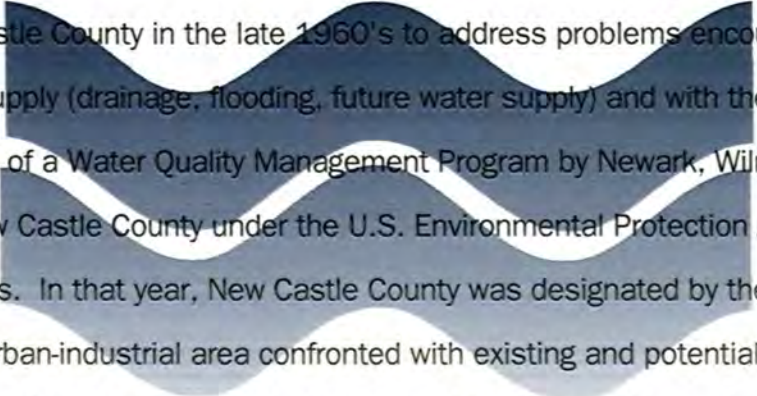




**1995 ANNUAL REPORT**  
 **Water Resources Agency  
for New Castle County**



The 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.

*"It is not only what we do, but also what we do not do,  
for which we are accountable."*

*-----Moliere*

**About The Cover:**

Anyone living in New Castle County during 1995 knows the major water story was the drought. Streams depicted are the Brandywine Creek at Wilmington, and the Red Clay Creek and White Clay Creek at Stanton and Newark.



## A Message from the Administrator... *THE CHURCHMANS REDEMPTION*

7 Writing a message capsuling the activity of the Water Resources Agency during 1995 should be easy and pleasant. More and better products and services were delivered by Agency staff. As you will note in reading the following pages, the work is of an increasingly diverse nature and is generally directed at improving our water resource condition. Lots of work, some bad, most good, improvement and progress made. The reality, however, is that the world of water in New Castle County in 1995 was dominated by one word - drought. That fact makes a message for the year difficult. The sense of success and achievement of the year is tempered by a sense of failure.

You will read in this ANNUAL REPORT of good work in developing a Groundwater Monitoring Network in the rapidly changing Southern New Castle County, of collaborative efforts with our Pennsylvania neighbors to address nonpoint sources of pollution, and of a tri-state attempt to ameliorate flooding problems in the Upper Christina River watershed. These and other efforts cited in the ANNUAL REPORT have made for a full year of demonstrable achievements. Nonetheless the most significant activity and the real message for 1995 remains the drought experienced during the year.

The feature article "Anatomy of a Drought" provides details of the drought experience that I would just as soon forget. My reflections are different. As is the case with many adverse or hardship situations, some "good" things do happen and that was true with the drought. The interconnected public water supply network developed as a deliberate policy in the WATER 2000 PLAN served us well, providing the basis for the transfer and sharing of available water. The Drought Management Plans and Agreements developed over the years allowed for a comity of governmental agencies, water utilities, and businesses to coordinate measures needed to maintain public drinking water supply. And, most importantly, the public and the general business community responded admirably in reducing water demands. Lastly, there also may be a potential "good" in the reinvigorating of the process to finally address the public water supply situation. These real and potential "goods" duly noted should not mask our failures.

The meaning of the drought is that New Castle County has had its warning. We need an additional, permanent, reliable source of water. A fact that we have known for some time now. Yet, as of 1995, after nearly a decade of effort, we have failed to do what is necessary to make that additional source of water available in the foreseeable future. You will read in the ANNUAL REPORT of progress on the Churchmans Reservoir Environmental Impact Statement Project (EIS). While the prospects for progress in the EIS project have improved, and the EIS still represents our single best hope of obtaining additional water supply, the pace of progress to date is embarrassing and for me a sense of personal failure. We still have not, as a community, established the development of a water supply project as a goal, with a priority emphasis in public policy or provided the focus, dedication, and discipline necessary in the EIS effort to achieve it. We long ago did the planning and have had the plan to do so. But, we have failed to carry out the plan. The memory and the meaning of the drought persists. We will see how long.

**B.L.D.**



## Policy Board

### Alternates

#### State

Gerard Esposito

#### New Castle County

Robert Maxwell

#### Newark

Carl Luft

#### Wilmington

James Holloway, Jr.

