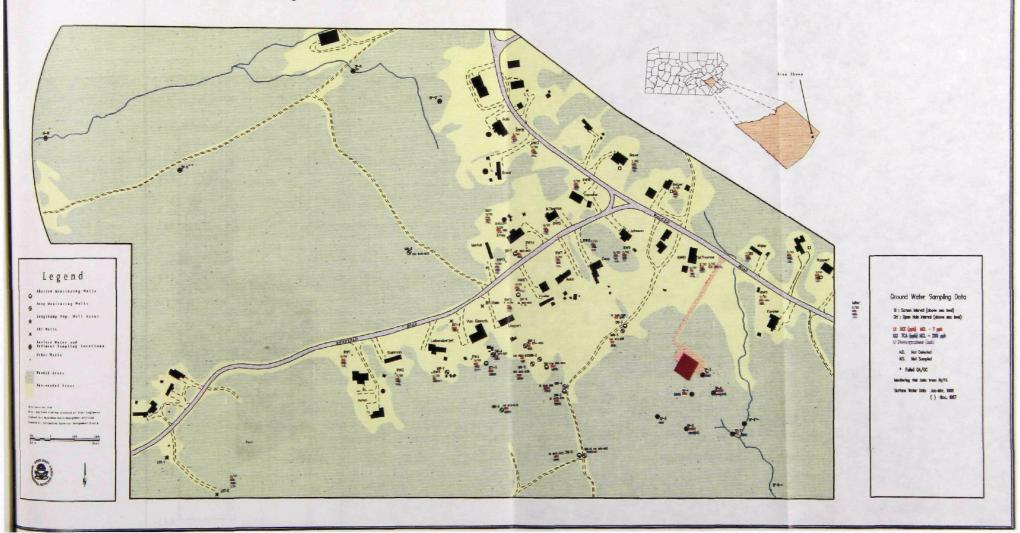
CONCENTRATIONS OF TETRACHLOROETHENE
SAMPLED ON FEBRUARY 28, 1986
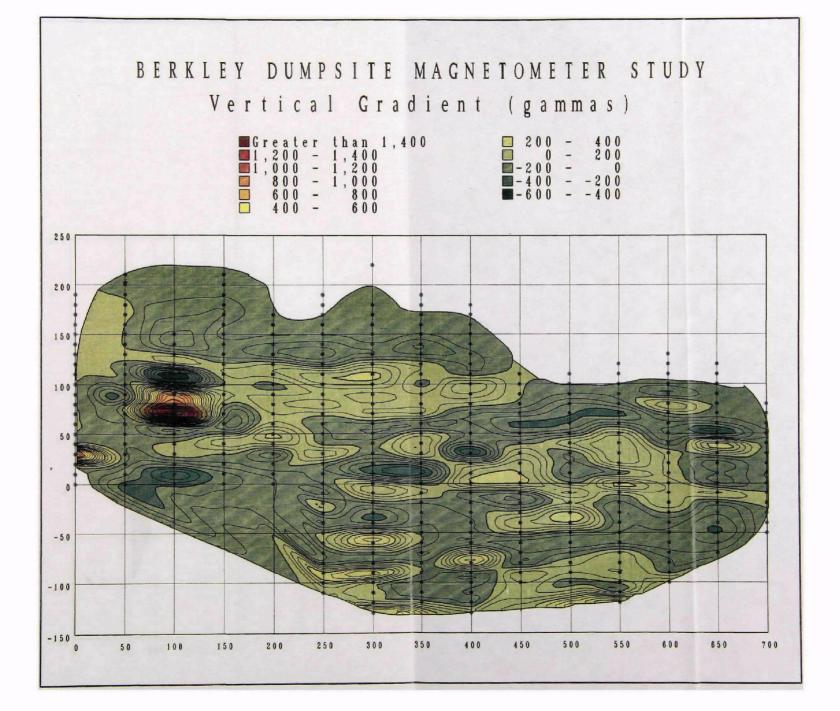
■ 25 UG/L - 50 UG/L
■ 15 UG/L - 25 UG/L
□ 5 UG/L - 15 UG/L
■ 0.5 UG/L - 5 UG/L

