

The Drought of 1999: The Efforts of the Governor's Water Supply Task Force in Delaware

November 8, 2000



Prepared by:

Delaware Geological Survey



University of Delaware, CHEP,
Institute for Public Administration,
Water Resources Agency



THE NATURE OF WATER

Differing opinions are naturally and historically inherent in water management, hence the words “river” and “rival”. Both words are derived from *rivalis (L.)* meaning “one taking from the same stream as another.”

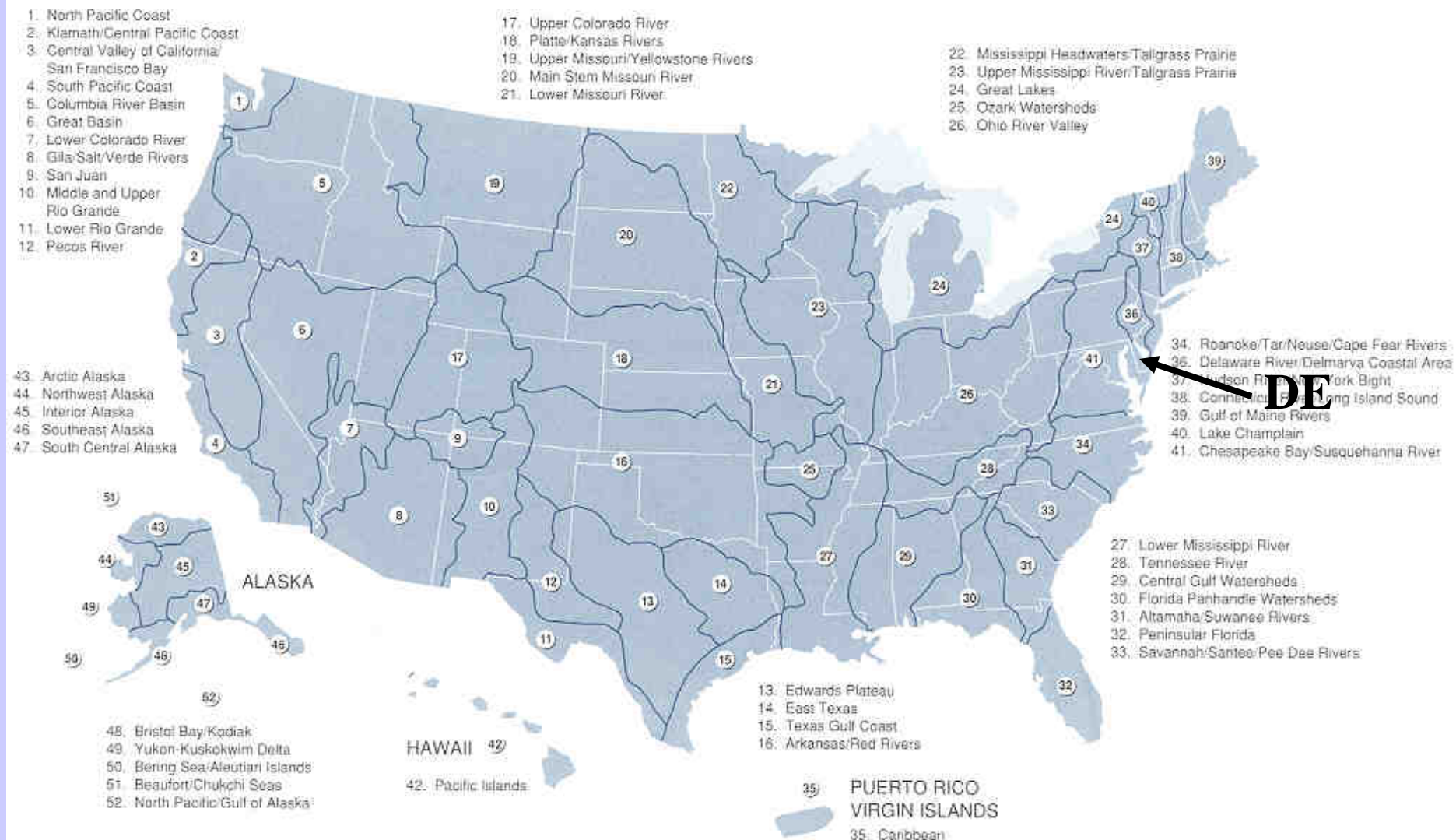
Our Water Supply Agenda:

1. DE Water Supply Framework

2. The Drought of 1999

3. Governor's Task Force Response



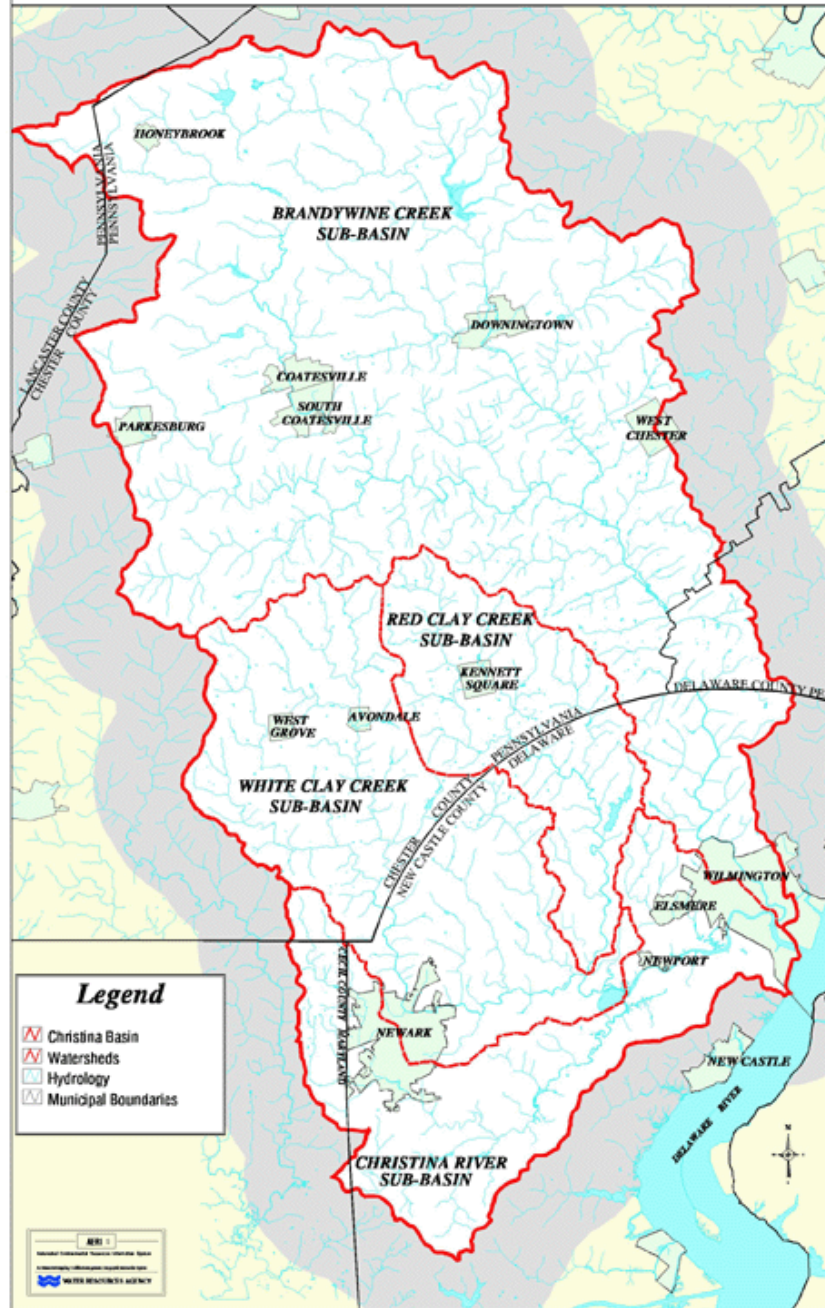


The United States (Watersheds) of America

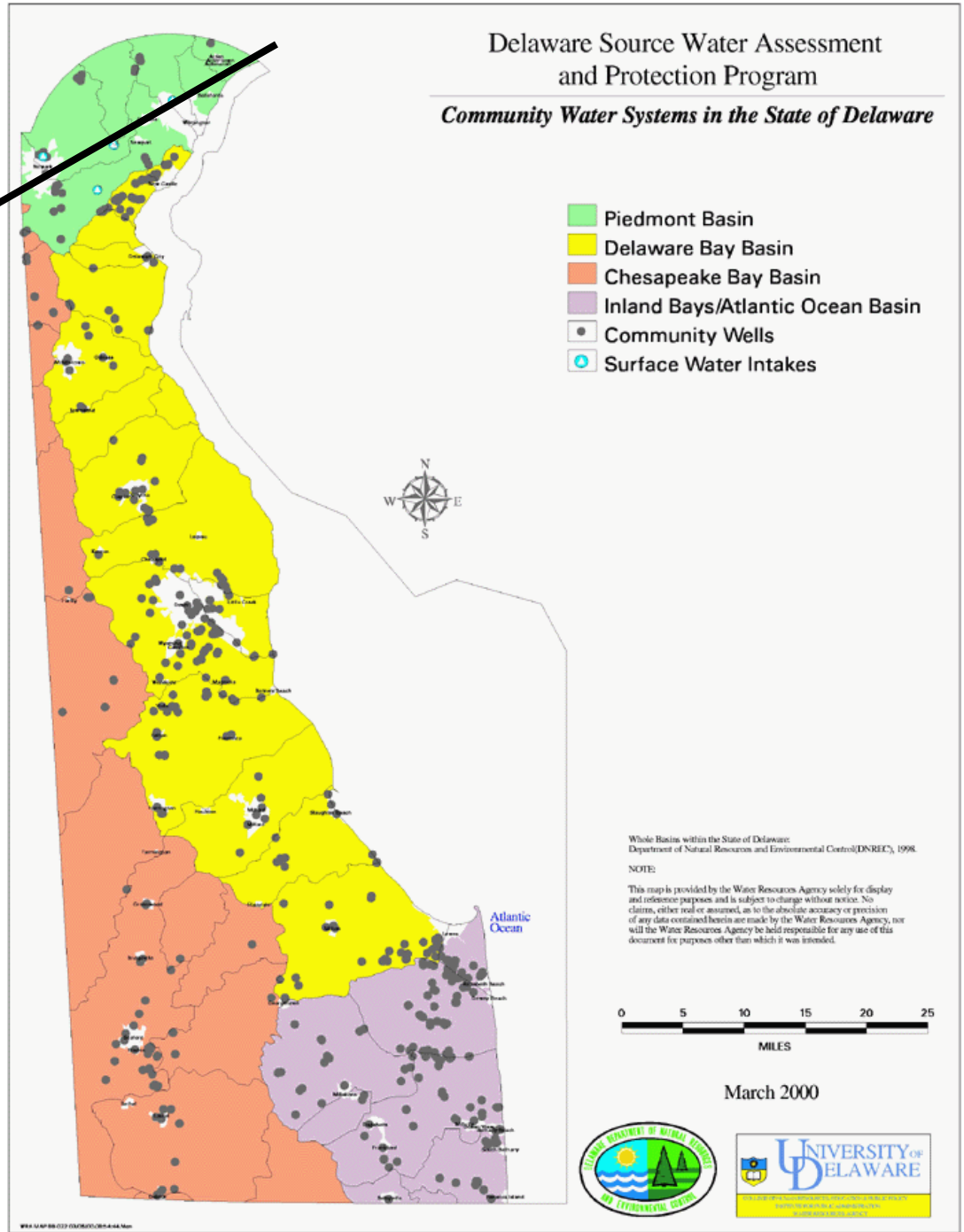
Delaware River Basin

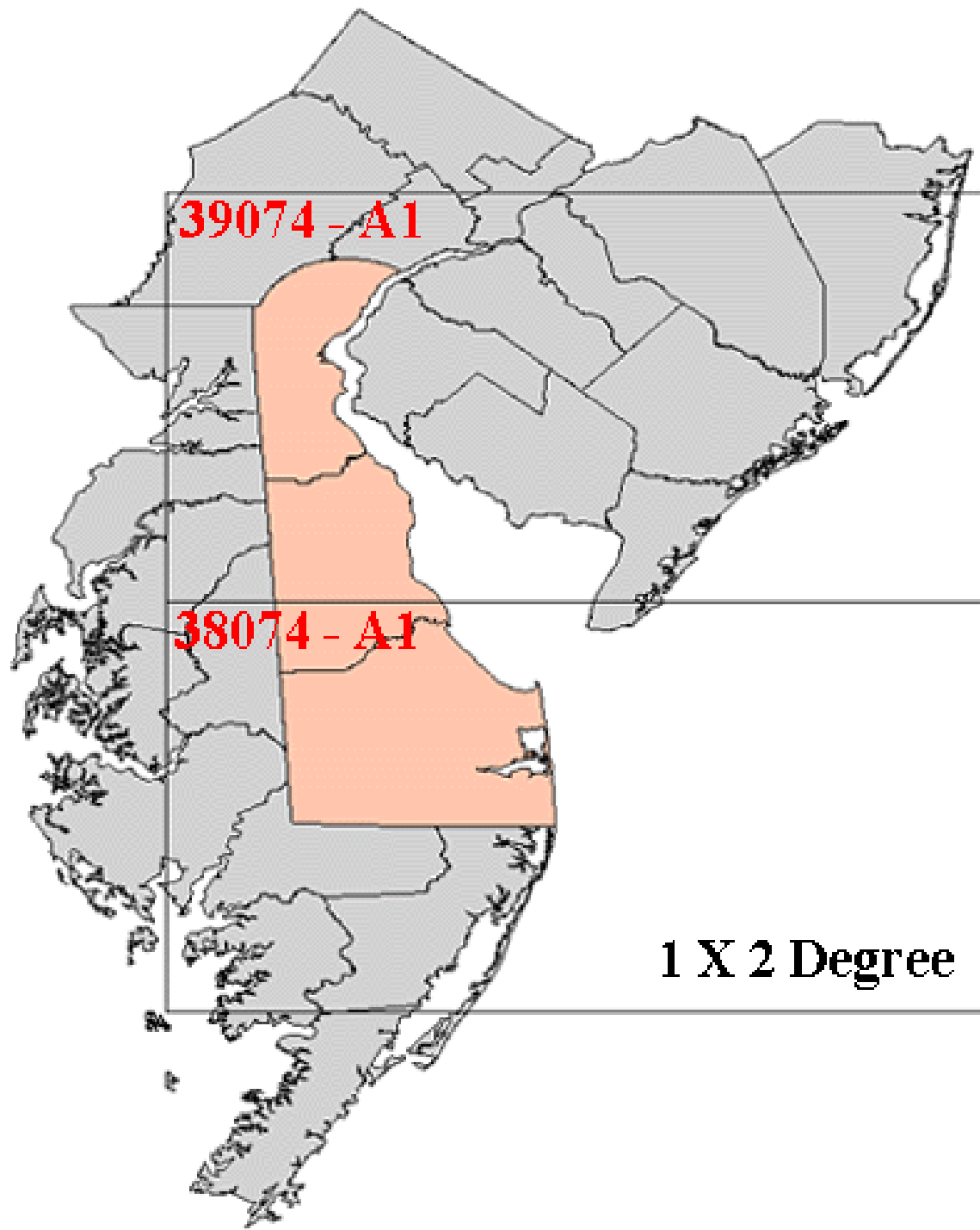


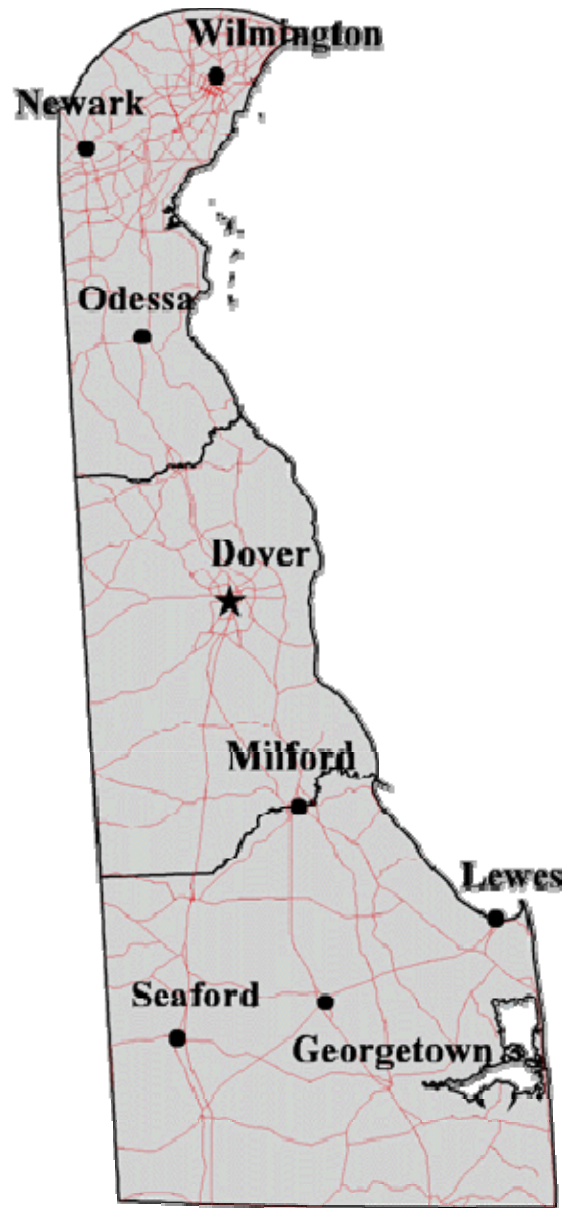
Christina Basin Water Quality Management Strategy *Base Map*



Fall Line







Delaware Source Water Assessment and Protection Program

Figure 3-1. Public Surface Water Supplies



New Castle County

Water Supplies

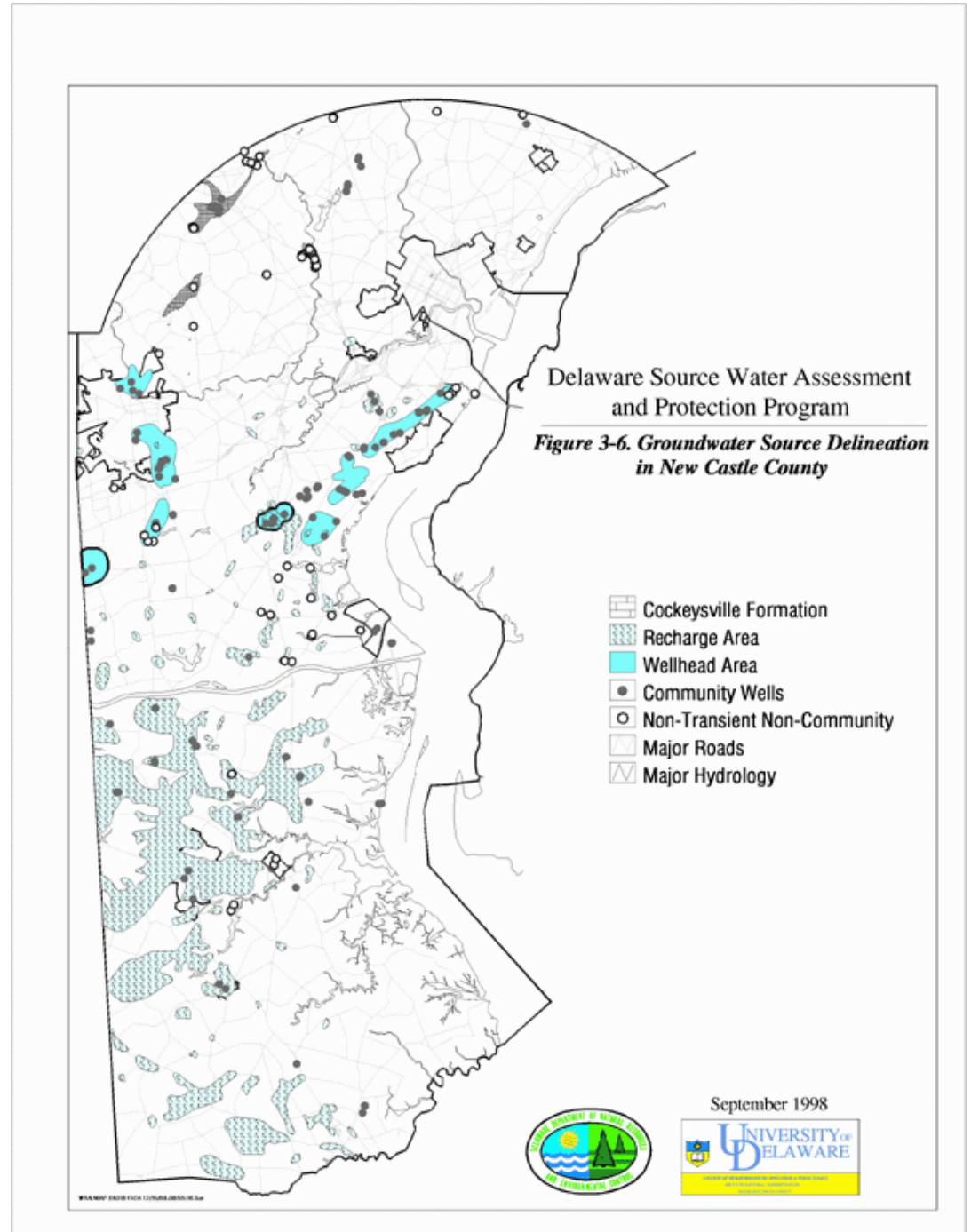
Streams - 75 %

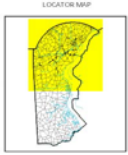
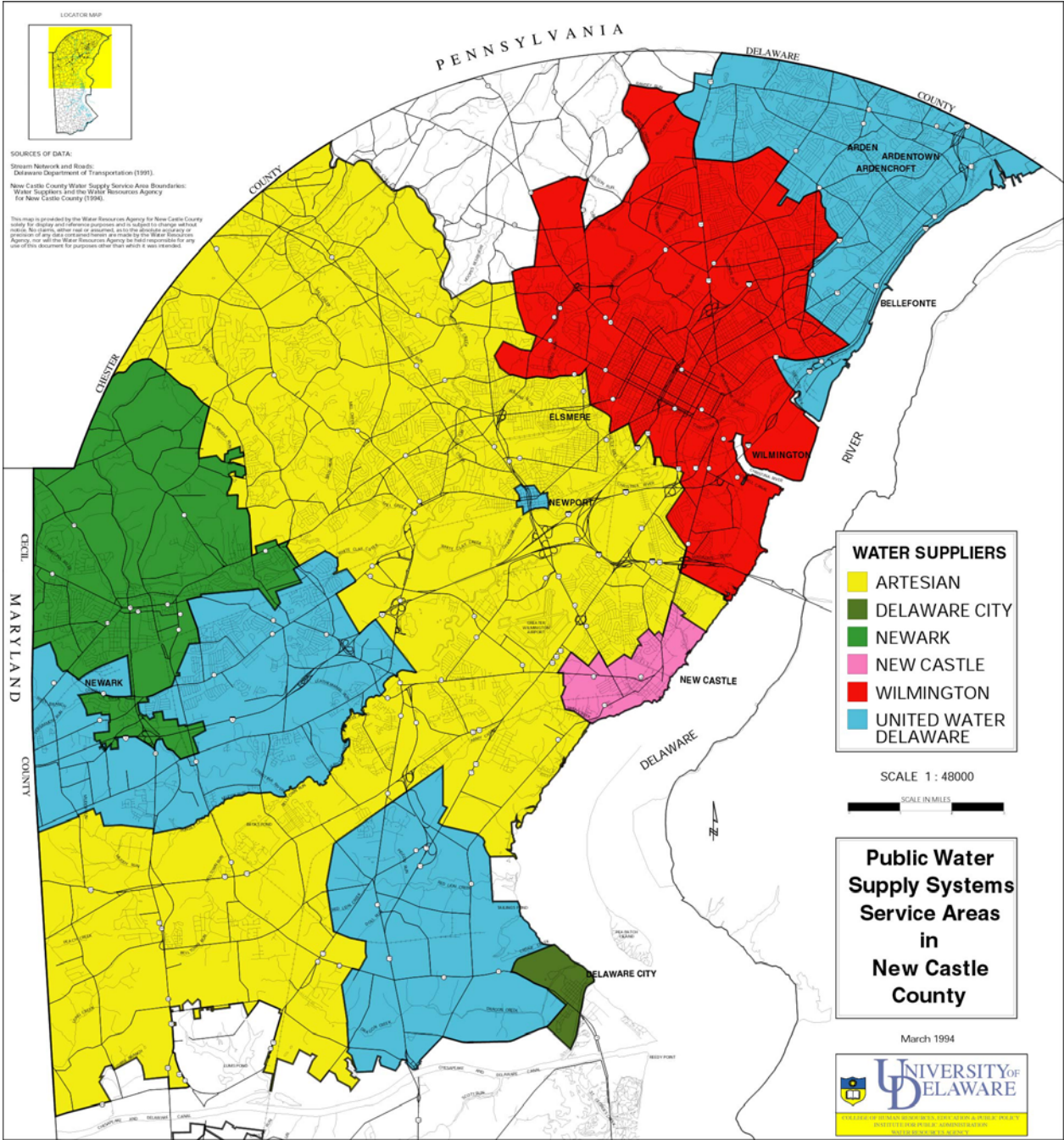
Wells - 25 %

Demands

Normal - 65 mgd

Peak - 90 mgd





SOURCES OF DATA:
 Stream Network and Roads:
 Delaware Department of Transportation (1991).
 New Castle County Water Supply Service Area Boundaries:
 Water Suppliers and the Water Resources Agency
 For New Castle County (1994).

This map is provided by the Water Resources Agency for New Castle County solely for display and reference purposes and is subject to change without notice. No claims, either real or personal, are made by the Water Resources Agency, nor will the Water Resources Agency be held responsible for any use of this document for purposes other than which it was intended.