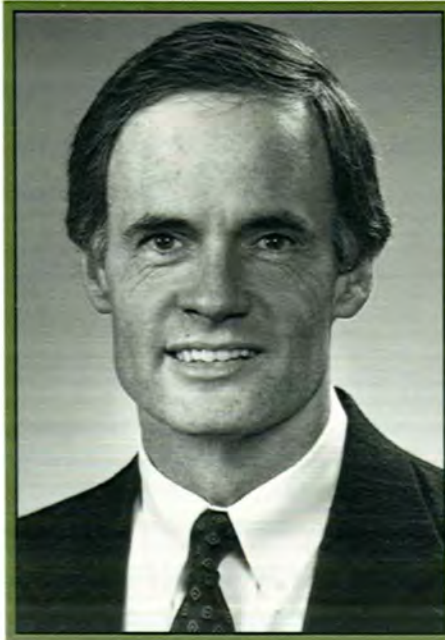
### Non-Voting Members

#### Artesian Water Company

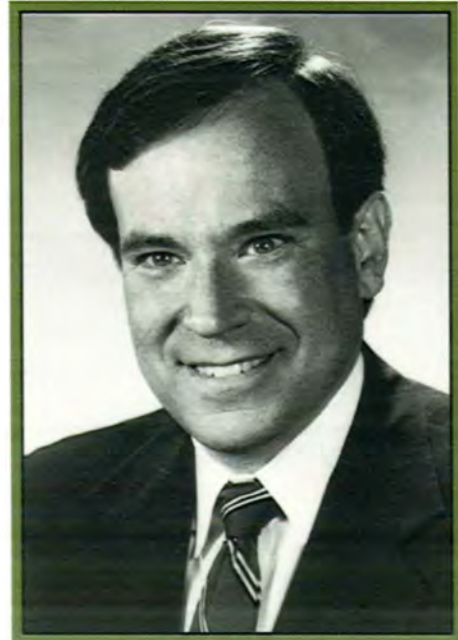
Dian Taylor

#### Water Resources Advisory Committee

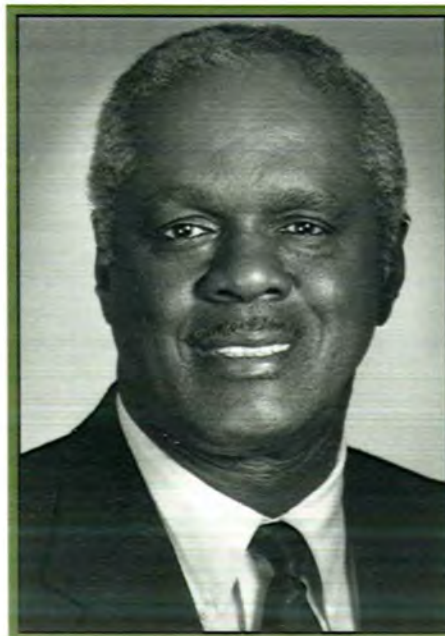
Dorothy Miller



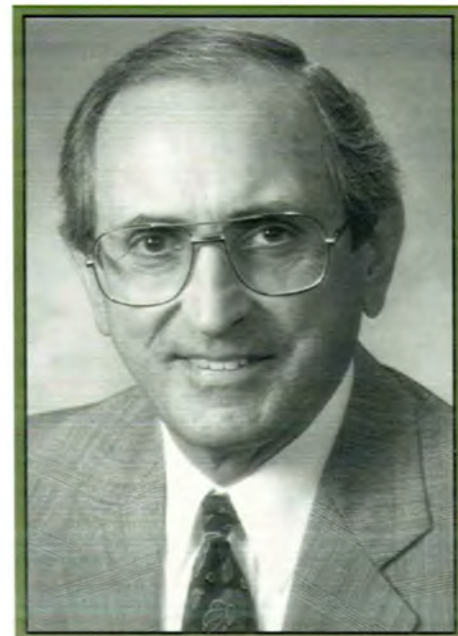
**State of Delaware**  
Governor Thomas Carper



**New Castle County**  
Executive Dennis Greenhouse



**City of Wilmington**  
Mayor James Sills, Jr.



**City of Newark**  
Mayor Ronald Gardner

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 the WRA's citizen advisory committee.



## Water Resources Advisory Committee



The Agency's **Water Resources Advisory Committee (WRAC)** is comprised of citizens which represent a variety of organizations that have an interest in water resources issues. Many of the eleven WRAC members have served on the Committee for more than a decade and several have been actively involved in water-related matters for over twenty years. The WRAC provides public input to the Agency, meeting four times a year in the evening. The 1995 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; and Christopher Wicks, Jr.

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*"The WRAC, composed of members with diverse interests, acts as a conduit to convey information on water planning issues to and from the community."*

*"We're the rabble-rousers who bring public participation into water planning issues."*

*--- Dorothy Miller, Chair*

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## Water Resources Technical Coordinating Committee

The WRA regularly convenes a **Technical Coordinating Committee (WRTCC)** to exchange information on programs and issues of mutual interest. The WRTCC consists of representatives of the water utilities and local, State, and regional organizations which are involved in water resources management. The following are represented on the WRTCC:

Artesian Water Company  
City of Newark  
City of Wilmington  
Delaware DNREC  
Delaware Division of Public Health  
Delaware Geological Survey  
Delaware River Basin Commission  
New Castle Board of Water and Light  
New Castle Conservation District  
New Castle County Planning Department  
Tidewater Utilities, Inc.  
Town of Middletown  
United Water Delaware  
Water Resources Advisory Committee.



# Anatomy of a DROUGHT

The drought of 1995 significantly restricted the availability of public water supplies in New Castle County. The year-long drought was caused by below normal precipitation through the winter and summer of 1995 resulting in declining stream flows, dwindling groundwater levels, and a diminished Hoopes Reservoir. The dry conditions decreased stream flows to shallow levels nearly resulting in water outages just after Labor Day of 1995. Through public water conservation efforts and cooperation among the public suppliers through the interconnected water supply network, a water shortage was averted. Fortunately, record rainfall during October alleviated the drought emergency and water conditions recovered in November.



The drought created hardships for the residents and businesses of New Castle County, yet it also highlighted opportunities for improvement of the regional water supply system. A water shortage was narrowly averted through commendable water conservation efforts and personal and economic sacrifice by the public. The drought also emphasized the need for an additional permanent and reliable source of additional water supply for New Castle County to prevent such adversity in the future. The experience identified actions to improve water supply management when an inevitable drought occurs in the future.

The drought required widespread water conservation efforts by the public. Residential water users

eliminated lawn watering and conserved household water use. Water-dependent businesses such as golf courses, nurseries, and car washes curtailed or ceased water use, which in turn affected the livelihood of business owners. Industries were requested to reduce water use for manufacturing processes by 25% causing impacts to business and commerce.

Public water supplies in Northern New Castle County are provided by five major public and investor-owned water utilities. The City of Newark, City of Wilmington, and New Castle Board of Water and Light operate public utilities which supply water in and around their respective municipalities. The Artesian Water Company and United Water Delaware are investor-owned utilities which supply water to the suburbanizing areas of New Castle County. During the drought of 1995, water production from the five water suppliers ranged from 60 to 70 million gallons per day (mgd) in September to near 90 mgd in July.

The utilities obtain water from surface, ground, and interconnected supplies. Surface supplies from the Brandywine Creek, Red Clay Creek, White Clay Creek, and from the Christina River provide over 70% of the water to New Castle County. Minimum flow requirements for habitat protection purposes limited the water supply during the drought along the White Clay Creek at Newark and Stanton. Groundwater provided additional water supplies from the Cockeysville, Columbia, and Potomac formation aquifers. Supplemental supplies were provided to Artesian and United Water Delaware via interconnections from the Chester Water Authority in Pennsylvania.

Additional capacities to store and transport water are furnished by both reservoir storage and interconnections. Hoopes Reservoir, a 2 billion gallon facility, is owned by the City of Wilmington and is the only reserve storage impoundment in New Castle County. Interconnections between the utilities provide the ability to transport water when and where it is necessary in the County. Presently, there are 23 interconnections with a capacity to transfer up to 8 mgd between the utilities.

