

1993 ANNUAL REPORT



he Water Resources Agency for New Castle County (WRA) is a cooperative program by the City of Newark, the City of Wilmington, New Castle County, and the State of Delaware in water supply planning and management and water quality planning and management. The WRA originated with the establishment of a Water and Sewer Management Office by New Castle County in the late 1960's to address problems encountered with water supply (drainage, flooding, future water supply) and with the formation in 1974 of a Water Quality Management Program by Newark, Wilmington and New Castle County under the U.S. Environmental Protection Agency auspices. In that year, New Castle County was designated by the Governor as an urban-industrial area confronted with existing and potential water quality problems and in need of an area-wide plan to address them. An inter-jurisdictional agreement signed by the three executives and concurrent resolutions passed by the respective councils established the planning program. Following the development and approval of a water quality plan in 1977, the separate County and regional activities were merged under the direction of a Policy Board for water resources planning and management. By amendment of the agreement in 1990, the State of Delaware was added as a voting member of the Policy Board. A member of the Water Resources Advisory Committee and a representative of the private water utilities serve as non-voting members of the Policy Board.

The cover depicts Major Watersheds in Northern New Castle County. Watersheds are the fundamental hydrogeological unit for managing water. A complete watershed map of New Castle County is shown on the inside back cover.

Friends and Associates

The Water Resources Agency for New Castle County (WRA) is pleased to present its First Annual Report to the citizens of New Castle County. This report has been developed to provide the public with a summary of some of the water supply and water quality issues included in WRA's program activities in 1993. Many of these issues already have or, in the future will, affect our daily lives. Additionally, this initial Annual Report provides background information on your drinking water, including the major public suppliers, their sources of water, and how this water is used everyday. The Report concludes with a brief discussion of programs that will be increasingly important in the upcoming years.

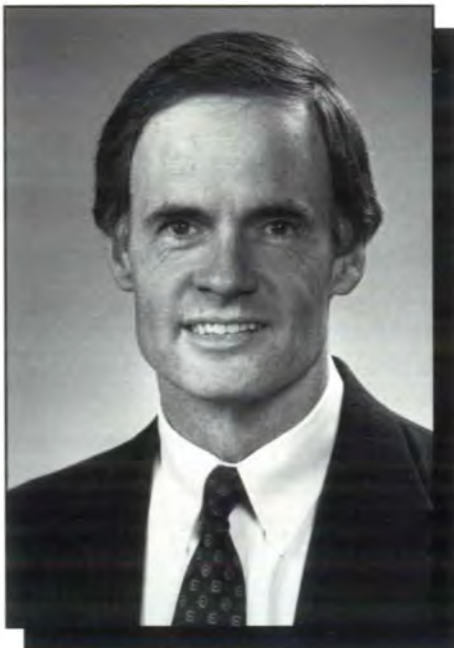


"Water is the best of all things."

PINDAR



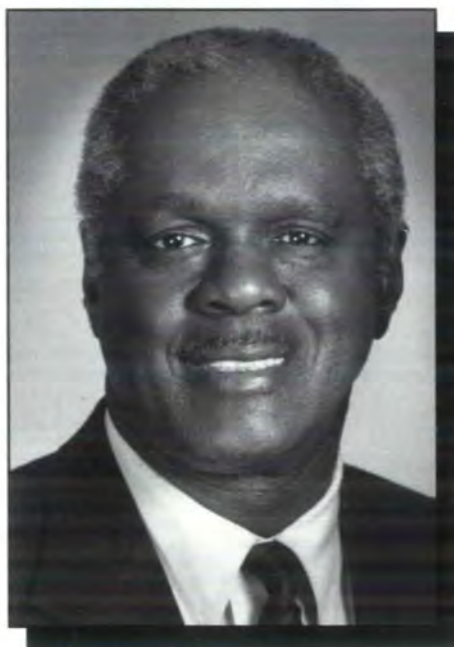
Policy Board



State of Delaware
Governor Thomas Carper



New Castle County
Executive Dennis Greenhouse



City of Wilmington
Mayor James Sills, Jr.



City of Newark
Mayor Ronald Gardner

Non-Voting Members

Dorothy Miller

Water Resources
Advisory
Committee

Dian Taylor

Artesian Water
Company

The Agency is governed by a Policy Board that meets bimonthly and directs all program activities. Voting members are the chief elected officials of the three local governments and the Governor of the State of Delaware or their designees. The Administrator of the WRA serves as the Secretary. Non-voting members include a representative of the water utilities in New Castle County and the chair of WRA's citizen advisory committee. ■



Water Resources Advisory Committee



The Agency's Water Resources Advisory Committee (WRAC) consists of citizens of varying interests and organizations whose background and expertise offers public input to Agency operations. The WRAC meets quarterly in the evening at the Agency's Office. The current members are: *Dorothy Miller, Chair; M. Clayton Burgy, Susan Burns, Joseph Hardman, Roland Leathrum, D. Preston Lee, Jr., Jerome Lewis, Kathleen Lord, Glen Schmiesing, Victor Singer, Christopher Wicks, Jr.* ■



Water Resources Technical Coordinating Committee

A technical committee, the Water Resources Technical Coordinating Committee, (WRTCC) provides for technical coordination and cooperation. It is comprised of representatives of water utilities and local, State and regional organizations directly or indirectly involved in water resources management. The WRTCC meets every other month. ■