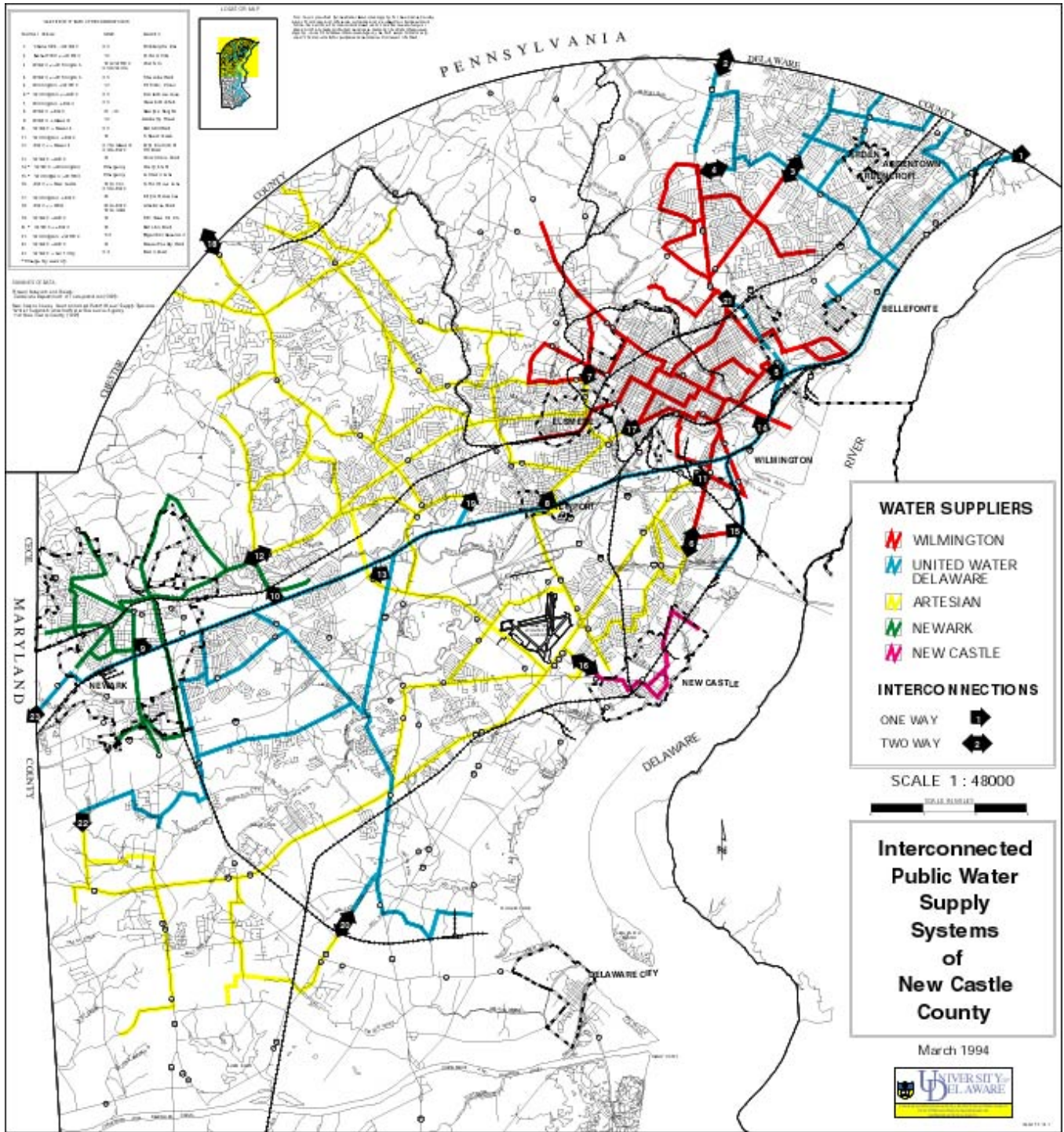


TABLE OF WATER SUPPLY SYSTEMS

WATER SUPPLY SYSTEM	AREA	WATER SUPPLY SYSTEM	AREA
1. Wilmington	Wilmington	11. Newark	Newark
2. United Water Delaware	Wilmington	12. Newark	Newark
3. Artesian	Wilmington	13. Newark	Newark
4. Newark	Newark	14. Newark	Newark
5. Newark	Newark	15. Newark	Newark
6. Newark	Newark	16. Newark	Newark
7. Newark	Newark	17. Newark	Newark
8. Newark	Newark	18. Newark	Newark
9. Newark	Newark	19. Newark	Newark
10. Newark	Newark	20. Newark	Newark



LEGEND

THE STATE OF DELAWARE HAS BEEN DIVIDED INTO 19 COUNTIES. THIS MAP SHOWS THE LOCATION OF NEW CASTLE COUNTY. THE COUNTY BOUNDARIES ARE SHOWN BY A DOTTED LINE. THE COUNTY NAME IS SHOWN IN CAPITAL LETTERS.

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WATER 2000

A WATER PLAN FOR NEW
CASTLE COUNTY, DELAWARE

VOLUME V

Water Supply Facility
Optimization
in Northern
New Castle County

*Submitted to:
Water Resources Agency for
New Castle County*

*Water Supply Plan for New
Castle County, Delaware*

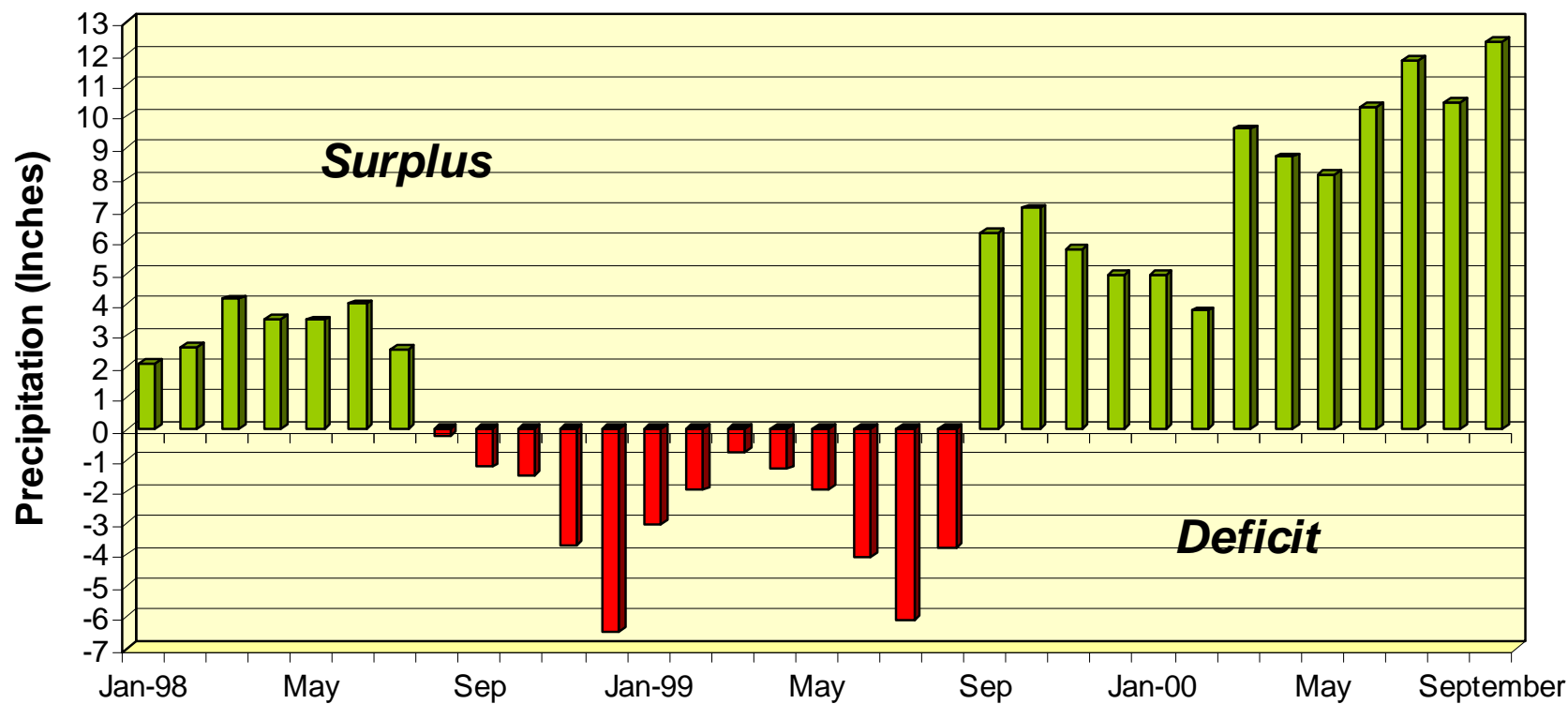
Final Technical Memorandum

*Task 1.2 - Environmental
Assessment for Thompson
Station*

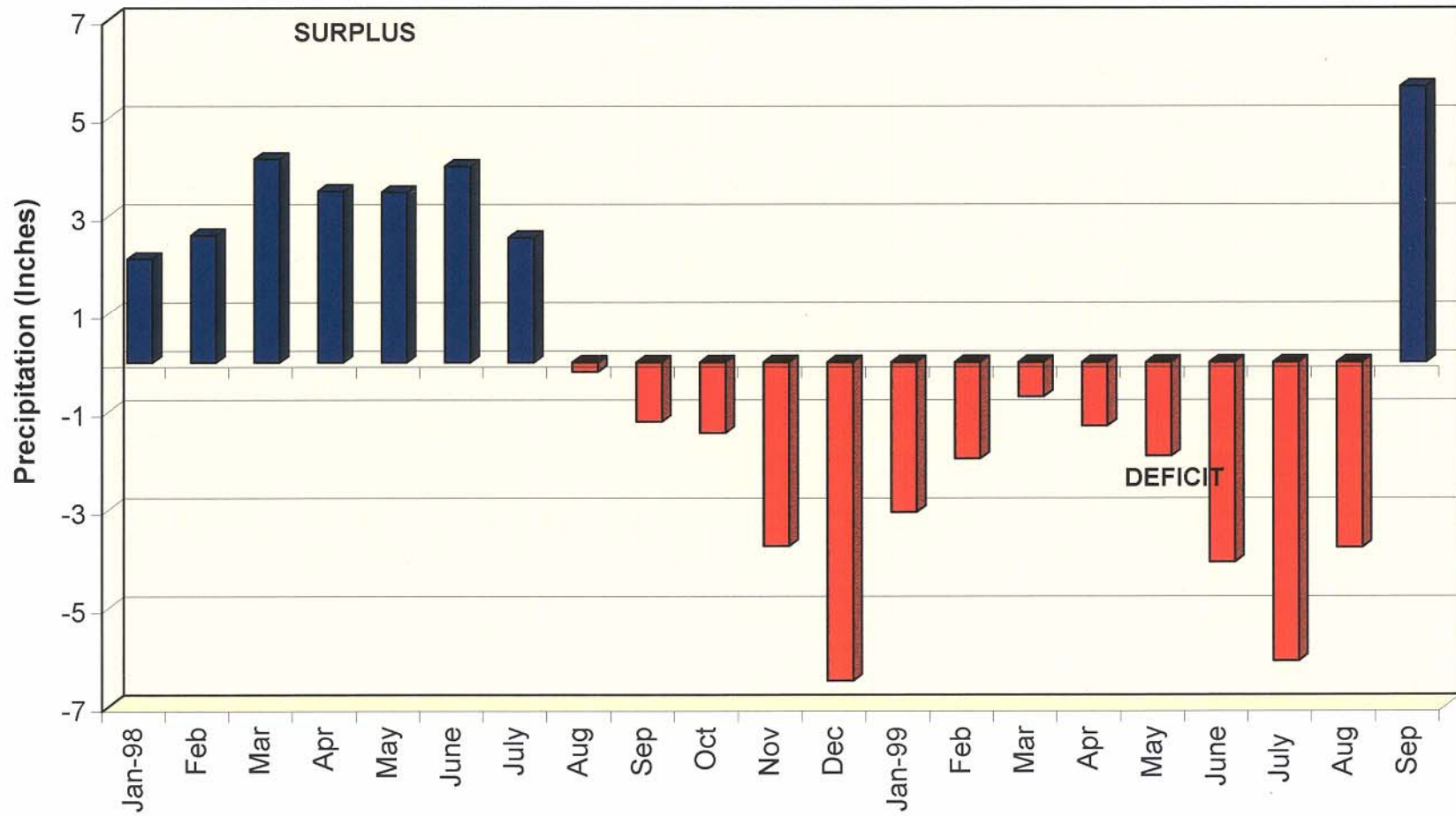
10 October 1996

M&E **Metcalf & Eddy**
An Air & Water Technologies Company

Cumulative Precipitation
January 1998 through September 30, 2000
Porter Reservoir - Wilmington, Delaware

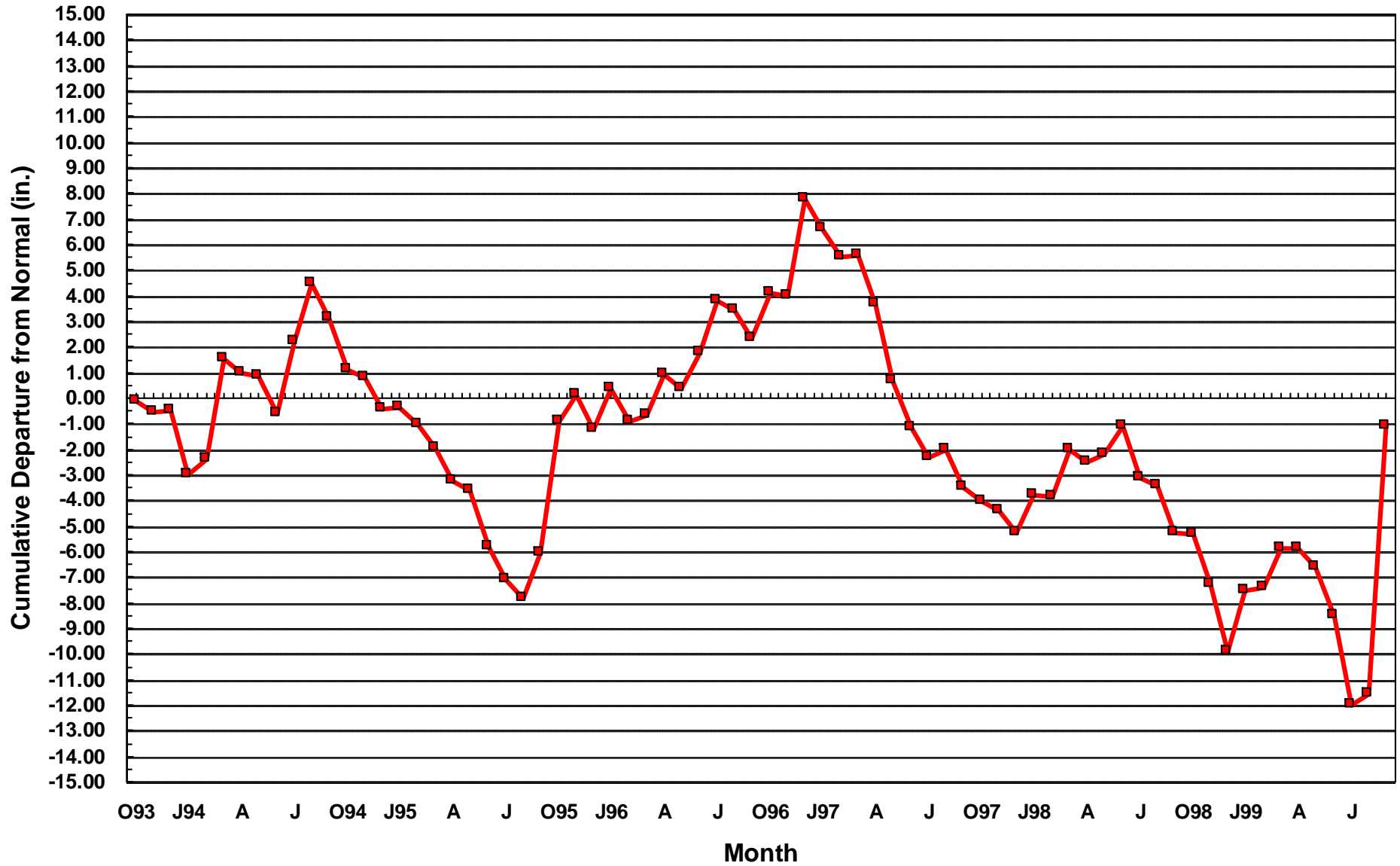


Cumulative Precipitation January 1998 through September 27, 1999 Porter Reservoir - Wilmington, Delaware