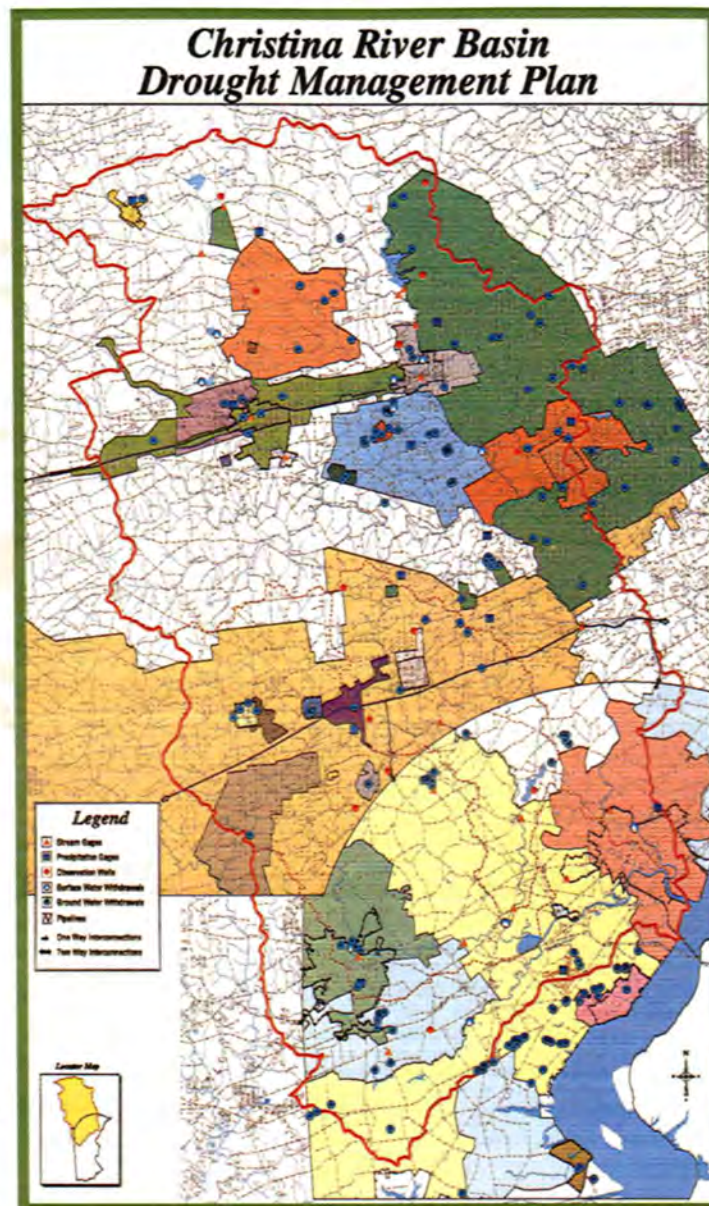


Judicious use of Hoopes Reservoir water and the interconnected system helped to alleviate the effects of the drought during the critical period in September.

The drought of 1995 actually started in the Autumn of 1994 and continued through a dry winter. The lack of winter rain and snow resulted in decreased groundwater recharge and depleted stream flows during the Spring snow melt period. The low water conditions continued through Memorial Day of 1995 when precipitation measured below normal for seven of the eight previous months and approached levels comparable to the drought of 1966.

During June and July, the dry conditions continued due to the extended period of low rainfall. The hottest day of the year occurred on July 15, 1995 when the public water suppliers recorded a peak water demand of near 90 mgd. Governor Carper, at the recommendation of his Drought Advisory Committee, issued a drought advisory on July 19 with voluntary water restrictions in effect for Northern New Castle County.

During August 1995, water conditions continued to decline. On August 22, the Governor's Drought Advisory Committee recommended the Governor declare a drought warning with mandatory water restrictions after a twenty-day public notice period. United Water Delaware declared mandatory water restrictions on August 27. On August 28, the City of Newark declared mandatory water restrictions due to declining stream flows and



the prospect of increased water demand during the new semester at the University of Delaware.

August concluded with worsening water conditions. The White Clay Creek and Brandywine Creek reached low flows likely to occur once every ten years (7Q10). Hoopes Reservoir was at 65% of capacity as the City of Wilmington continued to release water from the reservoir to supplement withdrawals at the United Water Delaware Stanton Filter Plant along the White Clay Creek. Groundwater levels in shallow wells monitored by the Delaware Geological Survey continued to decline due to lack of recharge.

September 1995 represented the nadir of the drought. On Labor Day, September 4, the City of Wilmington ordered mandatory water restrictions. On the same day, the Governor declared a drought emergency with intent to declare mandatory water restrictions in Northern New Castle County after a seven-day public notice. The Artesian Water Company declared mandatory water restrictions on September 5. The Delaware Geological Survey reported the Water Conditions Index for Northern New Castle County was in the "water shortage" range. Several suppliers reported that unless rainfall or additional reservoir flows were received, water shortfalls were possible.

The critical point of the drought occurred during the week of September 8. Some areas had not received rain for three to four weeks. The Brandywine Creek approached record low levels.



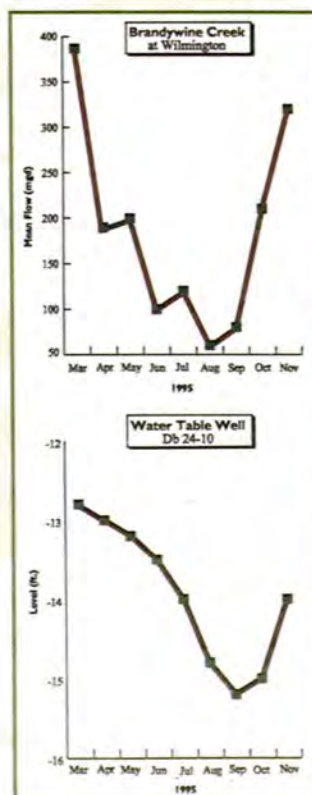
The White Clay Creek approached low levels not recorded since the drought years of the early 1960s. Several utilities reported difficulty capturing the low stream flows to meet water demands. Due to depleted streams flows, salt concentrations in the White Clay Creek rose above normal levels. Several utilities curtailed surface water withdrawals and made use of alternative well supplies.

The water problems continued through the middle of September. Hoopes Reservoir reached its lowest level during the drought at near half of capacity. Releases from Hoopes were ceased to conserve water in the reservoir. The Artesian Water Company reached agreement with United Water Delaware to provide additional water by reversing pumps at interconnections. Due to effects of the drought in Chester County, the Chester Water Authority required Artesian and United Water to reduce water delivery from the Pennsylvania inter-connected supply by 10%.