WATER...It's There When You Want It

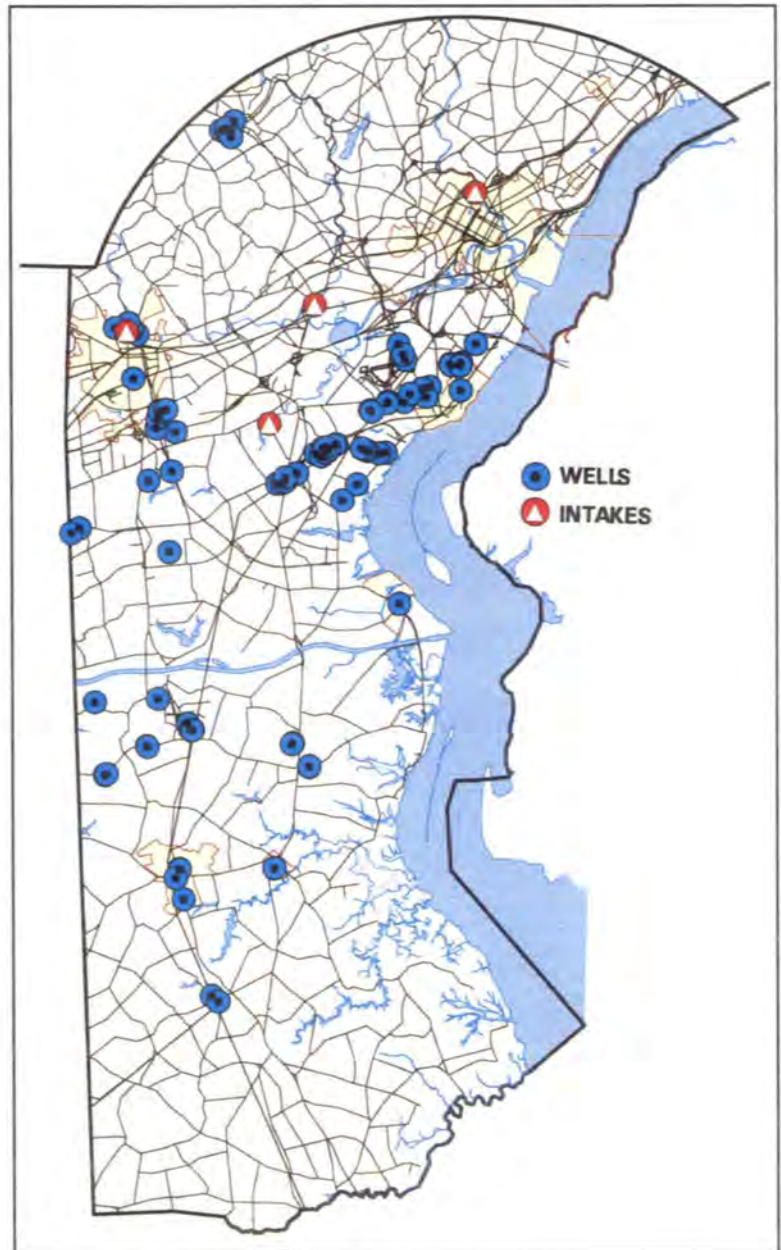
Water. Simply turn the faucet and it's always there. Most people take their water supply for granted, with no idea of where it comes from or how it got to their faucet. The answers may surprise you.

Your Water Source

New Castle County residents and businesses are fortunate to have two sources of fresh water — streamflow, or surface water and saturated sediments, or groundwater. These sources are utilized by either a public water supplier that withdraws, treats, and distributes it, or an individual, self-serving system (usually a well).

The majority of our potable water supply is provided through public water supply systems. There are currently nine public water suppliers in New Castle County. Most of our publicly supplied water comes from four streams—the Brandywine Creek, the White Clay Creek, the Red Clay Creek, and the Christina River. Several suppliers have constructed facilities on these streams which withdraw raw water, treat it to Federally and State mandated quality standards, and distribute it through an elaborate system of pipes, pumps, and storage tanks.

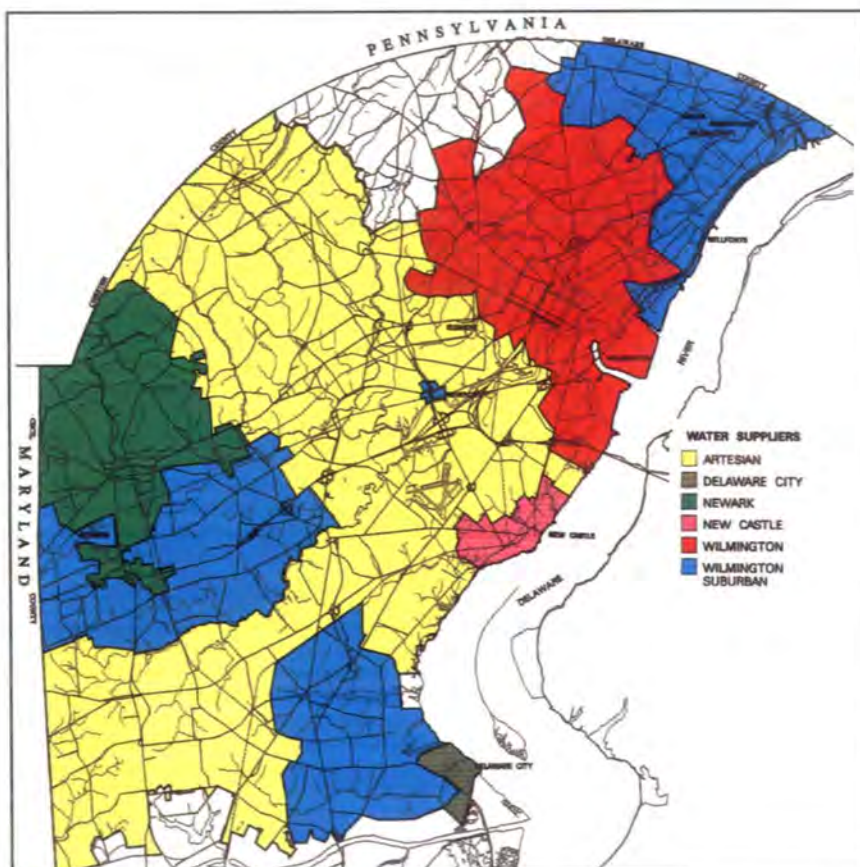
The other public water suppliers and several large industries in New Castle County withdraw water from beneath the surface using wells. Most of these groundwater-based systems utilize a number of large, deep wells which bring water up from layers of saturated sand and gravel to a surface pumping facility where, after minor treatment, it is pumped into their distribution system. Usually this minor treatment, typically chlorination and fluoridation, is all that is needed since groundwater is of a higher quality from natural filtration processes. The high quality of groundwater is the reason it is also utilized by thousands of smaller, individual wells for servicing a single home or business, often with no treatment system.