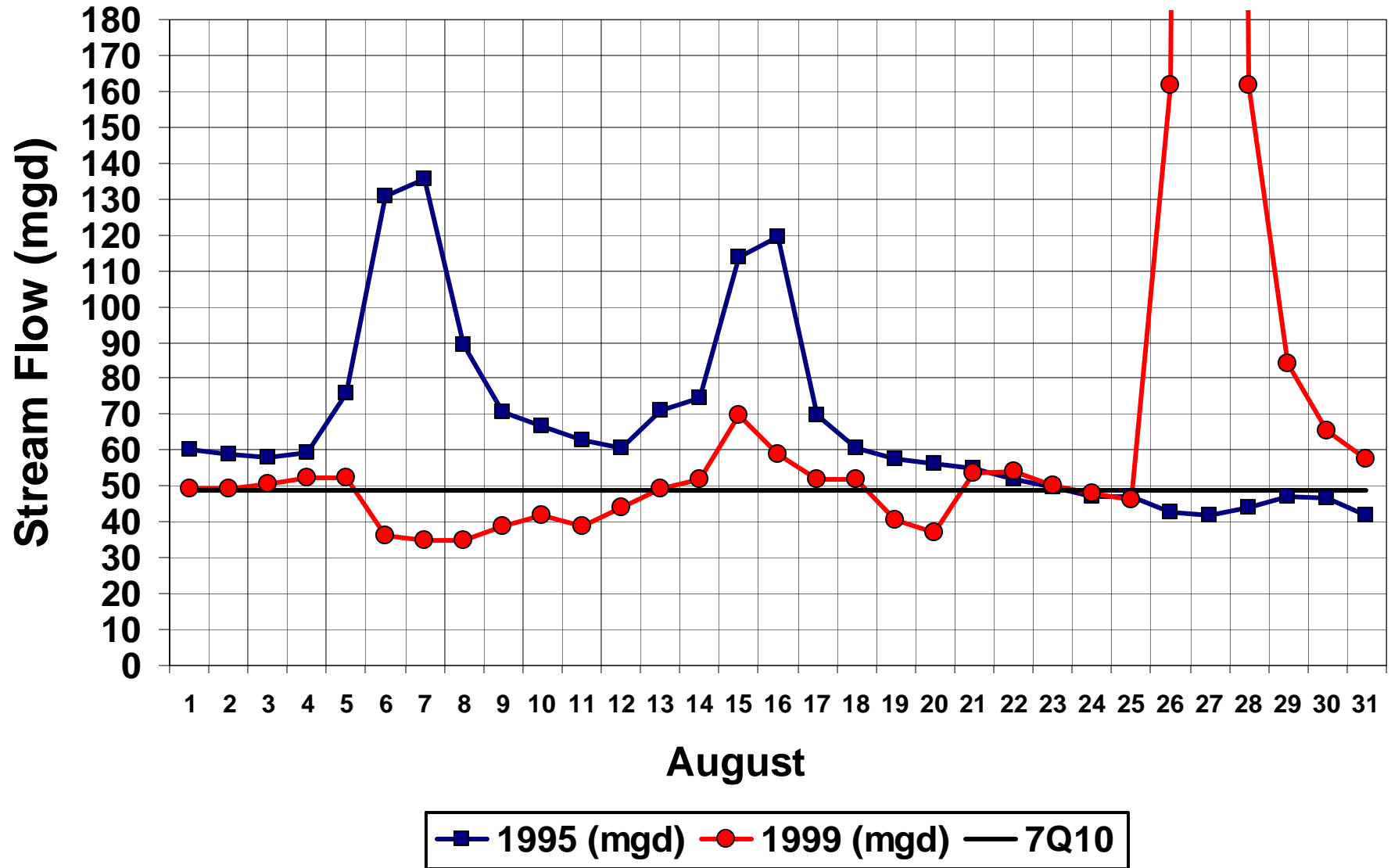


WATER YEARS 1994-99

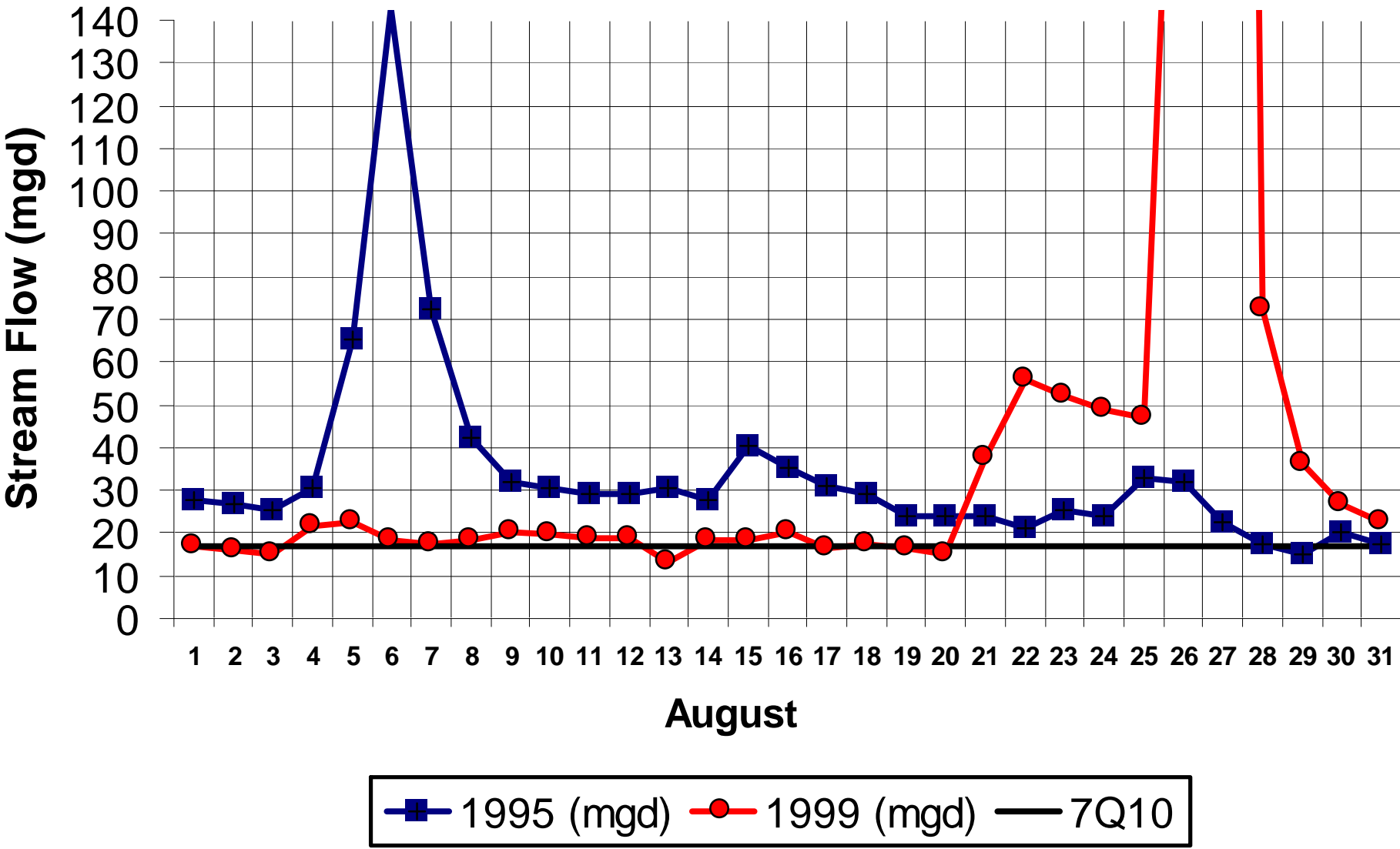
Precipitation at Wilmington Airport



Brandywine Creek at Wilmington

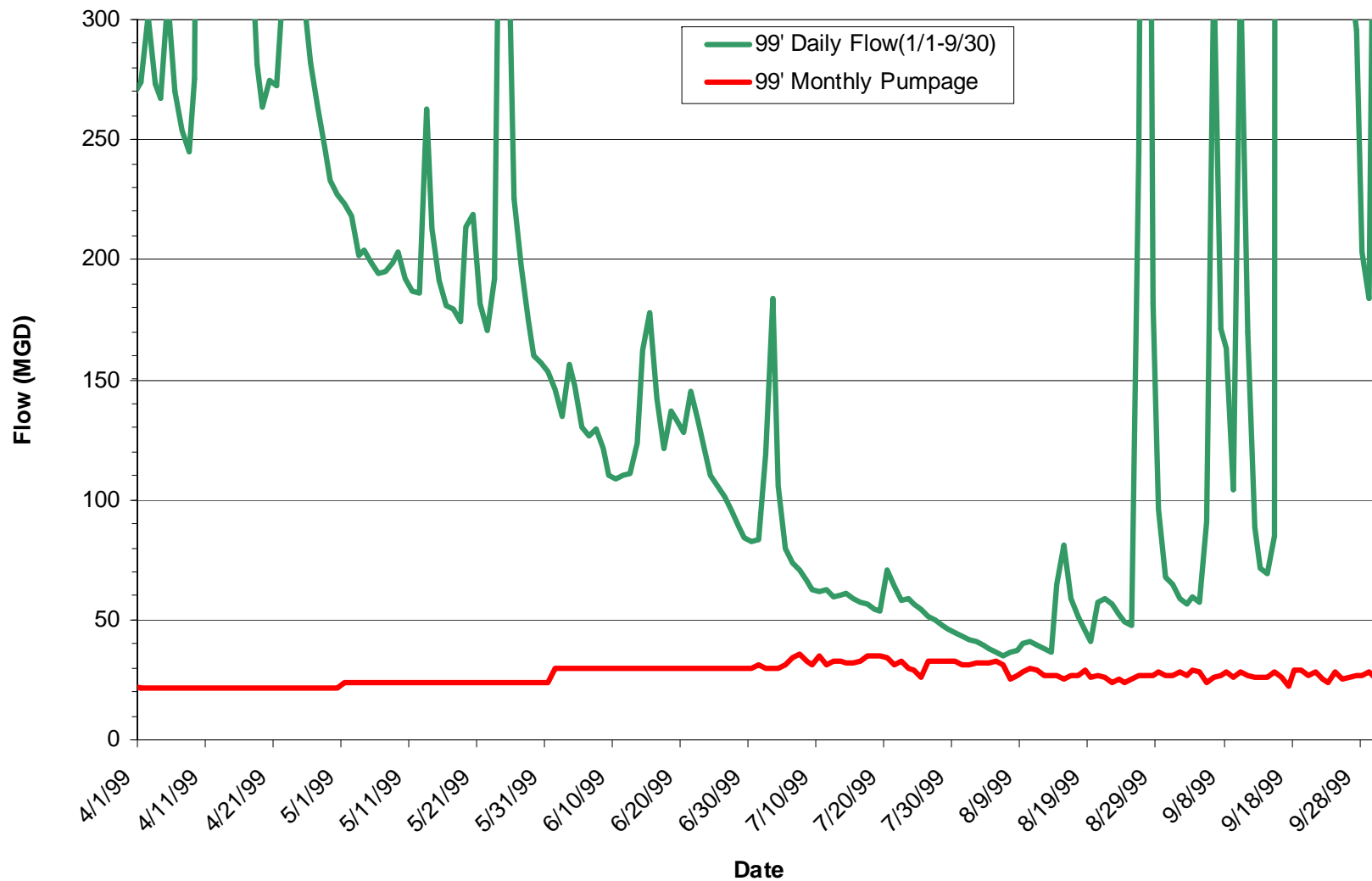


White Clay Creek at Stanton WTP



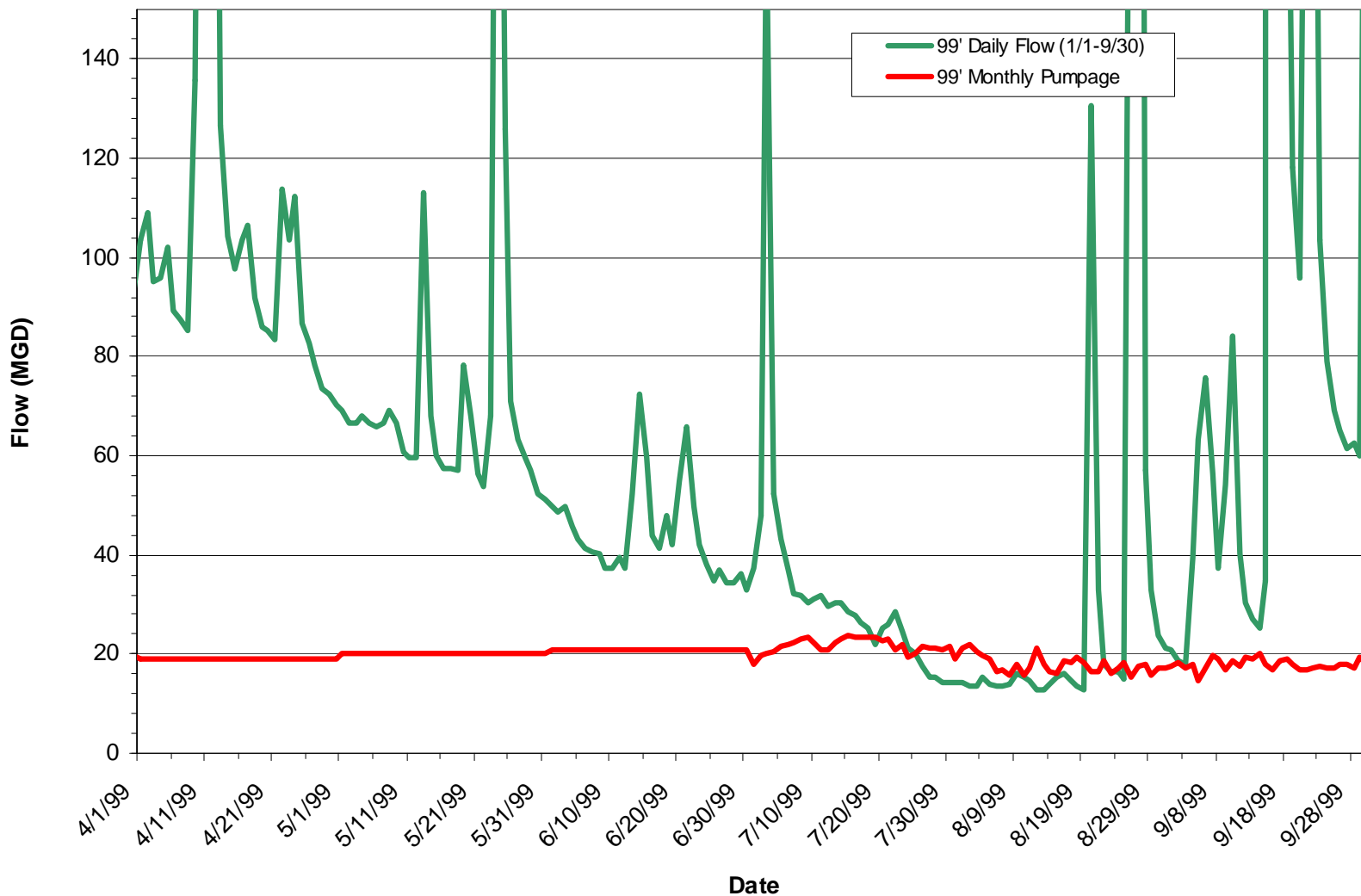
Delaware Geological Survey

Brandywine Creek at Wilmington, Daily Mean Streamflow

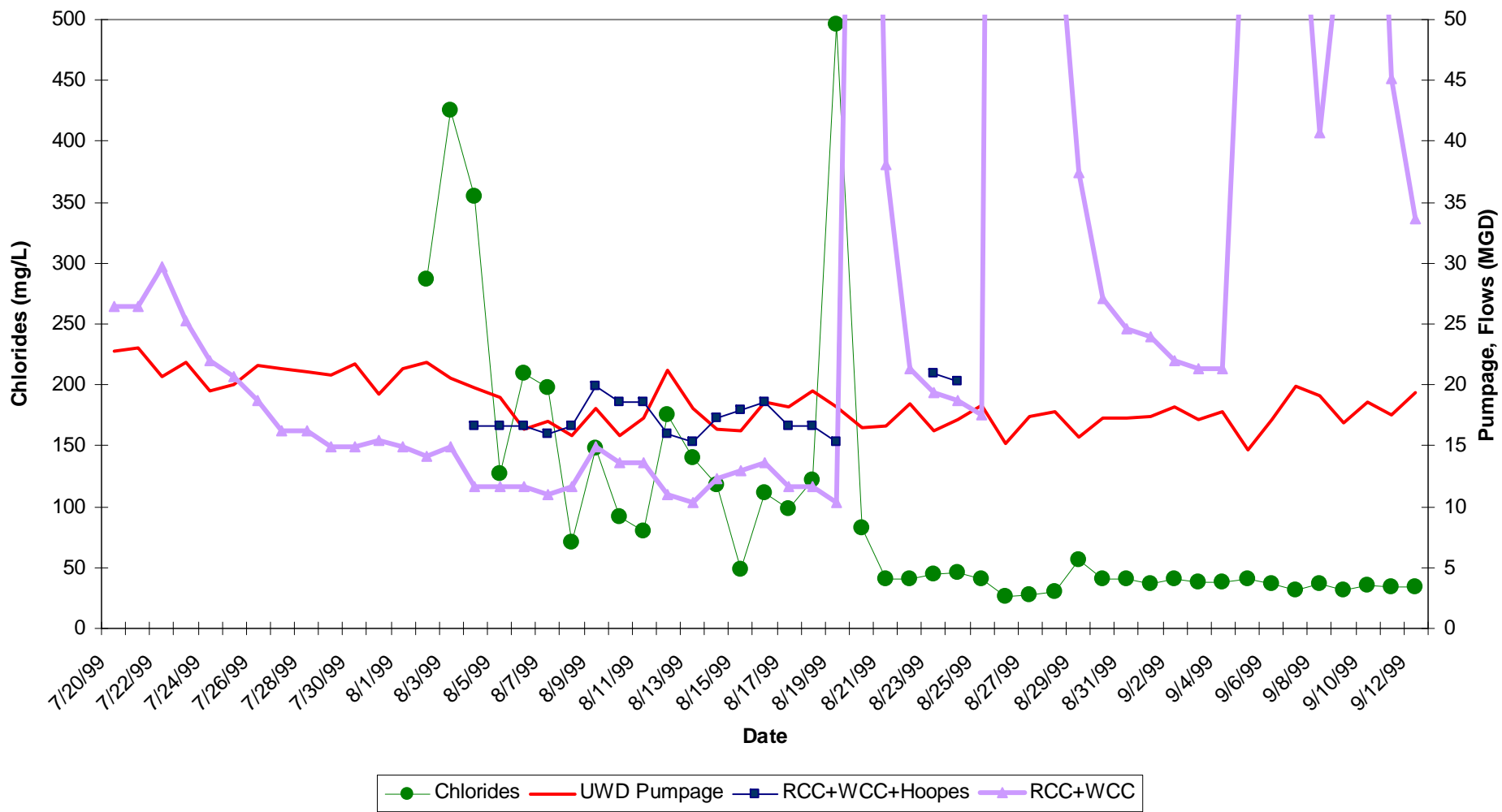


Delaware Geological Survey

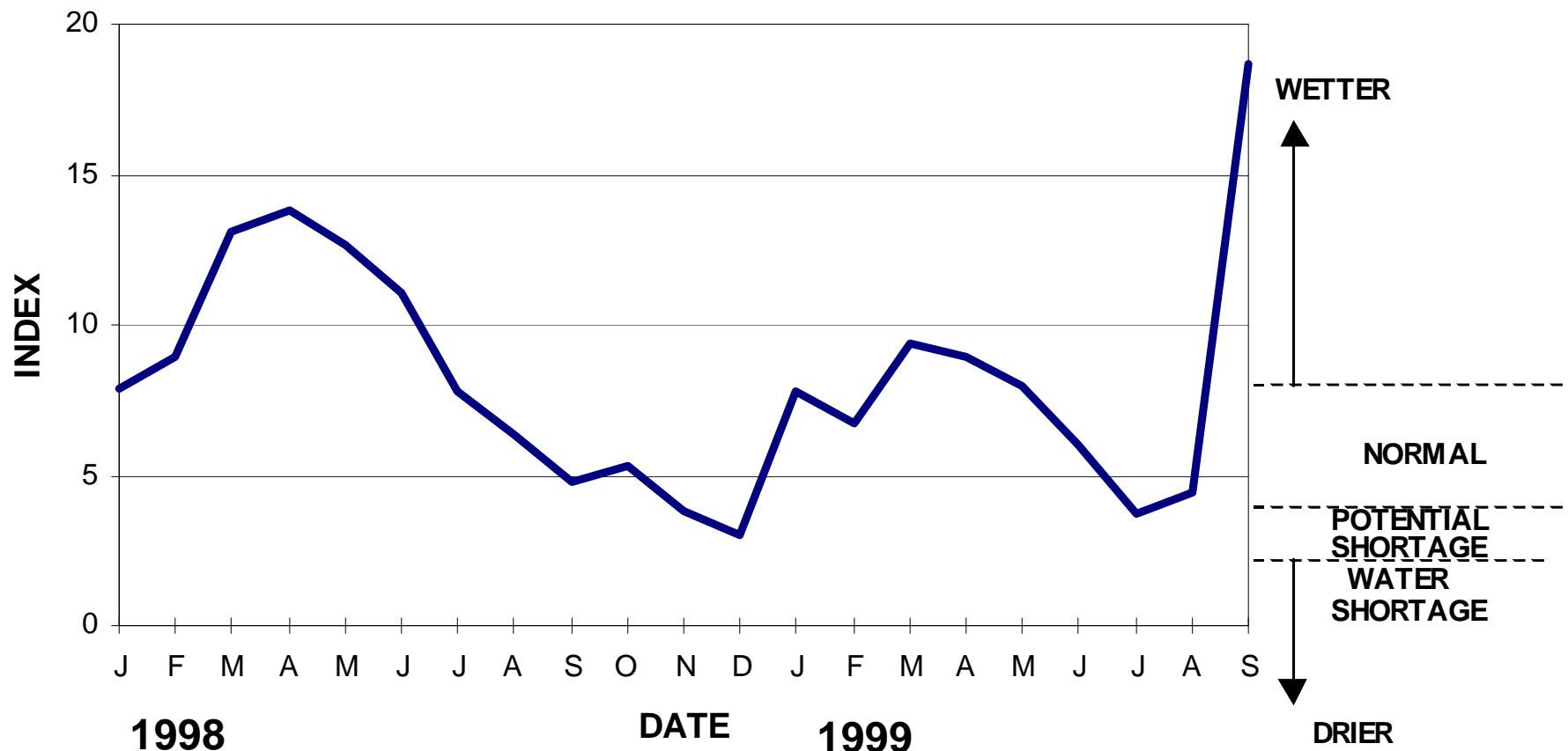
White Clay & Red Clay Creeks at Stanton, Daily Mean Streamflows



Delaware Geological Survey Pumpage, Flows, and Chlorides at Stanton



Water Conditions Index for New Castle County January 1998 - September 1999



DELAWARE GEOLOGICAL SURVEY

MONTHLY MEAN STREAMFLOWS

October 1, 1998 - September 30, 1999

Water Course	Years of Record	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
Brandywine Creek	52	N	***BN	**BN	N	BN	N	N	BN	BN	**BN	BN	AN
Red Clay Creek	55	BN	RECORD LOW	RECORD LOW	N	BN	N	BN	BN	*BN	BN	BN	AN
White Clay Creek	58	N	**BN	*BN	N	BN	N	BN	BN	*BN	BN	BN	RECORD HIGH
Christina River	55	BN	**BN	*BN	N	BN	N	N	N	BN	**BN	N	RECORD HIGH
AN - Above Normal; N - Normal; BN - Below Normal													
* 2nd lowest of record; ** 3rd lowest of record; *** 4th lowest of record;													