After September 18, the water problems eased gradually due to timely rainfall and coordinated drought management actions. The City of Wilmington started refilling Hoopes Reservoir and approved emergency releases to United Water Delaware. By the end of the month, the City of Wilmington had pumped enough water from the Brandywine Creek to fill Hoopes Reservoir to 75% of capacity. Industries utilized short term emergency surface and groundwater supplies to reduce reliance on public water. Stream flows increased above the 7Q10 for the first time in several months. Due to steady rainfall over the last two weeks of the month, September concluded as the first month with above normal rainfall since May.



October 1995 represented a period of drought recovery with a record monthly rainfall of over 8 inches needed to ease the drought. Stream flows increased to near normal levels. Observation wells reversed their decline and



**Declining precipitation, stream flow, and groundwater levels contributed to the water problems during 1995. The Delaware Geological Survey provided an important role tracking these water conditions during the most severe drought in many years.**

leveled off. The City of Wilmington pumped water from the Brandywine Creek to refill Hoopes Reservoir to near full capacity. Public water demand hovered between 60 to 62 mgd which was normal for the cooler weather conditions of October.

November of 1995 represented the end of the drought emergency. Due to improved precipitation, stream, groundwater, and reservoir levels, the Governor signed an executive order on November 6 suspending the drought emergency and rescinding mandatory restrictions. By Thanksgiving, the public and private water utilities had resumed normal operations. By the end of December, conditions continued to improve although groundwater levels still had not yet inclined to normal levels. Due to the continuing lower than normal groundwater levels, voluntary water restrictions and drought warning were still in effect at the end of 1995.

The severe effects of the drought required day-by-day communication and coordination by the water utilities; the public; State, County, and local government; and the news media. Drought coordination activities were administered by three teams which successfully worked with the public to alleviate the water problems. The responsibilities of these committees included monitoring of water conditions and demand, coordination of water supplies between the utilities, and declaration of drought warnings and





water restrictions. These actions were coordinated by the Christina Basin Drought Management Committee, the Governor's Drought Advisory Committee, and the Water Resources Technical Coordinating Committee. Agencies represented on these committees include:

- Delaware Governor's Office
- Delaware DNREC-Division of Water Resources
- Delaware Geological Survey
- Delaware River Basin Commission
- Delaware Division of Public Health
- Delaware Emergency Management Agency
- New Castle Conservation District
- New Castle County Department of Planning
- Water Resources Agency for New Castle County

Municipal Public Water Suppliers

- City of Newark
- City of Wilmington
- City of New Castle Board of Water & Light

Investor-owned Water Suppliers

- Artesian Water Company
- Tidewater Utilities, Inc.
- United Water Delaware

The drought of 1995, while it caused many water supply problems, provided valuable lessons and actions that can enhance our abilities to cope with future droughts. The agencies and utilities have considered the after-effects of the drought

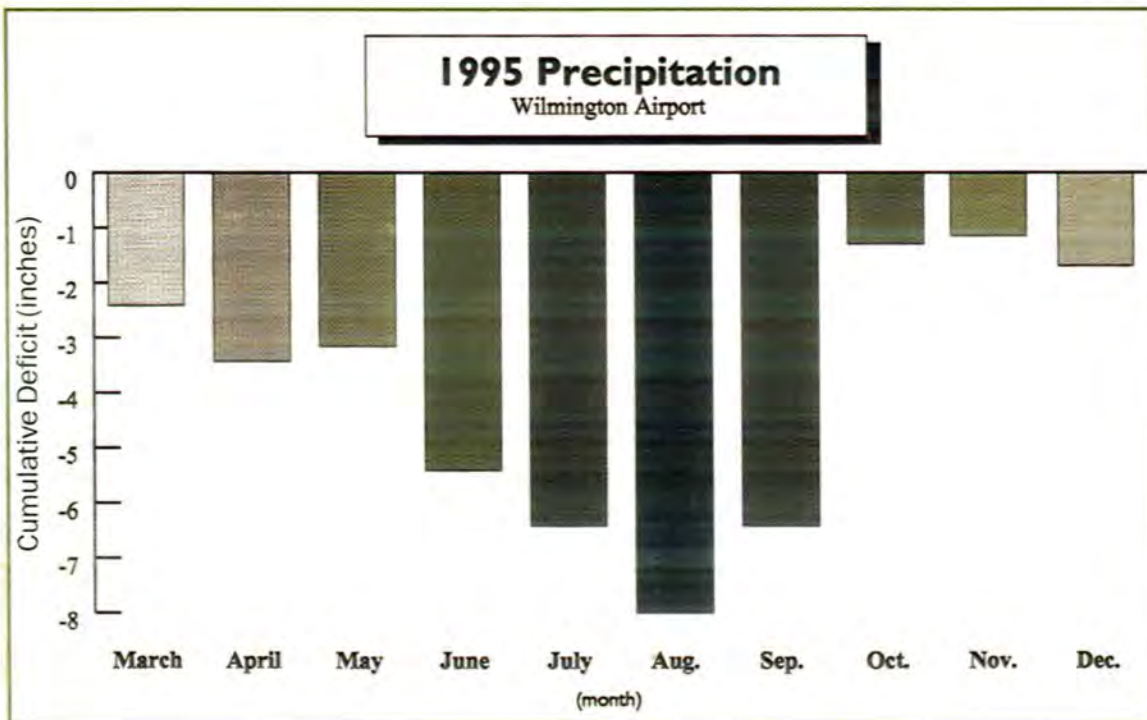
and have recommended several actions.

The drought emphasized the need for an additional permanent, reliable source of public water supply for Northern New Castle County. Presently, the water supplies in the White Clay Creek watershed are vulnerable to drought and have been deemed as "unreliable." The Churchmans EIS remains the best process to select the most feasible and reliable source of future water supply to meet long-term water needs in New Castle County.

Day-to-day management of the water problems will be optimized by updating the Statewide Drought Emergency Management Plan. The existing plan, which worked well to prevent water outages during the drought, will be modified to include contingency plans for emergency water supplies, operating guidelines for the reservoir and interconnections, and a chain of command for drought coordination during an emergency.

Several policies for entering and declaring a drought emergency will also be reconsidered to provide earlier warning to the public. Some of these actions include shortening the public notice period to seven days, providing a three-phase drought declaration system of advisory, warning, and emergency, and including drought indicators such as groundwater levels and reservoir storage. These modifications should provide greater responsiveness to cope with future droughts in New Castle County.