Your Water Supplier

Your water supplier is determined by where you live. The State DNREC grants the suppliers the right to provide water to customers requesting service within specific geographic service areas. The area north of the C & D Canal is separated among six public water suppliers. Four of the six are government owned and operated systems — the City of Wilmington, City of Newark, New Castle Board of Water and Light, and Delaware City. The other two systems are investor-owned and operated utilities — the Artesian Water Company and the Wilmington Suburban Water Corporation.





supply and demand, about 1.2 MGD (million gallons a day) was transferred by means of a few interconnections. By 1992, about 8.5 MGD was being transferred through a network of over twenty interconnections.

Additionally, two of the suppliers have established interconnections that extend into Pennsylvania. The Wilmington Suburban Water Corporation has been importing water from the Chester Water Authority (CWA) since the 1960's, using it to satisfy demands in the northern portion of the County. And, in 1992, the Artesian Water Company began importing CWA water into the highest elevation part of their service area, near Hockessin. However, this imported water has a relatively short permit duration and may not be available in the future.

The rapidly growing area south of the C & D Canal is currently serviced by four water suppliers. Two of these suppliers are operated by governments — the Town of Middletown and the Town of Townsend. The other two are investor-owned suppliers — Tidewater Utilities, Inc. which has operated small public systems in this area for several years, and the Artesian Water Company which has recently expanded into this area. Southern New Castle County is a contrast to Northern New Castle County in that most of the area is rural with small, individual water systems dominating water supply provision. However, this is likely to dramatically change in the next decade as public water service areas are established in response to expected development.

Interconnections Link Suppliers

Although all of the water suppliers have their own sources of water, several have excess supply capacity while some have greater demands than supplies. Fortunately, for years the suppliers have worked together to optimize the use of existing facilities by developing interconnections among their systems.

The five largest water suppliers north of the C & D Canal have steadily increased their capability to exchange water. In 1978, the first year for which the WRA conducted a comprehensive examination of water

Water Use

Finally, how much potable water is used, and how is it used on an average day in New Castle County? On average, about 80 MGD of fresh water is used a day, excluding irrigation which varies seasonally. About 85% of that water is provided through public systems, the remaining 15% through individual wells.

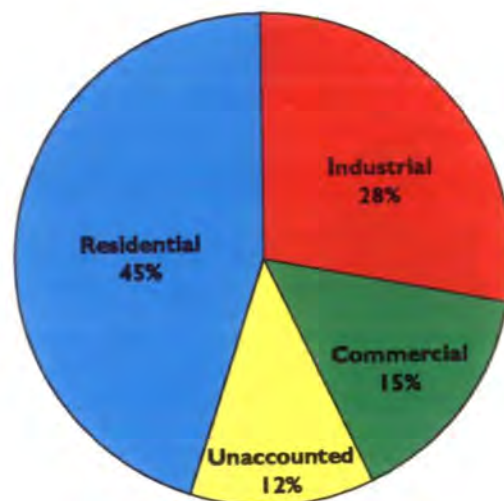
Where Does Your Water Come From?

City of Wilmington	-Brandywine Creek
Wilmington Suburban	-White Clay Creek Red Clay Creek Christina River Pipeline from PA
City of Newark	-White Clay Creek Wells
Artesian Water	-Wells Pipeline from PA
New Castle	-Wells
Delaware City	-Wells
Middletown	-Wells
Townsend	-Wells
Tidewater	-Wells



The predominant use of water is for residential needs, accounting for about 45% of total water use. Residential water use increased dramatically during the 1980's as population and housing units increased. On the other hand, industrial water use decreased by 25% during the last decade as new recycling technologies were installed and several businesses closed. Currently, industries use about 28% of the total fresh water use in the County.

Commercial water use has remained fairly constant through the years, at about 15% of the total. This may be surprising with all the new commercial construction during the 1980's. However, most new and many older buildings have installed water conserving fixtures which significantly reduce water use. And unaccounted water, the difference between water produced and metered water use, continues to decrease as the suppliers initiate aggressive leak detection and metering programs. ■



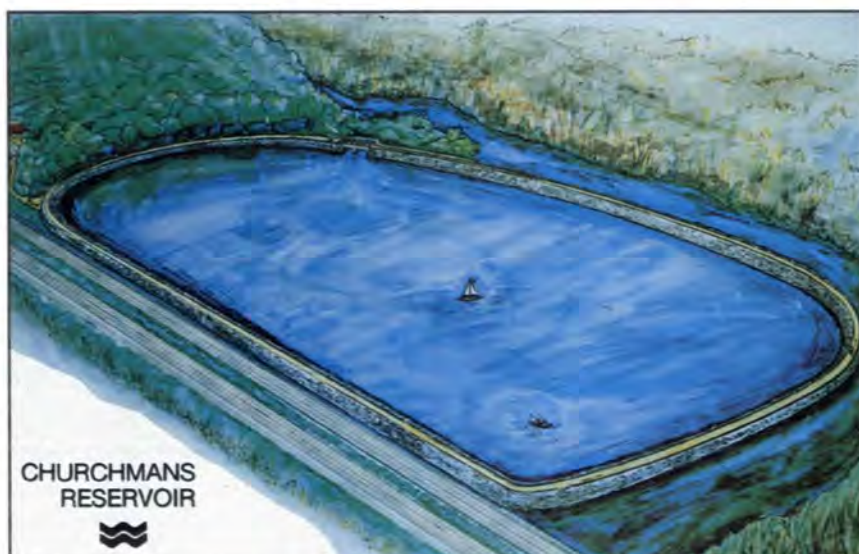
An EIS for NCC

The Long Road to New Water

During the mid-1980's, the Water Resources Agency developed the New Castle County (NCC) component of the State Water Plan under a formal Memorandum of Understanding with the State Department of Natural Resources & Environmental Control (DNREC). Dubbed the WATER 2000 PLAN, this series of nine reports established the foundation for NCC to address its current and future water supply needs. In recent years, several parts of this PLAN have been updated, as WATER 2020 reports, to reflect changes to the water supply systems.