Data from: USGS 1:24,000 DLG data. Well sampling
              data were analyzed by the North Penn
              Water Authority located in Montgomery
              County, Pennsylvania.
Projection: UTM Zone 18
Plotted: February 7, 1990
Produced by: EPA Region III - Philadelphia
              Information Resources Management Branch
Produced for: EPA Region III - Philadelphia
              Eastern Pennsylvania Section
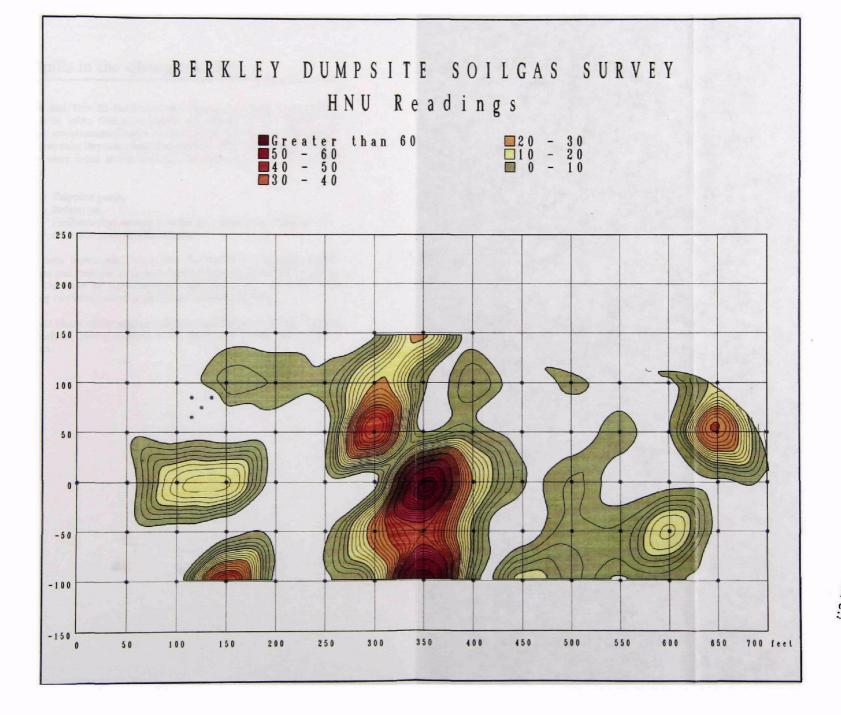
BERKS SAND PIT - RI/FS
Longswamp Township, Berks Co., PA

Area Shown

Legend

○ Shallow Monitoring Wells
◐ Deep Monitoring Wells
★ Longswamp Twp. Well Assoc.
✕ EET Wells
● Surface Water and Sediment Sampling Locations
□ Other Wells

▨ Wooded Areas
▨ Unwooded Areas

Scale

Ground Water Sampling Data

SI : Screen Interval (above sea level)
OH : Open Hole Interval (above sea level)

1,1 DCE (ppb) MCL = 7 ppb
1,1,1 TCA (ppb) MCL = 200 ppb
∇ Chloroethane (ppb)

N.D. Not Detected
N.S. Not Sampled

★ Failed QA/QC

Monitoring Well Data from RI/FS

Surface Water Data Jan–Mar, 1988
( ) Nov. 1987

BERKLEY DUMPSITE MAGNETOMETER STUDY
Vertical Gradient (gammas)

BERKLEY DUMPSITE SOILGAS SURVEY
HNU Readings

Oil Spills in the Chesapeake Bay

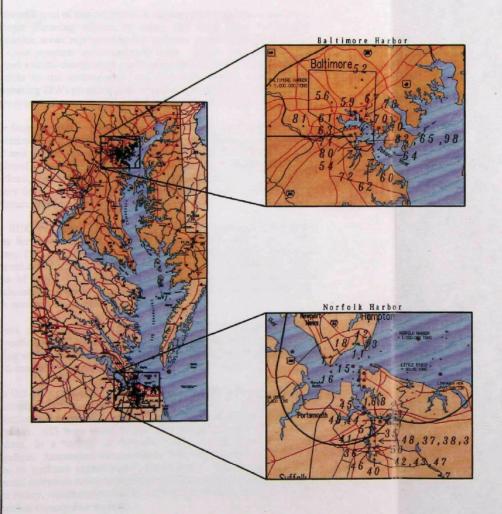The Oil and Title III Section of the Hazardous Waste Management Division is using GIS to evaluate the impact of oil shipping on sensitive environmental areas in the Chesapeake Bay. A basemap for the Chesapeake Bay was created and information from various tabular reports were input in the GIS and the following data layers were created:

- Shipping ports,
- Refineries,
- Facilities that receive petroleum products by barge or ship,
- Oil spills (vessel related only).

These data layers are being used for planning and presentation purposes and eventually, may be developed as an emergency response tool. The map on the following page shows the locations of oil shipping facilities and oil spills in the Chesapeake Bay.

A second phase of the project will map sensitive environmental areas and analyze their proximity to oil spills, refineries, and shipping facilities.