DELAWARE GEOLOGICAL SURVEY

WATER LEVELS

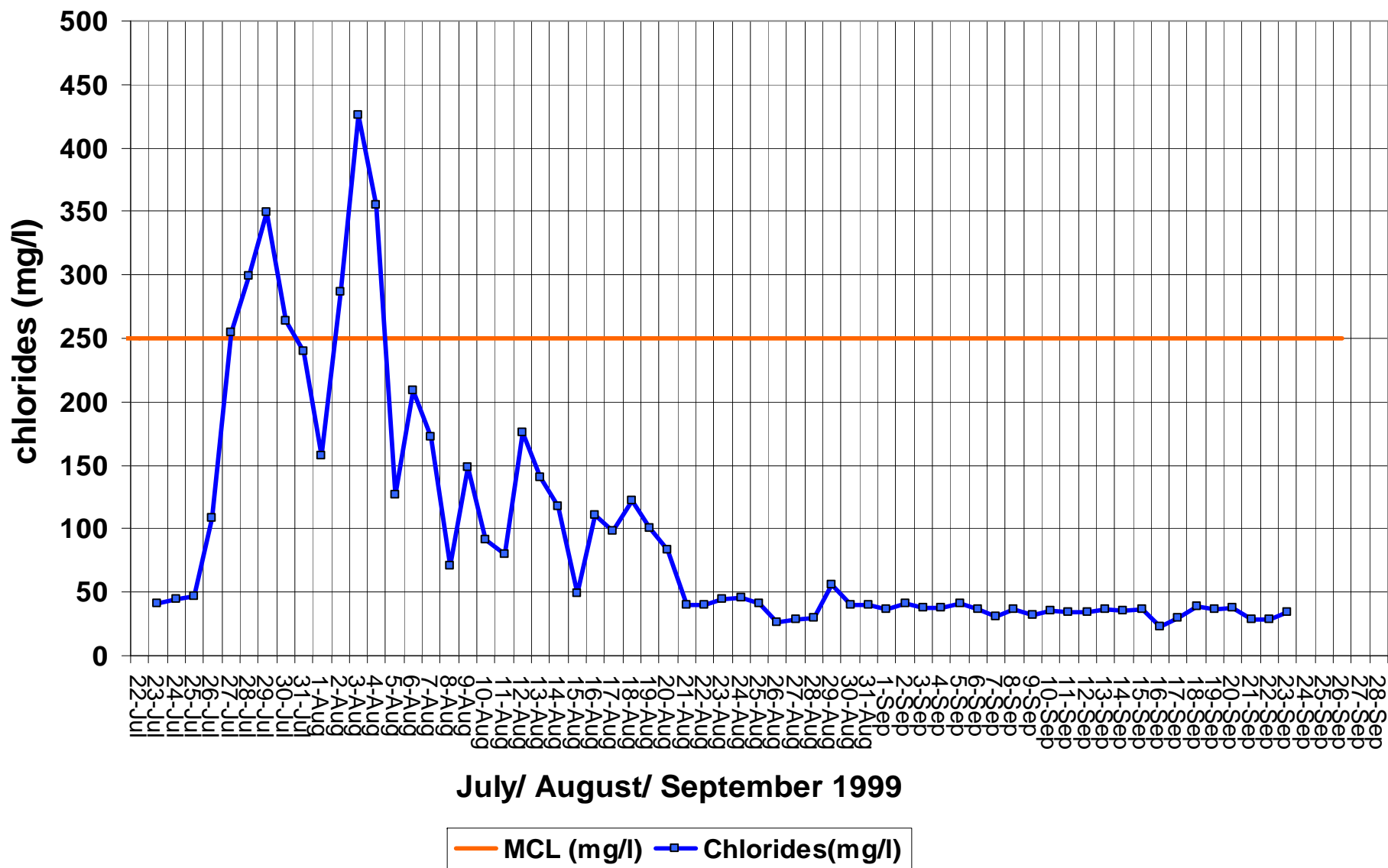
Shallow Water-Table Wells

October 1, 1998 - September 30, 1999

Well	Years of Record	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
Db24-10	42	N _F	BN _F	BN _F	**BN _F	**BN _R	BN _R	***BN _R	BN _S	BN _F	**BN _F	**BN _F	N _R
Hb14-01	42	N _R	N _F	N _F	N	BN _R	BN _R	BN _S	BN _F	BN _F	*BN _F	**BN _F	N _R
Md22-01	41	N _F	BN _F	N _R	N _R	N _R	N _R	BN _F	BN _F	***BN _F	BN _F	***BN _F	AN _R
Qe44-01	40	RECORD LOW	RECORD LOW	RECORD LOW	BN _R	BN _R	N _R	BN _F	BN _F	RECORD LOW	**BN _F	***BN _R	AN _R
AN - Above Normal; N - Normal; BN - Below Normal; R - Rising; S - Steady; F - Falling													
* 2nd lowest of record; ** 3rd lowest of record; *** 4th lowest of record													