A key part of the WATER 2000 PLAN was Volume VII which outlined future water supply projects for the NCC area located north of the C & D Canal. The major recommendation was that the actions necessary to develop two new reservoirs in NCC be initiated so that, when needed, they would be available. The preferred

project, Churchmans Reservoir, was a basin-like reservoir at the confluence of the White Clay Creek and Christina River. The second-ranked project, Thompson Station Reservoir, was a more traditional dam structure



across a tributary of the White Clay Creek along Thompson Station Road. The State DNREC adopted the Volume VII work conditional upon an Environmental Impact Statement being completed on the WATER 2000 preferred alternative—the Churchmans Reservoir. Soon after, the WRA formally initiated the EIS process by filing for the appropriate permits from the U. S. Army Corps of Engineers, the agency ultimately responsible for an EIS for this type of project.

Funding for the EIS was initially secured from the State, the Artesian Water Company, and the Wilmington Suburban Water Corporation. In January 1990, the consulting firm Metcalf & Eddy, Inc. (M & E) was selected and a multi-phase work program got underway. An EIS Project Management Committee was assembled to oversee and guide the work. In addition, a forty-member EIS Public Advisory Group was organized representing environmental, civic, professional, and business interests. And, a thirty-member EIS Technical Coordinating Committee was put together to technically evaluate work submitted by M & E.

The initial phase of M & E's work involved two main tasks. The first task involved a re-evaluation of water supply sources and facilities and an assessment of how water is used (residential, industrial, etc.). Next, the consultant developed projections of water supply use through the year 2040, a fifty-year period required by the Corps. Comparing existing water supplies versus future water use yielded the first key document of the Phase I work—the forecast of future water supply needs of New Castle County. This document was formally accepted by the Corps in October 1993.

The second task of the Phase I work involves a re-examination of all the alternatives imaginable for future water supply, 68 projects ranging from icebergs to reservoirs. M & E approached this task by initially excluding projects which were impractical or technically infeasible, unreliable, or already implemented. It was also decided that the projects be separated into those located north and those located south of the C & D Canal. These resulting two sets of projects would be used to meet the needs only within their respective areas. Since it appears that the water resources south of the Canal are

fortunately, the methodology, and its application to specific projects, was questioned and was ultimately discarded by the Corps. Subsequently, the Corps has provided a lengthy listing of criteria that must be provided on the projects comprising the original list of alternatives. Fortunately, the Corps has also agreed that prior to the detailed work, projects may be eliminated if they are infeasible, provide only a small volume of additional supply, or have inherent "fatal flaws" that makes future project development highly unlikely.

At this time, the WRA is working with the State DNREC and Metcalf



adequate to meet the future water needs in that area, the EIS focused on the future supply needs north of the Canal. Metcalf & Eddy utilized an alternatives screening methodology which they've utilized in other areas of the country to initially assess the projects which remained for north of the Canal. This methodology, dubbed STEEPLI, involved assigning either a positive, a negative, or a neutral effect of the project on the criteria: Social, Technical, Economic, Environmental, Political, Legal, and Institutional considerations.

This assessment yielded a preliminary ranking of the alternatives. Un-

& Eddy staff to assemble the materials required by the Corps. The EIS is a long, slow process, but one that is required if we are to establish the groundwork necessary to develop the future water supplies New Castle County will need during the next fifty years. ■



Protecting Our Water Assets

In 1987, the WRA embarked on the development of a comprehensive program to protect the public water supply resources in New Castle County (NCC). Armed with the technical assistance of the Delaware Geological Survey (DGS), the Department of Natural Resources and Environmental Control (DNREC), and the U. S. EPA, the WRA produced a set of maps designating areas in NCC that are important for protecting and maintaining our public water supplies.

Dubbed Water Resource Protection Areas, the WRPAs were separated into four types of areas:

- Cockeysville Formation Area
- Wellhead Areas
- Surface Water Areas
- Recharge Areas

Each of these areas were delineated using the best available information concerning topography, geology, soils, and well pumpage data. For each type of WRPA, management measures were developed establishing standards such as minimum lot sizes, maintenance of recharge, and prohibition of hazardous substances. The maps and management measures were adopted through ordinances into the codes of the City of Newark and New Castle County in 1991.

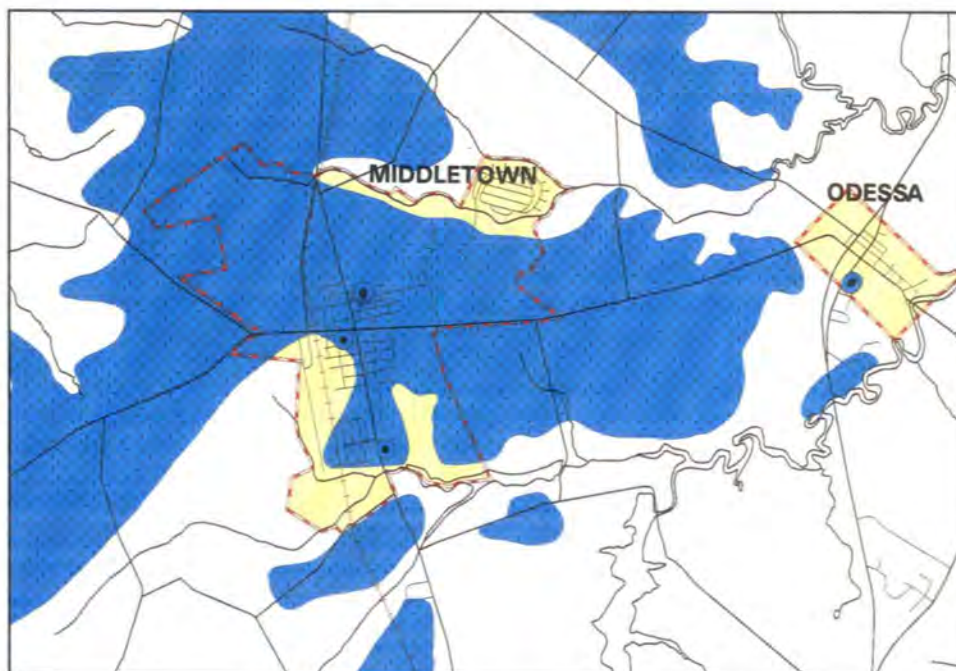
From the beginning, the WRA recognized that the technical basis for the delineation of the WRPAs need to be constantly improved. A technical advisory committee was included in the original ordinances to assist in implementing and revising the program. With funds provided by New Castle County, the WRA set out to improve the database and modeling

techniques initially used to determine the boundaries of the WRPAs.