CHESAPEAKE BAY OIL FACILITIES & SPILLS

Baltimore Harbor

Baltimore

BALTIMORE HARBOR
1,000,000 TONS

52
56 59 67 78
81 61 70 01
63 82 , 65 , 98
71 80 64
54 72 60
62

Patapsco River

Norfolk Harbor

Newport News   Hampton

NORFOLK HARBOR
1,000,000 TONS

18   12
03
1.1
15
16
45 1,68
Portsmouth
48 44
33   48 , 37 , 38 , 3
41 50
36   42 , 43 , 47
46 40   7

Suffolk

James River

Portsmouth

LITTLE RIVER
< 50.00 TONS

LYNHAVEN RD&
< 50,000 TONS

OIL BARGE
CARGO TONS

SPILLS REPORTED TO THE NRC
VESSEL RELATED ONLY
1980 - 1987

- 10,000 - 99,999 Gallons
- 1,000 - 9,999 Gallons
- 500 - 999 Gallons
- 100 - 499 Gallons
- Less Than 100 Gallons

Oil Pipeline

★ = Facilities that recieve bulk
    oil by barge or ship

Data: Basemap data from USGS 1:200,000 DLG.
              Facility data from the U.S. Coast Guard
Projection: UTM Zone 18
Plotted: January, 1991
Produced By: EPA Region III - Philadelphia
              Information Resources Management Branch
Produced For: EPA Region III - Philadelphia
              Western Response Section

Regional Strategic Planning Initiative

The overall goal of this project is to support EPA Region III's on-going Strategic Planning efforts by using GIS technology to identify geographic areas representing the greatest potential single-program and cross-program environmental risks. Senior management has charged a multi-disciplinary, multi-program task team with identifying the risks to the environment and to human health. The team is interpreting EPA's program data, to define and rank areas for purposes of program resource targeting and environmental indicator selection.

Data from a variety of sources are being retrieved and integrated to determine the current condition of both the natural resources (air, land and water) and the public health in Region III. Data are being displayed on a geographic basis, by county, zipcode and point locations, depending on the data georeferencing. To date, over twenty data layers have been assembled representing a wide range of environmental conditions and risks.

The RISC project's first phase will identify threatened geographic areas for more concentrated evaluation. Seven data layers (TRI-Water, TRI-Air, 3041, Superfund, RCRA, Radon, Ozone) have been selected for thirteen overlay combinations so as to spatially define areas of risk. Later phases will focus on further analyzing the relationship between sources and receptors of environmental risk, both ecological and human health.

Project results will be used by managers to target: pollution prevention initiatives, intensive monitoring and enforcement, priority-setting within programs, multiple-program initiatives, areas of highest multi-media risk, and risk communication and outreach.

This GIS project is significantly fostering cross-program teamwork in developing holistic environmental solutions, is improving data collection and management, and is helping set regional environmental priorities. GIS is an essential tool for managing enormous amounts of data, in a variety of formats, from a large number of EPA programs. Automated data retrieval and analysis enable the project team to perform sophisticated assessments. This project has also directed attention towards helping implement the Agency's Locational Data Policy, which states that by 1995 locational data will be accurate to within twenty-five meters.

Population Growth
1980 to 1988

0-5 % Increase
6-10 %
11-20 %
21-30 %
31-40 %
> 40

Decrease

EPA Region III
Regional Integrated Strategic
Cartographic Project

Data: Population data by county from US Census
Bureau 1980 census and estimates for 1988.
Projection: Universal Transverse Mercator, Zone 18
Produced for: Regional Integrated Strategic
Cartographic Task Team
Produced by: Information Resources Management Branch
Date: March, 1991
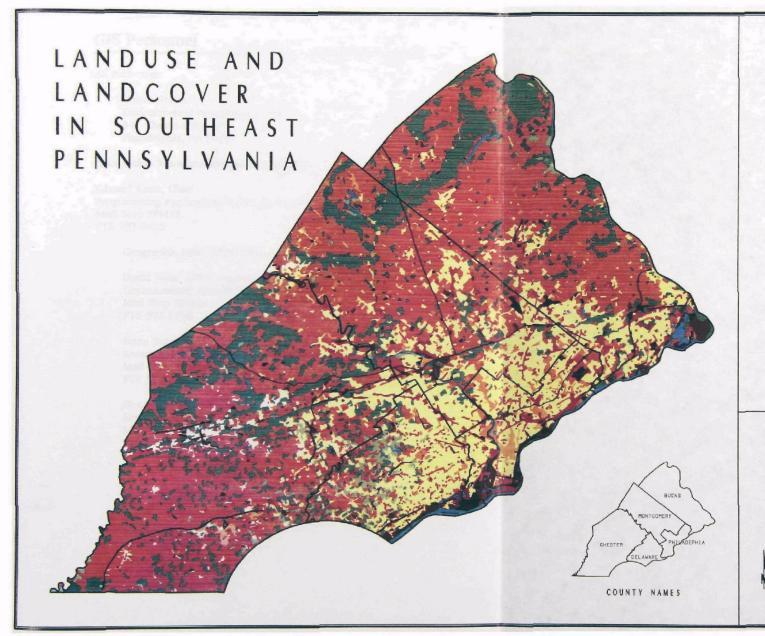
Building Regional Geographic Databases