---Gerald Kauffman



## Churchmans EIS Will Provide Solution to Droughts

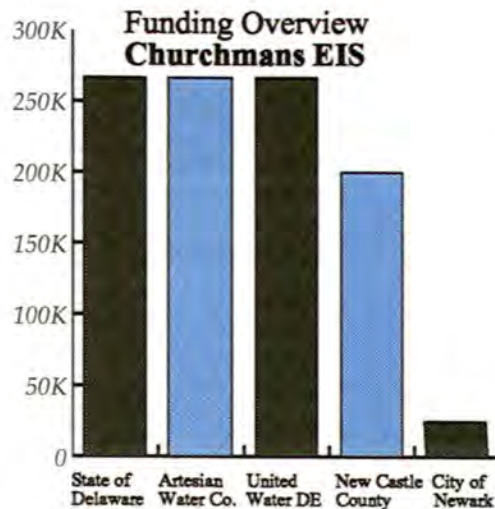
Since the mid-1980's, the WRA has sought to provide a solution to forecasts of potential public water supply shortages in northern New Castle County (NCC). These potential shortages result from the steady growth in daily water demands and our strong reliance on the day-to-day flow within our streams for meeting our freshwater needs. Since streamflow is dependent upon precipitation and groundwater discharges, a decrease in precipitation as experienced during 1995 decreases the quantity of public water supply available for northern NCC.

The WRA concluded the development and adoption of a water supply plan for NCC in 1986. Called the WATER 2000 PLAN, it provided the framework for water management activities in NCC. A key component of the PLAN was the recommendation that the process be initiated to develop projects that provide for additional, reliable water supplies.

The preferred project recommended in the WATER 2000 PLAN was the building of a 2 billion gallon basin-like reservoir near I-95 and Route 7 in an area known as Churchmans Marsh. The State and the Delaware River Basin Commission adopted the WATER 2000 PLAN conditional upon the completion of an Environmental Impact Statement (EIS) for this Churchmans Reservoir project.

The EIS is a federal process mandated by Congress and directed by the U. S. Army Corps of Engineers. An EIS is required by the Corps if it concludes the proposed project would have significant environmental impacts. The EIS examines the need for and the alternatives to a project under the guidance of the Corps and its allied federal and State agencies. The WRA initiated the EIS process by filing for the necessary permit for this project from the Corps. The Corps responded that an EIS would be required for the permit.

In the following months, much effort was expended by the WRA organizing a management structure and the initial funding for what would be the most significant water supply project undertaken in New Castle County since the City of Wilmington built the Hoopes Reservoir in the early 1930's. The EIS Project Management Committee and the sources of funding for the Churchmans EIS as of the end of 1995 are displayed.



After a lengthy selection process, the consulting firm Metcalf & Eddy, Inc. (M&E) was hired to conduct the initial two-task phase of the EIS. Its first task was to document the water supply needs in NCC for the next 50 years. This document was accepted by the EIS-PMC and forwarded to the Corps. The Corps accepted the work in October 1993.

It is important to note that the first task concluded that there is a need for additional water supply for the area of NCC located north of the Chesapeake & Delaware Canal. South of the Canal, M&E's work concluded that there will be sufficient groundwater supplies to meet the projected growth. Therefore, the EIS focused on alternatives that will provide additional supplies north of the Canal.

The second task involved the assessment of a variety of alternatives to meet the water supply needs projected in the first task. An initial assessment of nearly 70 alternatives was conducted by M&E. This work attempted to evaluate and rank the alternatives using a methodology called STEEPLI. However, the Corps' review of this work resulted in its direction for additional information on the alternatives. This alternatives assessment, a laborious process involving a detailed review of each alternative under the direction of the Corps, has been underway for several years.

As 1995 ended, there were 19 alternatives remaining on the listing of potential water supply sources. These 19 alternatives are:

- 8 reservoir sites,
- 3 interstate pipelines,
- 2 wastewater reuse projects,
- 2 demand management alternatives,
- desalination of brackish surface water,
- groundwater north/south of the Canal; and
- aquifer storage and recovery.



Additional information provided by the WRA and the State on some of these alternatives will hopefully provide sufficient evidence to the Corps for it to remove some of them from the list of alternatives that it will require detailed studies. In the Spring of 1996, a detailed screening of the remaining alternatives will provide the Corps another tool to refine the list of alternatives requiring detailed studies.

In the meantime, the Corps has recommended that the PMC develop the scope of work for the detailed studies that will be needed for the remaining alternatives. Federal and State agencies have been meeting for several months to work out the details of the multi-faceted studies that will be needed. These studies range from the on-site biological and ecological work to the cultural and economic impacts that would be realized from the development of each alternative.

If work continues to progress as planned, we should begin to gather site-specific information on the remaining alternatives in the Spring of 1996. This work will continue through 1996 with the goal of having the Draft Environmental Impact Statement report completed by the Spring of 1997. This would be a major step in reaching a conclusion on what will be the solution to New Castle County's future water supply needs.

As a final note, it is essential that the public continues to be involved with this EIS project

since it affects most people in New Castle County. Public workshops have been and will continue to be held to inform the public of our progress. The drought of 1995 has raised the visibility and the recognition of the need for this work. Your involvement will be essential for its success.

### PROJECT MANAGEMENT COMMITTEE

New Castle County, Chair  
 City of Wilmington  
 City of Newark  
 Artesian Water Company  
 United Water Delaware  
 State Department of Finance  
 Delaware Development Office  
 Water Resources Agency  
 State Department of Natural Resources  
 & Environmental Control

#### Non-Voting Members

State Budget Office  
 Office of U.S. Senator Biden  
 U.S. Army Corps of Engineers  
 U.S. Environmental Protection Agency  
 Delaware River Basin Commission  
 EIS Public Advisory Group

----Martin Wollaston



## Water Resources-Southern Style

The next time you travel south across the C&D Canal on the new St. Georges Bridge, look over to your right. What you'll see is the changing landscape of Southern New Castle County. Instead of soybeans and corn, farm fields now seem to be growing houses. Since 1970, the population in the County south of the Canal has more than doubled to about 20,000 people. Projections for the next 25 years are for continued growth to more than 32,000 people. This growth translates to increased demands on water resources and presents some very real and pressing challenges. For the continued economic and social well-being of Southern New Castle County, it is essential that there be an adequate supply of safe drinking water. Yet developing a comprehensive water resources strat-

egy that is compatible with growth is a complex task. During 1995, a great deal of work was accomplished addressing the issues of water resources planning in Southern New Castle County ... much work remains.

its drinking water. Today, residents enjoy a safe and reliable water supply. However, the total dependence on groundwater aquifers presents unique challenges for long-term water resource planning. Perhaps because groundwater is a resource that can't be seen, it can easily be subject to abuse. Premature depletion caused by overpumping and contamination due to seepage of pollutant-laden surface waters are but two problems that can plague groundwater.