Several contracts with the DGS over the last few years have resulted in changes to three of the four types of WRPAs. The most significant changes have occurred to the Wellhead WRPAs and the Recharge WRPAs, with relatively minor changes occurring to the Cockeysville Formation WRPA. All these changes have been formally adopted by New Castle County government. The new data has been incorporated into our GIS database and will be printed as a new set of WRPA maps, dated 1993.

Briefly, the Wellhead WRPAs are now separated into three classes: A, B, and C. Class "A" Wellhead areas are points indicating the location of all public water

**Map of
Wellhead
and Recharge
WRPAs in
Middletown
area**



supply wells as designated by DNREC with a buffer of 300 feet. Class "B" Wellhead areas are two wellfields analyzed and delineated by the DGS using a "time of travel" model, and Class "C" Wellhead areas are those carried over from the original 1987 WRPA work.

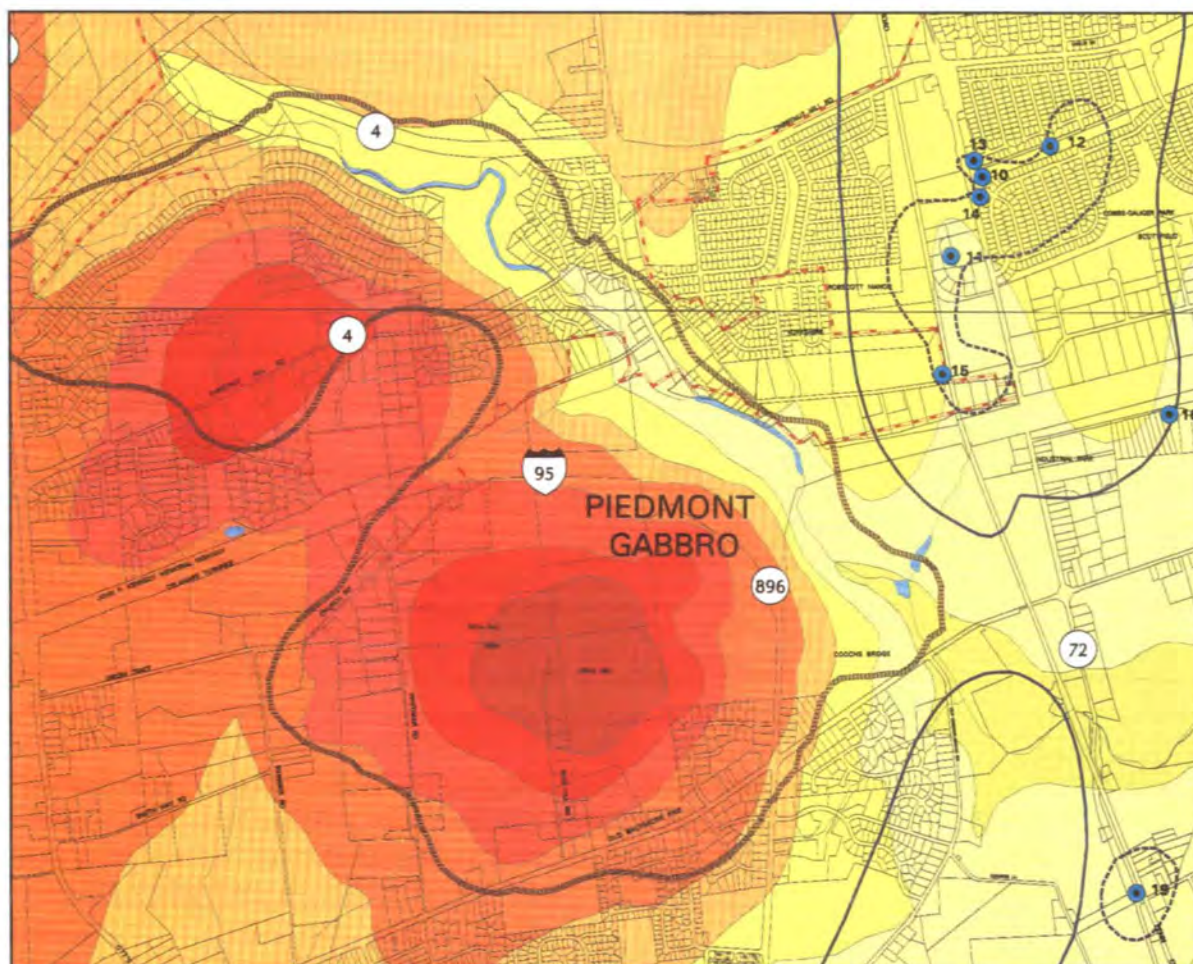
The Recharge WRPAs were changed substantially by the work of the DGS. Using an improved methodology called Stack Unit Mapping and significantly more data



than previously available, the DGS dramatically changed the location and extent of the Recharge WRPAs. However, the new Recharge WRPAs represent a smaller total area of land than previously mapped and should result in much more definitive WRPA boundaries.

Finally, a joint study by the U.S. Geological Survey and the DGS resulted in slight modifications to the Cockeysville Formation WRPAs. The principle change involves the designation of a formational boundary around the Cockeysville where inter-formational groundwater flow is greater than average. This boundary area is governed by the same measures required in the drainage area of the Cockeysville Formation WRPA.