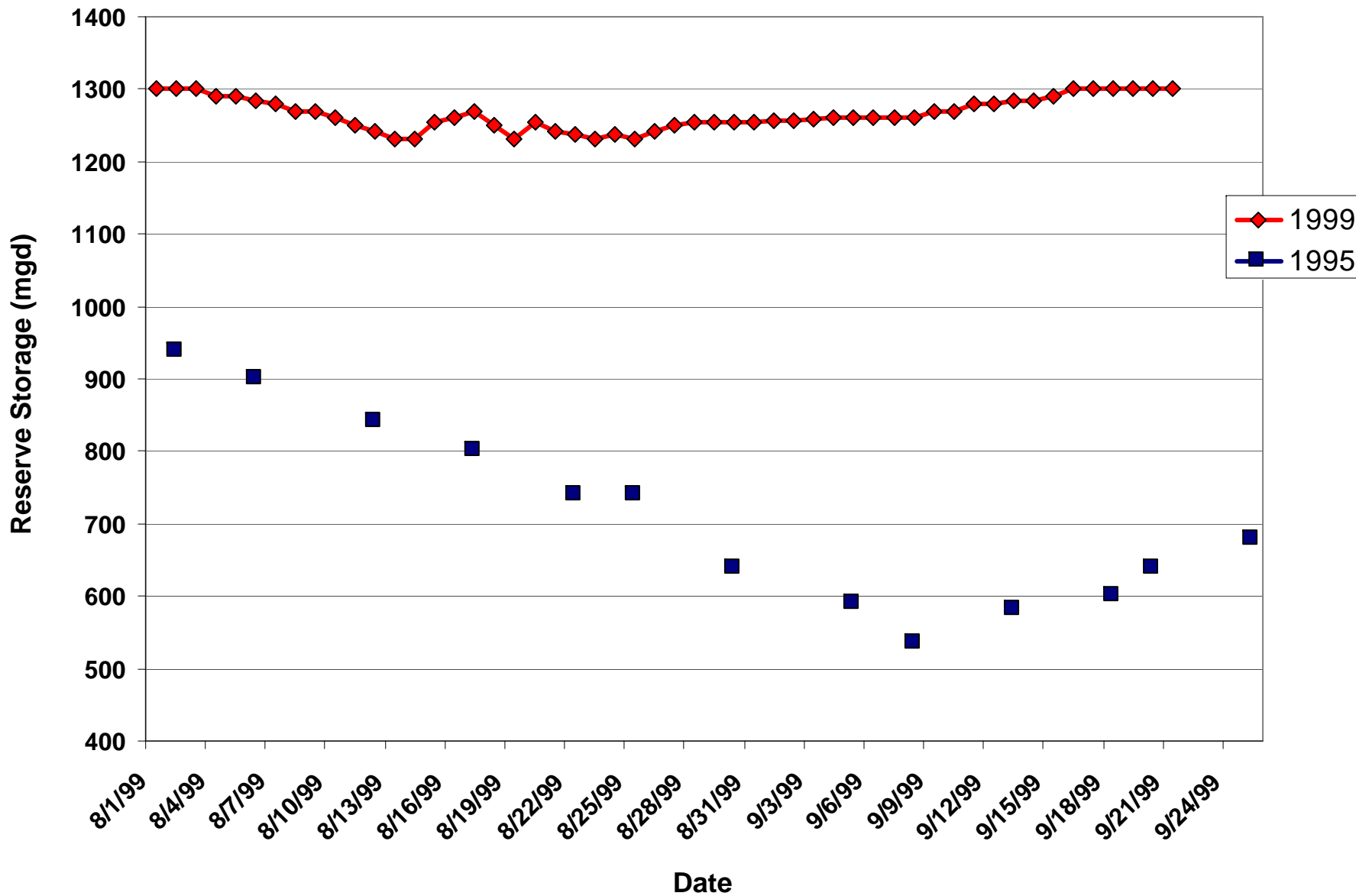
RAW CHLORIDES

White Clay Creek at Stanton

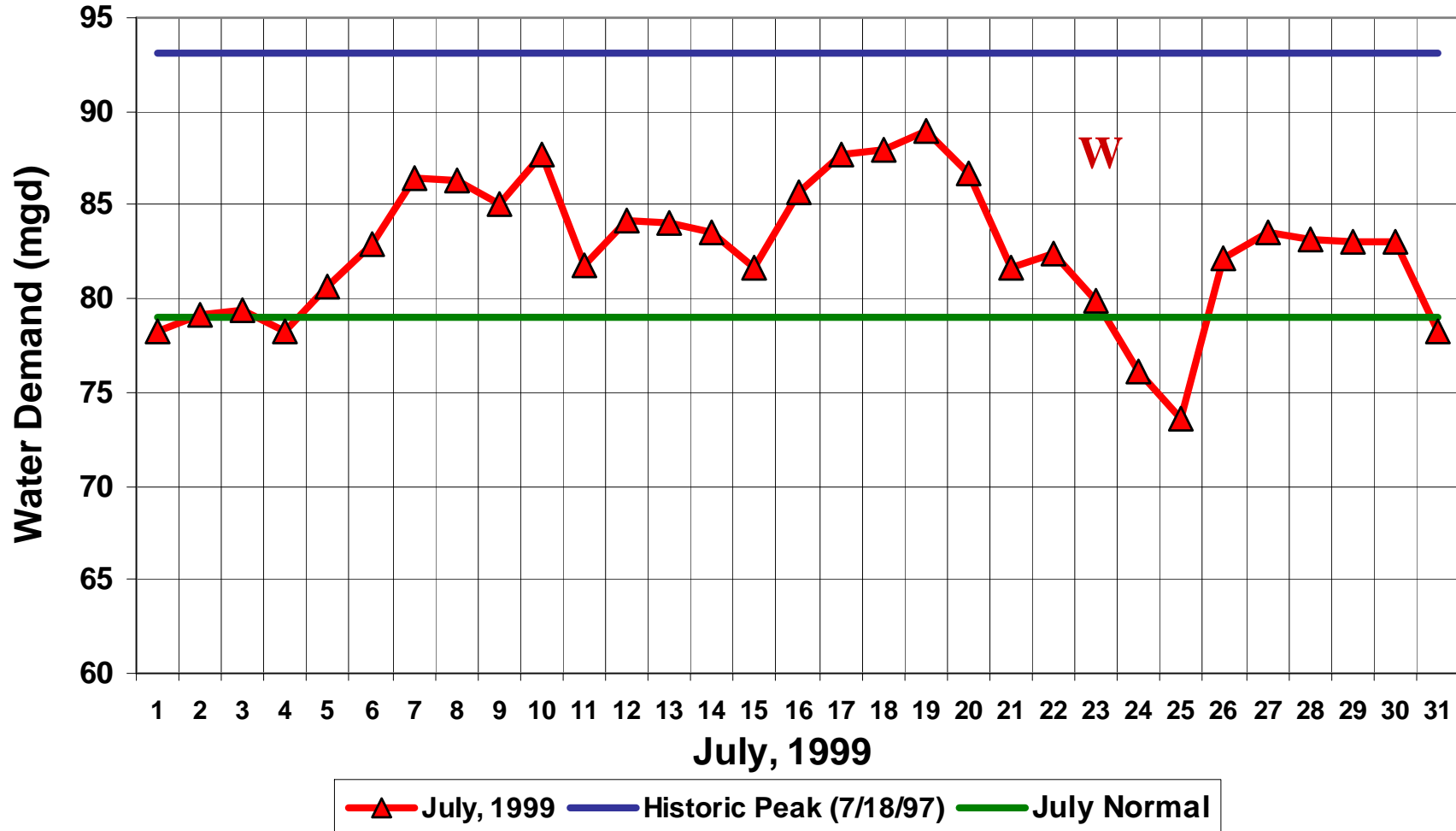


HOOPES RESERVOIR

Reserve Storage

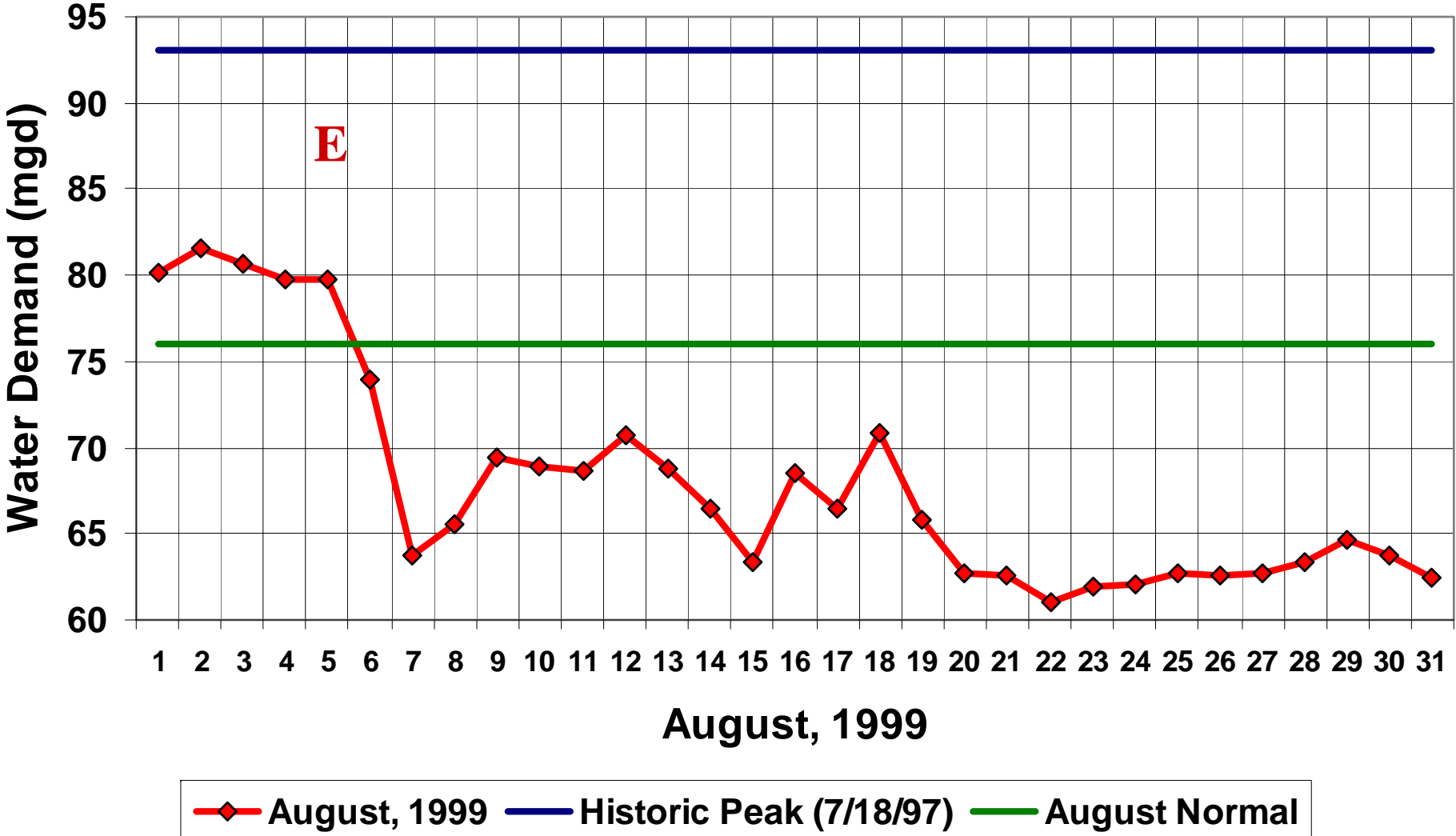


Public Water Demand Northern New Castle County



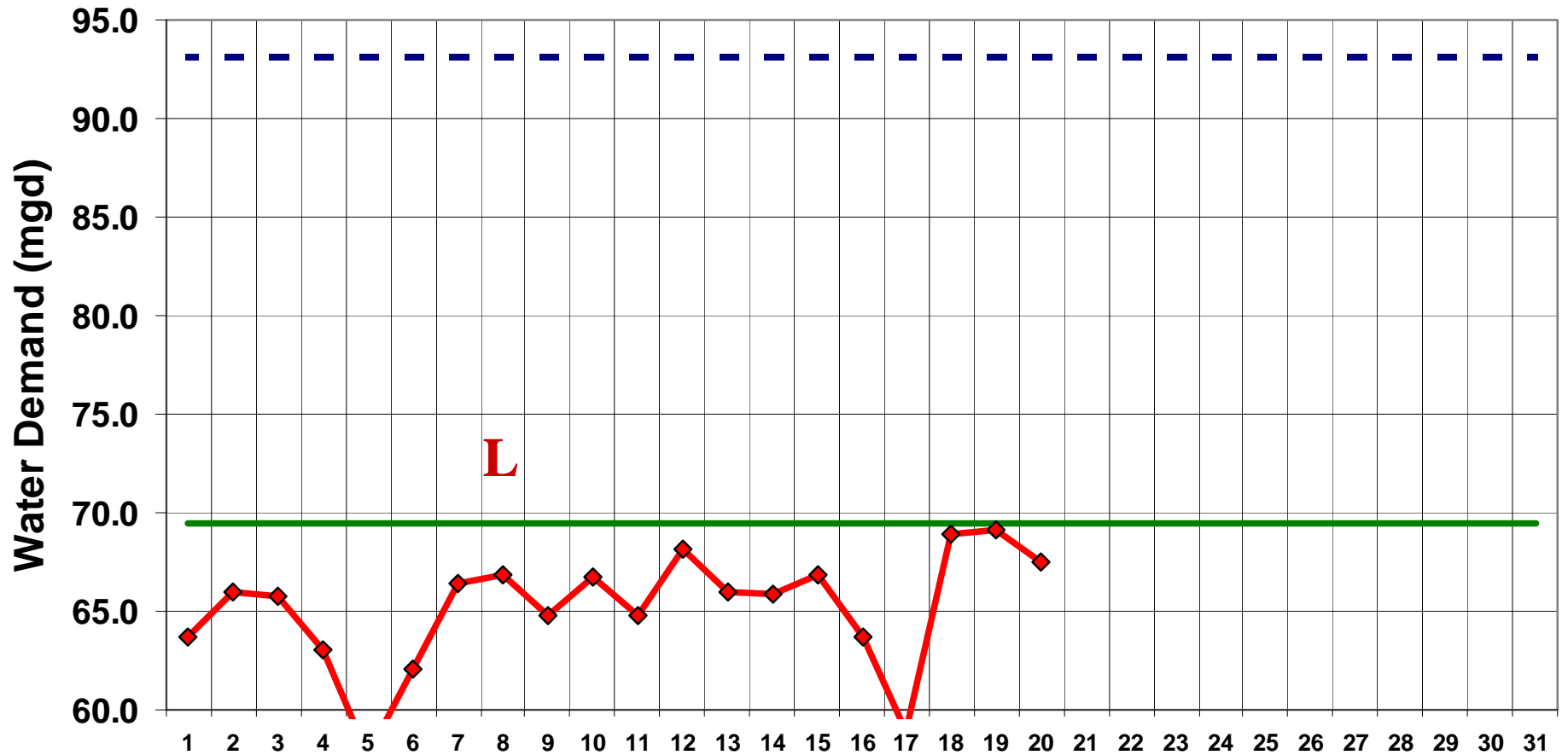
W = Drought Warning

Public Water Demand Northern New Castle County



E = Drought Emergency

Public Water Demand Northern New Castle County



September, 1999



L = Drought Emergency Lifted



E. O. No. 65 - Governor's Water Supply Task Force

*** Composition**

- State, Regional, County Agencies
- 5 Municipal/Investor - Owned Purveyors
- DGS and U of D WRA Lead Advisors

*** Charges**

- Evaluate the 1999 Drought
- Update Supply and Demand Curves
- Recommend Solutions to Close Deficit

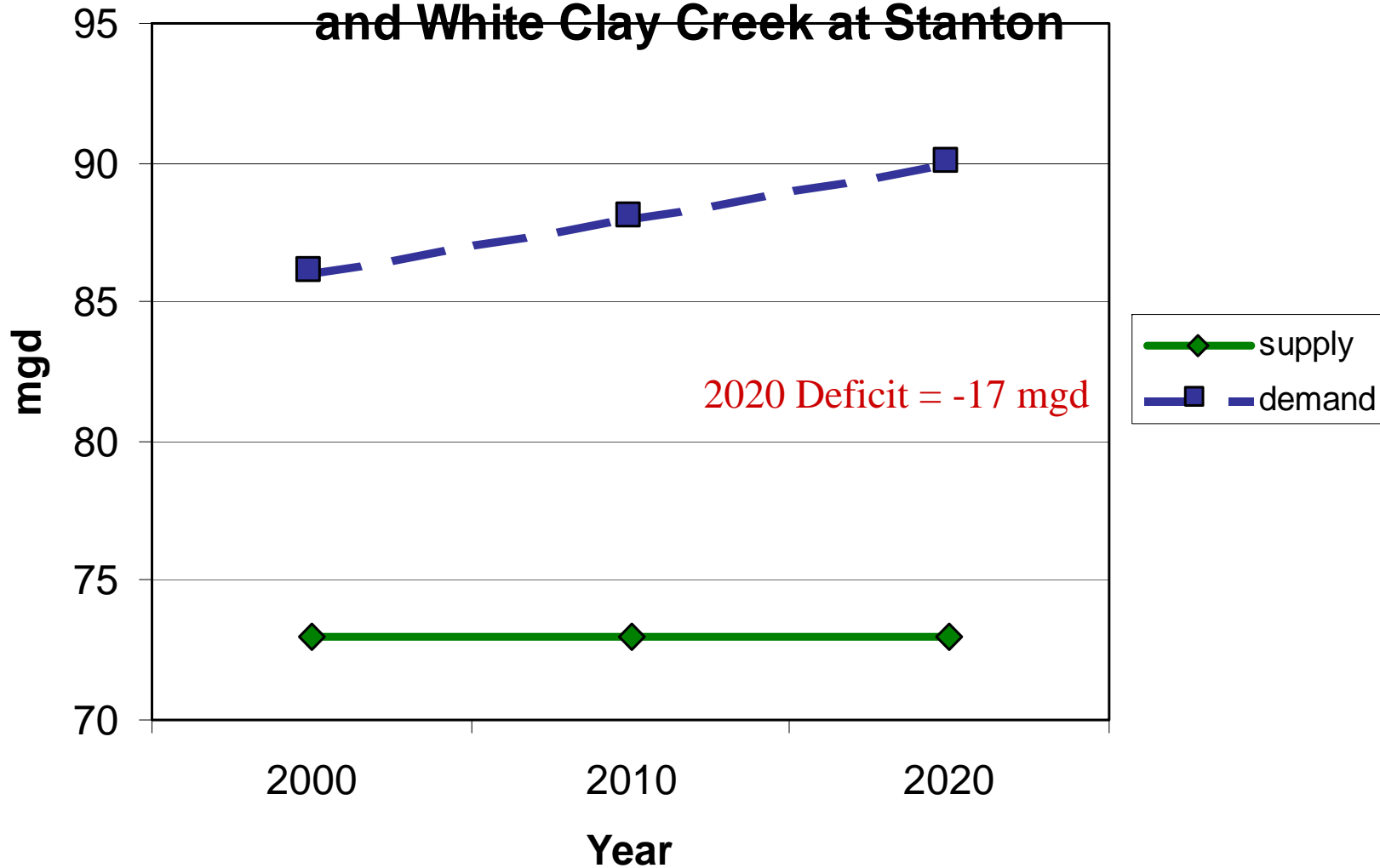
Supply/Demand Curve (mgd)

Year 2020

<u>Scenario</u>	<u>Supply</u>	<u>Demand</u>	<u>+/-</u>	<u>Vol (mg)</u>
<u>1. No 7Q10</u>	93	90	+3	180*
2.7Q10 Wc	85	90	- 5	-300*
3.7Q10 B&W	73	90	- 17	-1020*

* Volume required assuming a 60-day drought period

**Figure 7. Water Supply and Demand Curve,
Scenario 3b - Future Condition, 7Q10 Flow
Standards in place along the Brandywine Creek
and White Clay Creek at Stanton**