In 1994, the Water Resources Agency commissioned the Delaware Geological Survey (DGS) to initiate a groundwater monitoring network for Southern New Castle County. The goal of this multi-phase program is to refine previous estimates of the quantity and quality of groundwater in the area. In addition, a permanent network of monitoring wells will be established throughout Southern New Castle County to track future trends.

The DGS completed Phase I: Water Quality

Evaluation in August 1995. The report evaluates existing water quality data and gives us good baseline information on the quality of the groundwater. Nitrate, a recognized health hazard in drinking water, was detected in the surface aquifer in monitoring wells less than 30 feet deep. In several areas, nitrate levels exceed

State of Delaware safe drinking water standards. The probable causes are infiltration of nitrogen fertilizers and seepage from septic systems. By continuing to allow the proliferation of individual septic systems on relatively small lots, groundwater quality will almost certainly deteriorate. Growth must be planned in coordination with the ability to provide safe and efficient wastewater management. In 1995, the WRA worked with the Departments of Planning and Public Works to update the existing 1975 Wastewater Management Plan for the County.

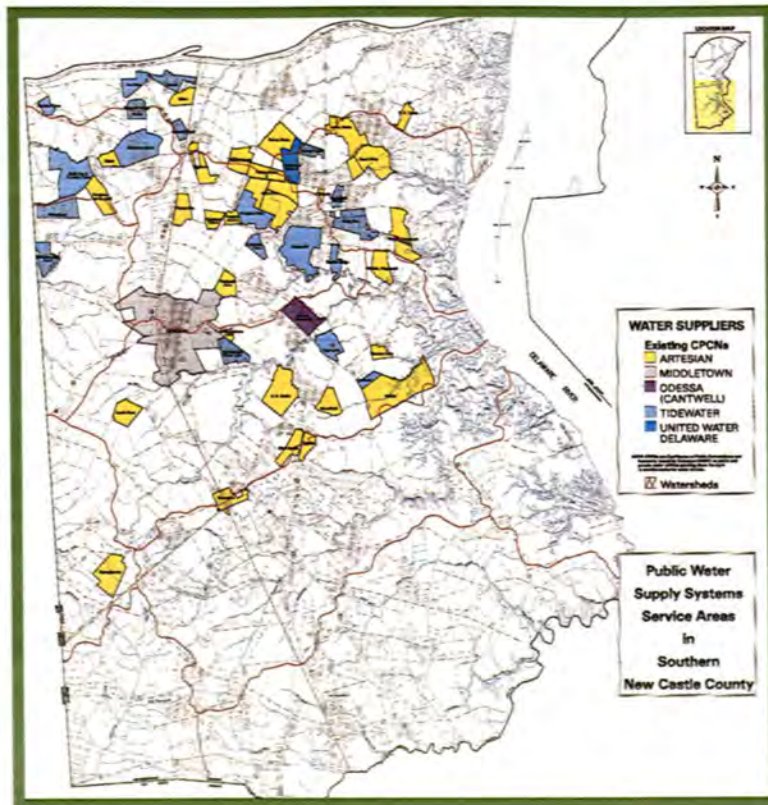
The use of alternative wastewater treatment techniques in growth areas makes good sense. Water Farm #1, the spray irrigation facility operated by New Castle County near Odessa, is providing data to support this type of wastewater treatment. Operational since June 1995, this alternative treatment facility treats 0.5 million gallons of wastewater a day from over 5,000 households and businesses in the Middletown-Odessa-Townsend area. The design treatment capacity for the facility is approximately 1.7 million gallons a day. Monitoring over the past nine months shows that there has been no degradation of groundwater from the spray. Spray irrigation, whether on a regional or community basis, is a viable and desirable alternative to the proliferation of on-lot septic systems.

Other results from the DGS investigation indicate that iron is present in deeper aquifers. In several instances, levels are above those set by the State of Delaware for safe drinking water. Iron is a



Southern New Castle County relies entirely on groundwater for





network should be operational in 1996. The net result will be a better understanding of the groundwater situation.

A comprehensive understanding of the status of the groundwater resources in Southern New Castle County is vital in planning the growth of our community. But so is the way we manage the distribution of water. When a subdivision is planned, the developer seeks an agreement with a water company for service. The water supplier then obtains a Certificate of Public Convenience and Necessity (CPCN) from DNREC. Currently, the process for the issuance of CPCNs is not resource-based; it is parcel-based. This current process means that two adjacent developments can have two different water companies. This can lead to a duplication of infrastructure and a lack of a well-developed, cohesive water distribution system. The bottom line may be higher costs for the

naturally-occurring substance often found in groundwater. However, we must be prepared to pre-treat drinking water where levels are excessively high. Radon and pesticides were also detected in portions of Southern New Castle County. Additional monitoring of these substances in the future monitoring network will refine our understanding of the severity and the geographic extent of these problems.

customer. The WRA advocates that regional CPCN territories be established based on watersheds, not on parcel boundaries.

The DGS recently completed Phase II: Groundwater Availability. The report updates a study done in 1983. Initial results reveal that there is less production-level groundwater available for public supplies than previously estimated. While the current estimates (20 million gallons a day) show no shortage of water into the 21st century, thoughtful planning and management of the resource is needed today. In 1995, the WRA continued to monitor groundwater quantity and quality where development has occurred in sensitive Recharge Water Resource Protection Areas.

The WATER 2000 PLAN for Southern New Castle County, which outlines water supplies and needs to the year 2020, will be updated during 1996. Water supply issues, both quantity and quality will be addressed. In addition, the Water Resources Agency will make recommendations for a comprehensive water management plan for the area. In 1995, we gained a much better understanding of our groundwater resources - now, we must put this knowledge to work for us.