The New Castle County WRPA program has been incorporated into the State of Delaware Wellhead Protection Program which was submitted to the U.S. Environmental Protection Agency in compliance with the federal Safe Drinking Water Act. The WRPA Program will continue to be modified as improved information becomes available. ■



The Cockeysville Formation WRPA

Underground Newark - groundwater gradients around the City of Newark.



AERI II: Our Water Management Tool for the 21st Century

The WRA Data Center is responsible for acquiring, maintaining and disseminating information used in evaluating water supply and water quality. The primary tool for accomplishing these tasks is the AERI II Geographic Information System, a combination of computer hardware and software designed specifically for manipulating and analyzing spatial data.

At the heart of AERI II is a SUN Microsystems SPARC 10 computing system. This UNIX-based workstation contains all of the Data Center's spatial data sets and GIS software. Current on-line storage components provide approximately 2.2 Gb of available disk space, roughly enough space to hold 2 billion characters of information. An additional 2.1 Gb of disk storage will be added in the next several months.

The SPARC 10 also functions as a network file server for several IBM-compatible, DOS-based 486 personal computers. These units provide low-cost access to the geographic data sets along with standard DOS applications, such as word processing and spreadsheet programs. In addition, the Data Center maintains connections to both the Engineering Building LAN (Local Area Network), providing access to data stored on the systems within Public Works and Planning, and the University of Delaware computing network.

Before the introduction of GIS and computer mapping, the primary spatial data product was the paper map. One of the major challenges to creating and maintaining a digital spatial data library has been converting the information on these maps into formats computers can understand. AERI II provides two methods.

The first and traditional method has been to "digitize", or electronically "trace" lines and symbols on maps. The tracings are converted into numeric

coordinates and saved on disk, allowing subsequent operations to process and manipulate them in a variety of ways. This can be a laborious and intense task. AERI's Calcomp 9100 digitizer provides this capability when needed.

The second and more recent method is to use an optical scanner. This device is much like a photocopy machine, except the resulting copy is digital rather than paper. Maps are fed through the scanner and translated. This is many times faster and often more



accurate than digitizing. Although not all types of hard copy maps are suitable for scanning, this technology offers an effective and efficient alternative to manual digitizing methods. AERI II's Houston Instruments LDS 4000 Plus is capable of scanning maps up to 36" wide at a resolution of 400 dots per inch.

Once incoming data has been processed, putting it back into hard copy form for analysis requires special printing equipment. AERI II has two, state-of-the-art devices; a Calcomp 58436 electrostatic plotter for handling large maps up to 34" wide, and a smaller Calcomp ColorMaster 6613 thermal transfer printer for producing maps of standard and legal size. Both





devices create high-quality cartographic products.

The other half of AERI II, the GIS software, is ARC/INFO from Environmental Systems Research Institute of Redlands, CA. This popular package provides tools to collect, manipulate, and display geographic data from a variety of sources. ARC/INFO's modules interact with the various input and output devices to produce maps at almost any scale or size. A specially created user interface permits novice users to create quality cartographic products quickly with minimal expertise. Additional custom software enhances the capabilities of ARC/INFO by automating such processes as generation of map graticules (horizontal and vertical grids).

The Data Center also provides spatial data in digital formats suitable for use in other computing environments. This service is usually provided free of charge to other government agencies or at nominal cost to the business community.

Major projects undertaken by the Data Center during 1993 included continuing conversion of the county tax parcels from paper to digital form, a floodplain management study of the Upper Christina River Basin, a land use mapping of the Appoquinimink River Watershed, and acquisition of several new data sets, including the FEMA County floodplain and floodway delineations, updated water resource protection areas, and locations of county, state and federal parks and lands. ■



WATR Models Flow

The WRA also operates WATR, a computerized water transmission model used to simulate and analyze the capabilities of major public water systems in New Castle County. WATR utilizes a data base consisting of each supplier's pipe network, pump stations, storage tanks, interconnections, and customer demands. It determines the availability of water at specific points in a supplier's system by providing the pressure and flow rate under average and peak demand conditions.

Currently, the five major water supply systems in New Castle County -- the Artesian Water Company, the Wilmington Suburban Water Corporation, the New Castle Board of Water and Light, and the cities of Wilmington and Newark -- are included in the data base. WATR can analyze these systems either individually or as a single integrated transmission network.

With WATR, an analysis can be made of each system's ability to provide service at specific locations, meet projected demands, or satisfy fire flow requirements. When changes are needed in the system, WATR can assist in identifying the optimal, least cost alternative.

For more information on these computer programs contact the Water Resources Agency for New Castle County at (302) 731-7670. ■