The Region III Geographic Information Center (GIC) of the Information Resources Management Branch is actively building Region-wide geographic databases. The most time consuming part of most projects is data collection and many potential users become discouraged when they learn that significant time and resources are required to collect the data that they will need. It is also anticipated that as GIS hardware become less expensive and a graphic user interface to ARC/INFO becomes available; the GIS user community will need, and expect, immediate access to commonly needed databases.

The GIC is therefore working to build the following Region-wide databases:

- soils,
- land use,
- wetlands,
- geology,
- edgematched 1:100,000 transportation,
- RF3 hydrology,
- population,
- and political boundaries.

The land use map of southeastern Pennsylvania on the following page represents a portion of the data that will be included in the region-wide land use database. It was created for USGS GIRAS land use data.

The GIC is also working on methodologies for periodic updates of ARC/INFO coverages created from EPA programmatic data, such as NPL and RCRA site locations.

LANDUSE AND
LANDCOVER
IN SOUTHEAST
PENNSYLVANIA

LEGEND

URBAN OR BUILT-UP LAND
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- TRANSPORTATION, COMMUNICATIONS, AND UTILITIES
- INDUSTRIAL AND COMMERCIAL COMPLEXES
- MIXED URBAN OR BUILT-UP LAND
- OTHER URBAN OR BUILT-UP LAND

AGRICULTURAL LAND
- CROPLAND AND PASTURE
- ORCHARDS, GROVES, VINEYARDS, NURSERIES, AND ORNAMENTAL HORTICULTURAL AREAS
- CONFINED FEEDING OPERATIONS
- OTHER AGRICULTURAL LAND

FOREST LAND
- DECIDUOUS FOREST LAND
- EVERGREEN FOREST LAND
- MIXED FOREST LAND

WATER
- WATER BODIES

WETLANDS
- FORESTED WETLANDS
- NONFORESTED WETLANDS

BARREN LAND
- SANDY AREAS OTHER THAN BEACHES
- STRIP MINES, QUARRIES, AND GRAVEL PITS
- TRANSITIONAL AREAS

Data from: U.S.G.S GIRAS 1:250,000 Landuse/Landcover
                 Source Date: 1973

Projection: UTM Zone 18

Plotted: April 0, 1989

Produced by: EPA Region III - Philadelphia
                 Information Resources Management Branch

Produced for: EPA Region III - Philadelphia
                 Pennsylvania Remedial Response Section

BUCKS

MONTGOMERY

CHESTER

PHILADELPHIA

DELAWARE

COUNTY NAMES

SCALE 1:150,000

2   0   2   4   6   8 MILES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

GIS Personnel

All Addresses:

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2. Targeting Areas for Wellhead Protection

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3. Underground Injection Control - Site Discovery

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4. Ground Water Pollution Potential Assessment

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5. Regional Ground Water Risk Assessment

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Project Leads (continued)

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6. Sub-Regional Ground Water Risk Assessment

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7. Federal Facilities Compliance Initiative

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8. CERCLA Site Discovery

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Project Leads (continued)

9. GIS Automation of Hazard Ranking System, Ground Water Migration Pathway

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10. Delaware River Water Trends Report

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11. Assessing Toxicological Impacts

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Project Leads (continued)

12. Monitoring Radon Levels

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13. Air Quality Monitoring

> David L. Arnold, Chief
> Program Planning Section
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> Virginia SO2

> Dennis M. Lohman, Chief
> New Source Review Section
> Mail Stop 3AT22
> FTS 597-3024

> Washington D.C. - SO2 Modelling

> Alan Cimorelli
> Environmental Scientist
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14. Superfund Applications

> Berks Sand Pit Superfund Site

> Christopher Corbett
> Remedial Project Manager
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Project Leads (continued)

North Penn Areas

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Berkeley Superfund Site

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15. Oil Spill Emergency Response

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16. Regional Strategic Planning Initiative

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