----Deborah Mills

Phase III will permanently establish a groundwater monitoring network to track groundwater quantity and quality trends in the future. The WRA worked with DGS, the Department of Natural Resources and Environmental Control (DNREC), and the State Division of Public Health to choose locations for approximately 60 monitoring wells throughout the area. The final



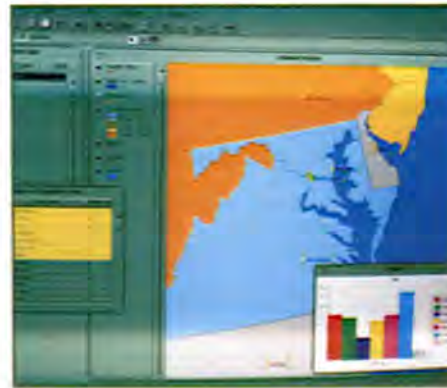
AERI, the WRA's geographic information system, celebrated its 20th birthday in 1995. In 1975, the 208 Areawide Waste Treatment Management Program (precursor to the WRA) purchased the AERI I system from Environmental Systems Research Institute (ESRI) of Redlands, California. ESRI installed the system on the University of Delaware's mainframe computer. The analyst created line printer maps by typing commands on punch cards and turning in stacks of cards to run overnight. Maps were not to scale and could only show gray tones.

Since then, geographic information system technology has kept pace with the growth of the computer industry itself. Today, the WRA creates maps using ESRI's interactive ArcInfo program. It resides on a SUN Microsystems SPARC 10 UNIX-based workstation. The analyst types ArcInfo commands at the workstation keyboard. The resulting lines, points, polygons, symbols, etc. appear instantaneously on the screen in the locations, colors, and scale of choice. Modifications are made at the workstation, and the map is sent to a plotter for final copy.

Of course, to take advantage of new technology, computer systems most often must be upgraded. The Agency increased its disk storage space on the workstation from 4 to 6 gigabytes (about two billion characters). Also, ArcInfo was upgraded from Version 6 to Version 7. While this upgrade adds new tools for spatial analysis and modeling, the most significant addition is that it allows open access to ArcInfo data. ArcInfo can now act as a server for PC clients which means that PCs with the proper software installed can access ArcInfo data over the network. While network access allows more people to run the ArcInfo from their PCs, additional functionality has been added by ESRI through a package called ArcView. Running under Microsoft Windows, this innovative software employs point-and-click technology to access ArcInfo and design maps on the PC. Geographic information system capability can be placed on the desks of planners, engineers, and others who use spatial data, but are not computer analysts. No knowledge of any of the innumerable ArcInfo commands is needed.

The WRA System Manager and Analyst installed and became familiar with the UNIX version of ArcView on the SUN workstation this past year. One's imagination, and data in an

acceptable format, are the only limiting factors in using this truly outstanding tool. ArcView will be made available to our engineer and planners this year. To accomplish this, we will upgrade two PCs and configure them with the requisite software, connect them to the network, and provide training. Additionally, we will purchase two new PCs so that ArcView is available to all technical staff.



This past year also brought requests for ArcInfo digital data from many private and public groups. Among these were the Brandywine Conservancy, Chester County, PA; City of Newark; State Department of Natural Resources and Environmental Control; State Mega GIS project; University of Delaware; U.S. Natural Resources Conservation Service; White Clay Watershed Association; TCI Cablevision; Tatman & Lee; ECCB Conservation Advisors; and WIK Associates. Mapping projects included a drought management plan for the Christina River Basin, proposed reservoir sites, the designation of White Clay Creek as a Wild and Scenic Area, piedmont stream habitat evaluation, drainage/flooding problems in the Shellpot Creek watershed, instream flow needs analysis, and land development activity in southern New Castle County.

In 1996, we will continue work on the White Clay, instream flow needs, reservoir projects, and Part 2 of the NPDES program begun in 1992. Among major new work efforts will be the preparation of a series of 11 maps covering Pennsylvania, Maryland, and Delaware to be used in developing a management plan for pollutant runoff in the Christina Basin. We will begin work on habitat evaluation in subbasins in southern New Castle County for the State Division of Fish and Wildlife. Additionally, we will provide data to the DNREC Division of Soil and Water Conservation for use in a regional demonstration project to evaluate the impacts of Best Management Practices for non-point source pollutants.

# Christina Clean Water Strategy

The drought of 1995 illustrated the need to maintain the quantity and quality of water in New Castle County. A plentiful source of clean water is critical to provide adequate water supply during normal and drought periods in the Christina River Basin. The four streams in the Basin – the Brandywine, Red Clay, and White Clay Creeks, and the Christina River – provide over 70% of the drinking water supply for the residents and businesses of New Castle County. To preserve the quality of our drinking water streams, the Water Resources Agency is participating in a five-year Christina Basin Water Quality Management Strategy with partners in Delaware and Pennsylvania.

The Christina Basin is the only watershed in Delaware where streams convey water from three states - Pennsylvania, Delaware, and Maryland. Much of the water used for drinking purposes in New Castle County originates upstream in Pennsylvania and Maryland. Water is used for different purposes in the individual states. Water quality and wastewater decisions in Pennsylvania can affect the downstream water-ways in Delaware which are utilized for water supply. Water quality issues are complex due to the many different forms of government in the tri-state Basin. Recognizing these differences, several Federal, State, and local agencies have prepared a unified water quality management strategy to protect the streams for water supply, habitat, and recreation purposes.

During the Summer of 1995, the U.S. Environmental Protection Agency and the Delaware DNREC awarded funds to the WRA for Phase I of the Christina Basin Water Quality Management Strategy. The purpose of Phase I is to identify the sources of pollutants in stormwater, estimate the amount of pollutants entering the streams, and prioritize watersheds for water quality cleanup programs. The WRA is serving as the local coordinator for the Delaware portion of the Christina Basin. Other agencies participating in the strategy include the Delaware DNREC, New Castle Conservation District, Pennsylvania DEP, Chester County Conservation District, Chester County Planning Commission, U.S. Environmental Protection Agency, U.S. Geological Survey, and the Delaware River Basin Commission.

The WRA started work on the Christina Basin project in October of 1995. Since that



time the WRA has conducted work on watershed inventory, water quality assessment, and prioritized watershed efforts.

The watershed inventory includes mapping to identify sources of pollutants in the Christina Basin. A base map of the Christina Basin has been completed that delineates the hydrogeological and political boundaries in the watershed. Over 40 subwatersheds have been delineated to serve as hydrogeological planning units. The boundaries of over 60 different forms of local township, village, and city government have been identified.