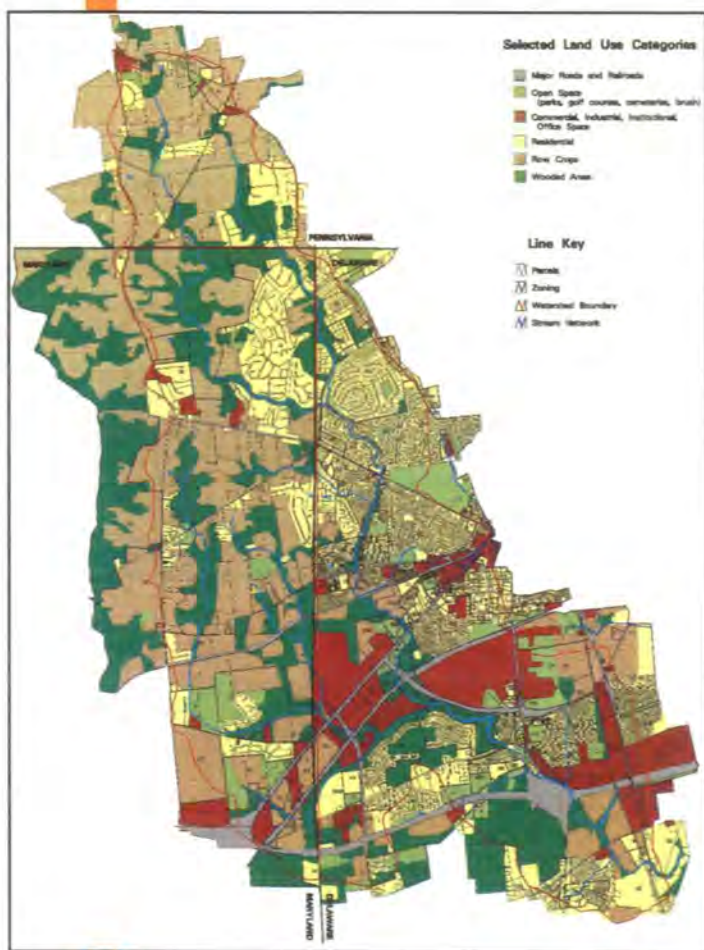


Newark - A River Runs Through It

In 1993, the U. S. Soil Conservation Service (SCS) completed the Upper Christina River Floodplain Management Study sponsored by the City of Newark. The study, prepared under a Joint Coordination Agreement with various local and State agencies, was developed to address a variety of

Dixon Line. This tri-state nature of this stream presents a uniquely complicated situation for addressing the problems associated with it.

The SCS focused its study on identifying and examining floodplain-related issues in this watershed. Key components of the study included detailed topographic mapping of the stream corridor and floodplain, analysis of historical stream gage records, mapping of the soils in the study area, and the preparation of a detailed land use map. This information was utilized to develop hydrologic and hydraulic models of the watershed. Using the models, the SCS forecasted future stream flows during a variety of precipitation events as land use changes. These results were assembled into a variety of recommendations for addressing current and future flooding problems and presented to the City of Newark and New Castle County.



erosion, sedimentation, high flow and episodic flooding problems that have plagued the lower reaches of the Upper Christina River watershed — principally the area in and around Newark.

The Upper Christina River is unique because it is the only stream in New Castle County with a watershed that spreads into two other states — Maryland and Pennsylvania. The River originates in the rural valleys of Cecil County and Chester County and meanders downstream entering New Castle County near the “wedge” at the Mason-

The WRA was asked by the City of Newark to assist in coordinating several activities resulting from this study. An Interstate Committee for the Upper Christina Watershed (ICUCW) made up of representatives of the three states was convened by the WRA. This Committee is developing a Watershed Action Plan listing the actions each of the parties need to take to prevent increased flooding and erosion in this watershed. The WRA is also coordinating an Arbour Park/Christina River Working Group that was brought together to try to resolve the current high flow and erosion problems facing the southwestern portion of Newark. The group, consisting of citizens, Newark officials, SCS staff, and WRA staff, meets regularly and is preparing a Plan which proposes cost-effective, feasible solutions to reducing the conditions affecting them. Potential solutions include stream debris removal, the retrofitting of stormwater and wetland areas, roadway bridge improvements, stream restoration, and open space conservation.

It is anticipated that the coordinated actions of these committees will result in the improvement of the Upper Christina River Watershed for many years to come. ■



The White Clay Creek

-- Wild and Scenic?

In 1991, the U.S. Congress agreed to a request from citizens in the White Clay Creek area to consider the inclusion of this Creek in the National Wild and Scenic River System (NWSRS). The

NWSRS was established by Congress to protect selected rivers with outstanding natural, cultural, and recreational features for the enjoyment of future generations.



Passage of the White Clay Creek Study Act initiated a work program, coordinated by the National Park Service, comprised of three major tasks: a determination of eligibility; the identification of principle issues; and the drafting of a management plan.

The WRA has been a participant in the Study since its inception. The White Clay Creek is a vital source of water supply, with the City of Newark and the Wilmington Suburban

Water Corporation operating facilities on the Creek. The development and implementation of a management plan would offer increased protection of these waters. Additionally, the Agency's WATER 2000 PLAN for New Castle County recommended two future reservoir sites within the White Clay Creek watershed. The WRA requested that the Study recognize the existing use of the Creek for public water supply and the two reservoir sites, preserving eligibility for future reservoir development.

The Study is scheduled for completion in 1995. The WRA believes that successful inclusion for the White Clay Creek in the Wild and Scenic River System would result in increased water quality protection of existing use while maintaining its future potential for new water supplies for New Castle County's residents and businesses. ■

EPA + WRA = H₂O

The U. S. Environmental Protection Agency (EPA) selected New Castle County for the first phase of a Geographic Information System (GIS)-Groundwater Modeling Pilot Project. The EPA awarded funding through its consultant, VIGYAN, Inc., Falls Church Virginia, to the Water Resources Agency to prepare a GIS database and maps for the City of Newark South wellfield. The purpose of this pilot project is to link GIS mapping and database techniques to groundwater modeling as a means to predict the potential for contamination of groundwater supplies.

With assistance from University of Delaware interns, the WRA prepared a series of GIS maps summarizing data on wellhead areas, groundwater recharge

areas, tax parcels, highways, zoning, existing land use, groundwater elevations, and geology (see map - page 9). The WRA contracted with the Delaware Geological Survey to assemble aquifer and water chemistry data into a computerized format. The interns also collected potential groundwater pollutant data such as Superfund sites, underground storage tanks, industrial/manufacturing sites, and hazardous spill areas.

The GIS mapping, aquifer data, and pollutant source information was forwarded to the EPA and VIGYAN for further groundwater modeling. A second phase of the project is possible during 1994. ■



FINANCIAL SUMMARY

FISCAL YEAR 1994

Operating Budget Overview

Estimated Expenditures

Personnel	328,227
Fringe Benefits	99,026
Travel / Civic	6,500
Communication / Utilities	4,500
Materials / Supplies	5,000
Contractual Services *	60,000
Equipment	1,000
Total	504,253

***Contractual Services**

Data Management	31,200
Automobiles	9,000
Stream Gage	3,800
Printing	15,000
Conservation Program	1,000
Total	60,000

Revenues

Source

New Castle County	323,253
City of Wilmington	33,000
City of Newark	33,000
State of Delaware	80,000
New Castle Board of Water & Light	5,000
Carry-Over	10,000
Income	20,000
Grant	0
Contribution	0
Total	504,253



FINANCIAL SUMMARY

FISCAL YEAR 1988 - 1999

Capital Budget Overview

Capital Projects	Authorized FY' 88 - FY' 93	Approved FY' 94	Proposed FY' 95 - 99
Glasgow Recharge Project	50 [50]	0	0
Cockeysville Formation Analysis	130 [33]	0	0
Christina Basin Network	0	0	310
Churchmans EIS Phase II*	200 [600]	200	400
Churchmans Reservoir Land	0	0	1920
Thompsons Station Reservoir Land	0	0	6775
Pipeline Crossing C&D Canal	57	530	0
AERI Systems Enhancement	130 [25]	0	90
WRPA Phase III	0	0	175
Groundwater Monitoring/Preserves	100	100**	2140
Multi-Media Education Center	0	0	50
Water Resources Education Center	0	0	120
TOTAL	667 [708]	830	11980

(Funding in Thousands)

Notes: [] Denotes funding from non- New Castle County Sources

* Previous EIS Phase I Funding was \$600,000

** Approved in New Castle County Public Works Budget





AGENCY STAFF

Bernard L. Dworsky
Administrator

Gerald J. Kauffman, P.E.
Water Resources Engineer

Thomas E. Russell
Senior Planner

Martin W. Wollaston
Water Resources Planner

Donald C. Evans
Data Systems Manager

Nicole M. Minni
Computer Graphic Artist

Ruth C. Fallis
Administrative Assistant

Christy L. Green
Executive Secretary

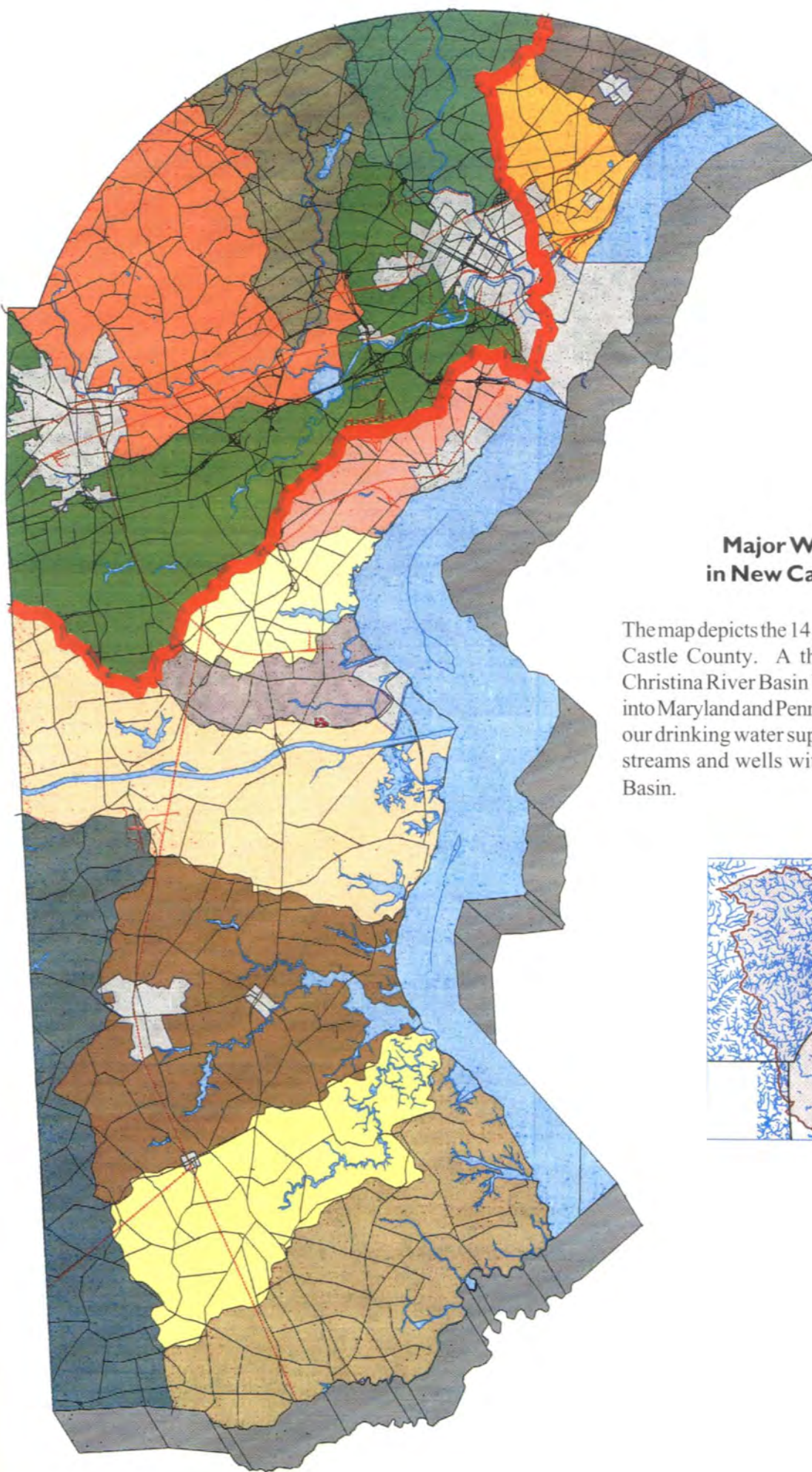
David Mannering
Ty Fitzpatrick

Anne S. Welsh
Secretary / Part-time

Gail Slevin
Students / Part-time

Information for this report was developed by the staff of the Water Resources Agency for New Castle County. The report was written and edited by Martin W. Wollaston; the layout and design was prepared by Nicole M. Minni. For more information contact the Water Resources Agency: 2701 Capitol Trail, Newark, DE 19711 (302) 731-7670.





Major Watersheds in New Castle County

The map depicts the 14 major watersheds in New Castle County. A thick red line marks the Christina River Basin boundary which extends into Maryland and Pennsylvania. The majority of our drinking water supplies is withdrawn from streams and wells within the Christina River Basin.