The WRA is preparing various watershed maps on the Agency's AERHI data management system including geology, soils, land use, zoning, wetlands, floodplains, and hazardous waste sites. Once this information is collected, it will be used to estimate the quantity of pollutants entering the streams and recommend actions to clean up stormwater. A report will be prepared summarizing the Phase I work serving as a water quality management plan for the Christina Basin.

Phase I of the Water Quality Management Strategy is expected to continue through 1996 with a public education program. Citizen involvement is needed to protect and improve the water quality of the streams in the Christina Basin that are important to the water supply needs of New Castle County.

---Gerald Kauffman



## *Drought Provides Data for Instream Flow Study*

The four major streams in northern New Castle County, the Brandywine Creek, Red Clay Creek, White Clay Creek, and Christina River, are the major source for public water supply in northern New Castle County. These streams also provide an aquatic habitat for various species of fish. Balancing these uses is necessary and is the subject of a multi-phase Instream Flow Needs Analysis initiated in 1994.

The State has provided funding for this analysis. The goal is to quantify how much streamflow can be withdrawn from each of these streams for water supply and still meet the needs of the aquatic environment.

Work in 1994 and 1995 was coordinated by a consultant to the DNREC, Mr. David Yaeck, who directed a multi-disciplinary Joint Task Force. The Phase 1 report, completed in 1995, focused mainly on the physical characteristics of the streams. Information collected included stream depth, width, and flow velocities. This information was used to develop computer models of the streams.

The Task Force also identified fish species requiring habitat protection in these streams. The State began this fish sampling work during the drought last summer. A team of State biologists collected real-world data on fisheries during low flow events in the streams. A report is being prepared to summarize the sampling.

Public meetings will be held to discuss the project. Completion of all work is scheduled for August 1996.

## *Upper Christina River Focuses Cooperation*

In 1993, the U.S. Natural Resources Conservation Service (NRCS) completed a study funded by the City of Newark that examined the frequent flooding episodes along the Upper Christina River. The NRCS recommendations included the formation of a tri-state committee to address these problems and several actions that could be undertaken by Newark.

Newark requested that the Water Resources Agency assist with coordinating the committee. This Interstate Committee for the Upper Christina Watershed (ICUCW) consists of representatives from the states through which the River flows: Pennsylvania, Maryland, and Delaware.

The goal of the ICUCW is the development of a Watershed Action Plan to address flooding and erosion. This interstate cooperation is important because the Christina originates in Pennsylvania and Maryland. The Plan includes improving ordinances on floodplains, stormwater management, erosion control, and open space preservation.

Newark has also acted on recommendations to resolve erosion and flooding. Newark Council approved a trial bioengineering project along the banks of the Christina. The project will use native vegetation to stabilize erosion prone areas. If successful, the project could be expanded. Newark is also clearing debris to maintain flow capacity under bridges. The WRA has assisted the City in updating stormwater regulations, floodplain mapping, and coordinating community groups.

## *White Clay Creek Wild & Scenic Study Progressing*

The White Clay Creek watershed has been the subject of a study by the National Park Service (NPS) to evaluate it for potential inclusion in the National Wild & Scenic Rivers System (NWSRS). Inclusion in the NWSRS would provide another mechanism to protect this watershed.

The Water Resources Agency has participated in the Study since it was approved by Congress in 1991. The WRA serves on the Study Task Force and chairs the Water Resources Subcommittee. As chair, the WRA has emphasized the critical value of the White Clay Creek for public water supply. Newark (3 MGD) and United Water Delaware (30 MGD) utilize the White Clay Creek.

In 1995, the WRA concluded the development of a series of maps of the NWSRS study area through a contract with the NPS. The maps detail features within the study area, including hydrology, zoning, land use, wetlands, floodplains, and parkland. These maps are being used to define the area to be designated and to develop the Watershed Management Plan for the designated area.

During 1995, progress was realized on the Watershed Management Plan. The WRA participates on a committee with other agencies and the public developing the Plan. This work is being done by a consultant to the NPS which intends to complete it in 1996. It will then be presented to local and State jurisdictions and the Federal government for approval and adoption.

--- Martin Wollaston





# FINANCIAL SUMMARY

FISCAL YEAR 1996

## *Operating Budget Overview*

### Estimated Expenditures

Personnel	\$383,713
Fringe Benefits	113,776
Travel / Civic	6,800
Communication / Utilities	4,750
Materials / Supplies	6,250
Contractual Services *	59,600
Equipment (AERI)	<u>1,000</u>
<b>Total</b>	<b>\$575,889</b>

### **\* Contractual Services**

Data Management	\$30,100
Automobiles	9,000
Stream Gage	4,500
Printing	<u>16,000</u>
<b>Total</b>	<b>\$59,600</b>

### Revenues

#### **Source:**

New Castle County	\$362,109
City of Wilmington	36,500
City of Newark	36,500
State of Delaware	85,000
New Castle Board of Water & Light	6,000
Carry-Over	15,000
Income	15,000
EIS Reimbursement	19,780
Grant	0
Contribution	<u>0</u>
<b>Total</b>	<b>\$575,889</b>



# FINANCIAL SUMMARY

FISCAL YEAR 1990 - 2001

## *Capital Budget Overview*

Capital Projects	Authorized FY'90 - FY'95	Approved FY'96	Proposed FY'97 - 2001
<b><u>Water Supply</u></b>			
Cockeysville Formation Analysis	130 [33]	0	0
Christina Basin Network	0	0	120
Churchmans EIS Phase II*	200 [600]	0	1400
Churchmans Reservoir Land	0	0	1920
Thompson Station Reservoir Land	0	0	6775
Pipeline Crossing C&D Canal	587	0	0
<b><u>Water Quality</u></b>			
Glasgow Recharge Project	50 [50]	0	0
AERI System Enhancement	130 [50]	0	90
WRPA Phase III	0	0	75
Groundwater Monitoring/Preserves	100**	100**	2140
Multi-Media Education Center	0	0	50
Water Resources Education Center	0	0	120
<b>TOTAL</b>	<b>\$1197 [733]</b>	<b>\$100</b>	<b>\$12690</b>

(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



## WRA STAFF

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*"Water, you have neither color nor odor,  
we swallow you without tasting you,  
you are not only necessary for life,  
you are life itself."*

*-----Socrates*

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