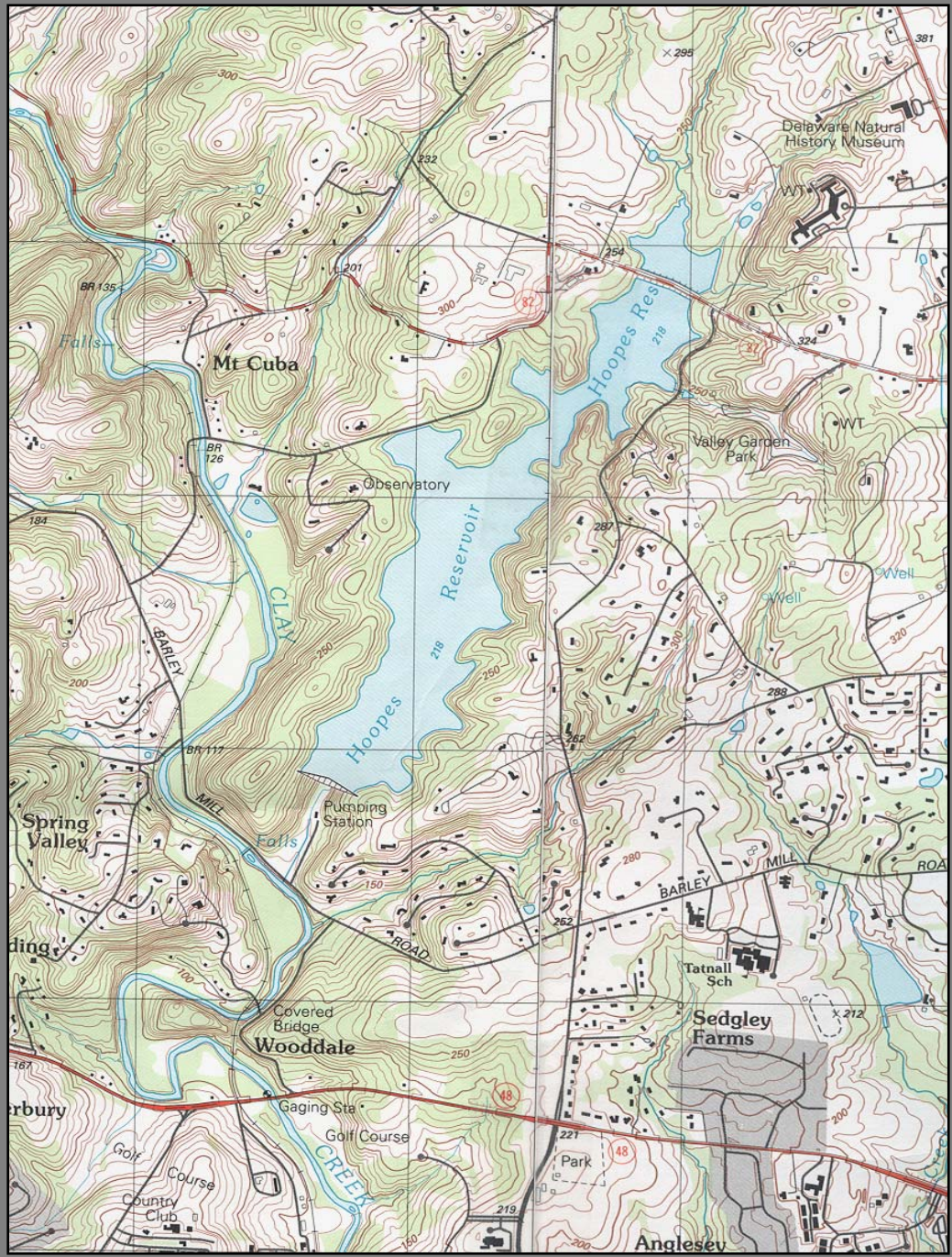


FUTURE WATER SUPPLY OPTIONS

- **Storage**
- **Ground Water**
- **Pipelines**
- **Innovative Technologies**

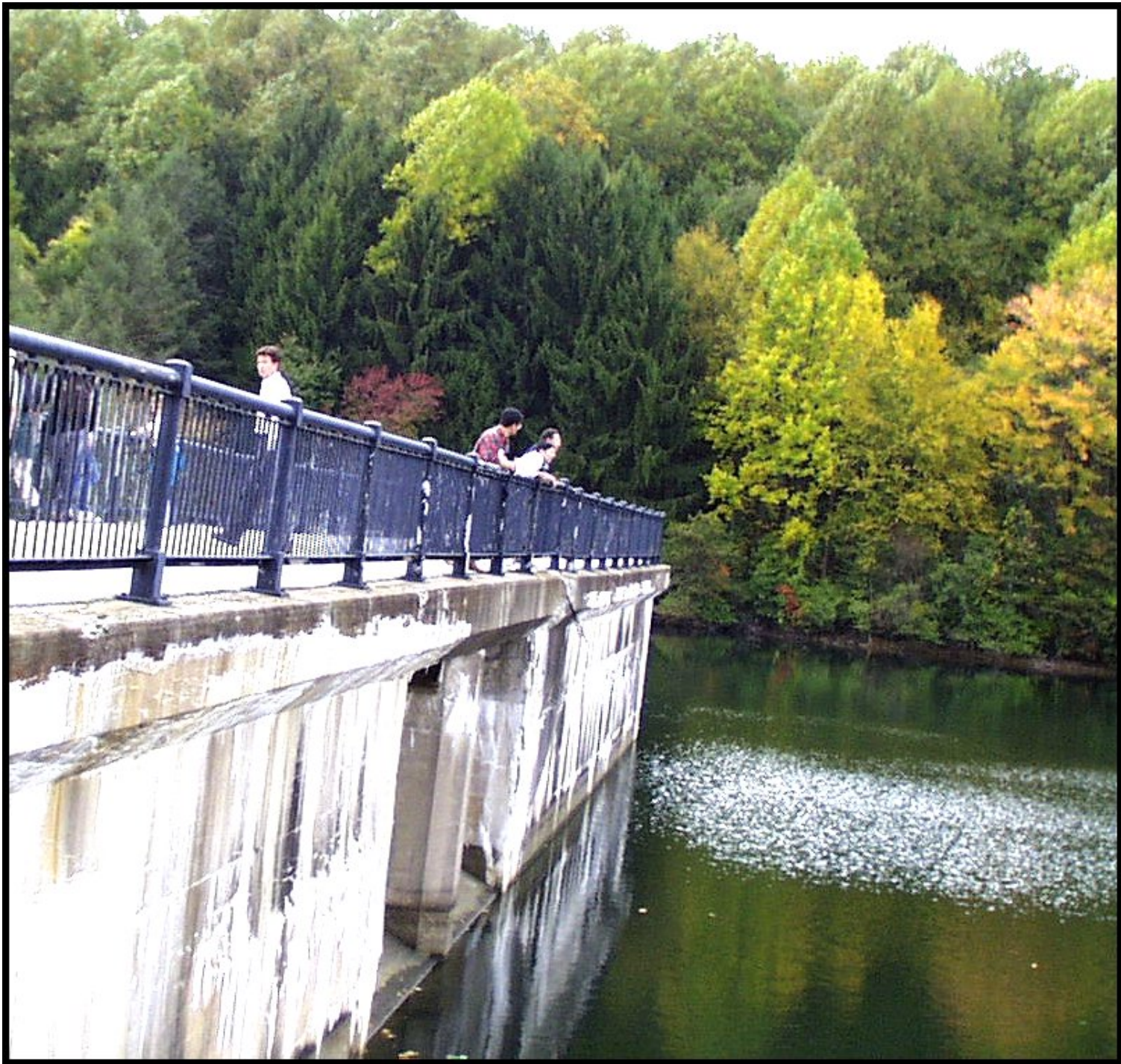


Proposed Newark Reservoir Site - the Koelig Farm

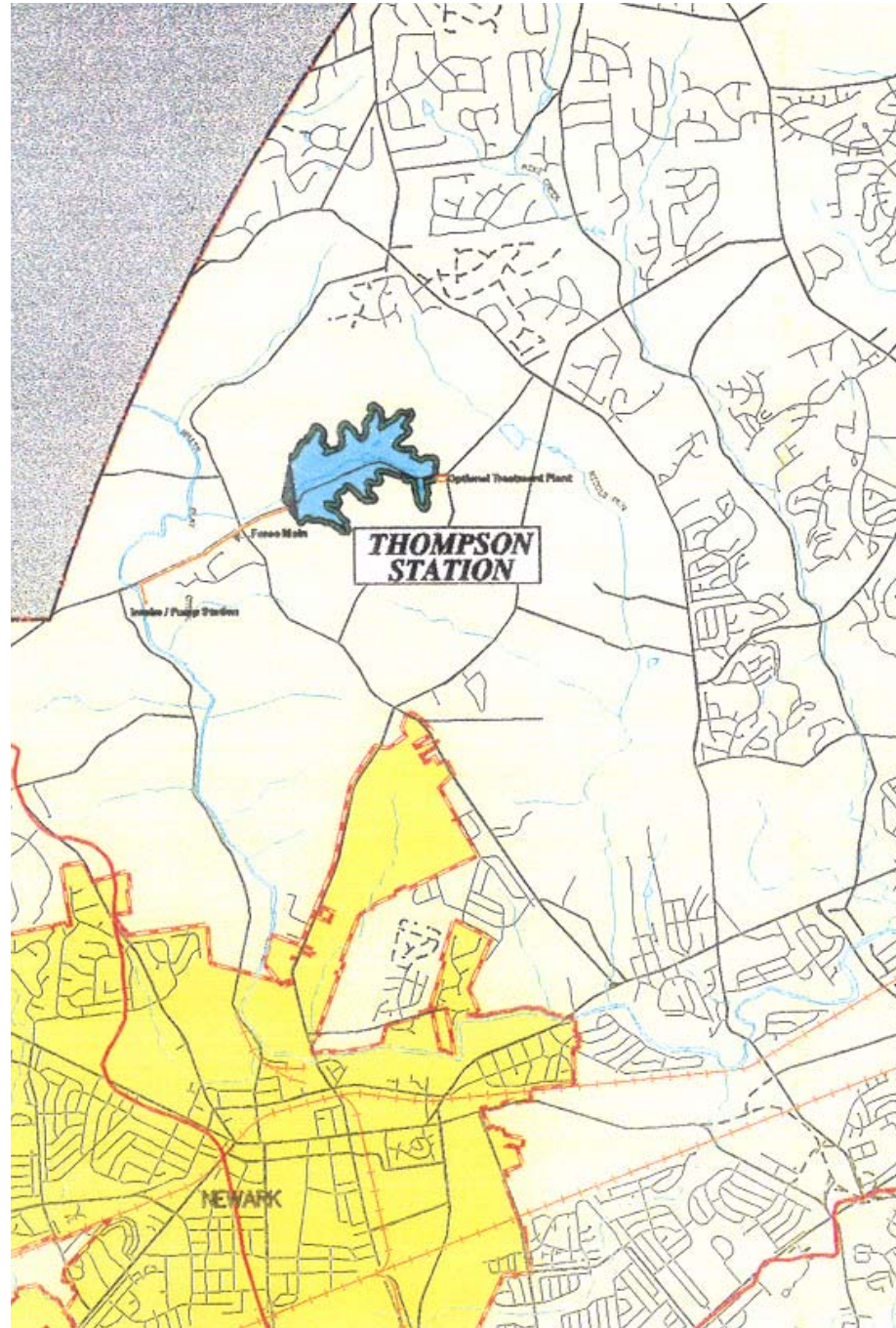


Hoopes Reservoir



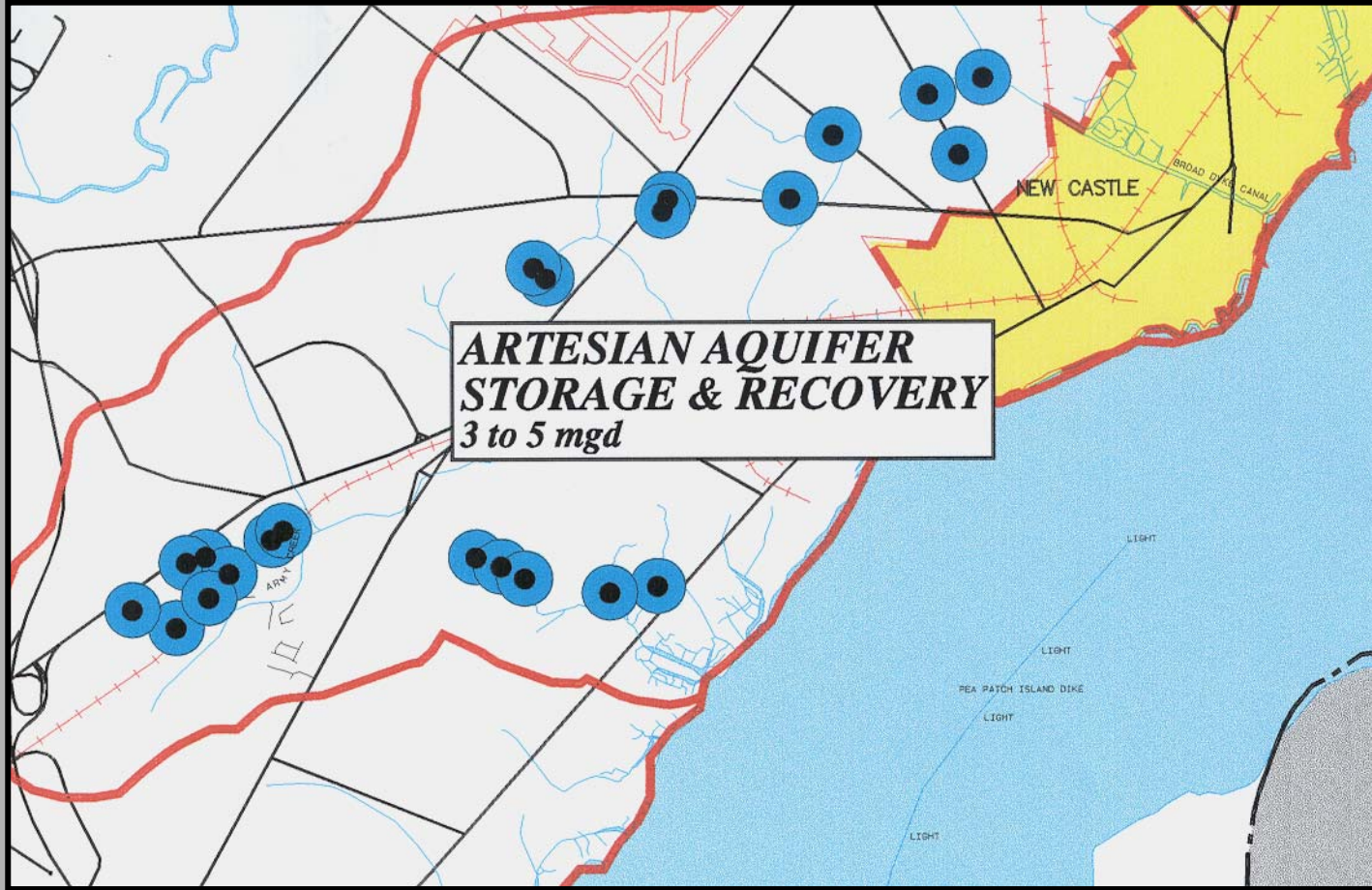


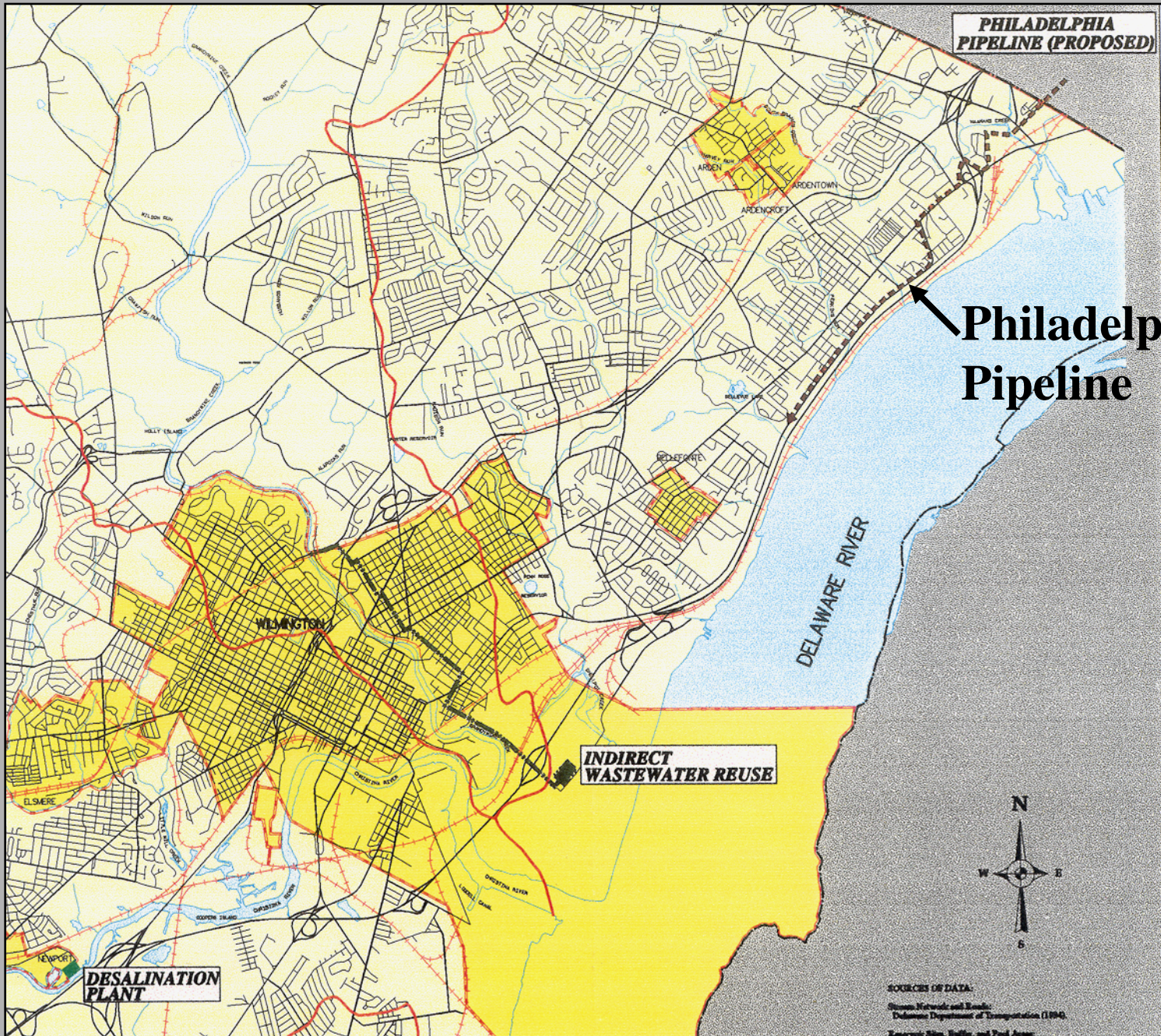




UWD - Tidal Capture Structure







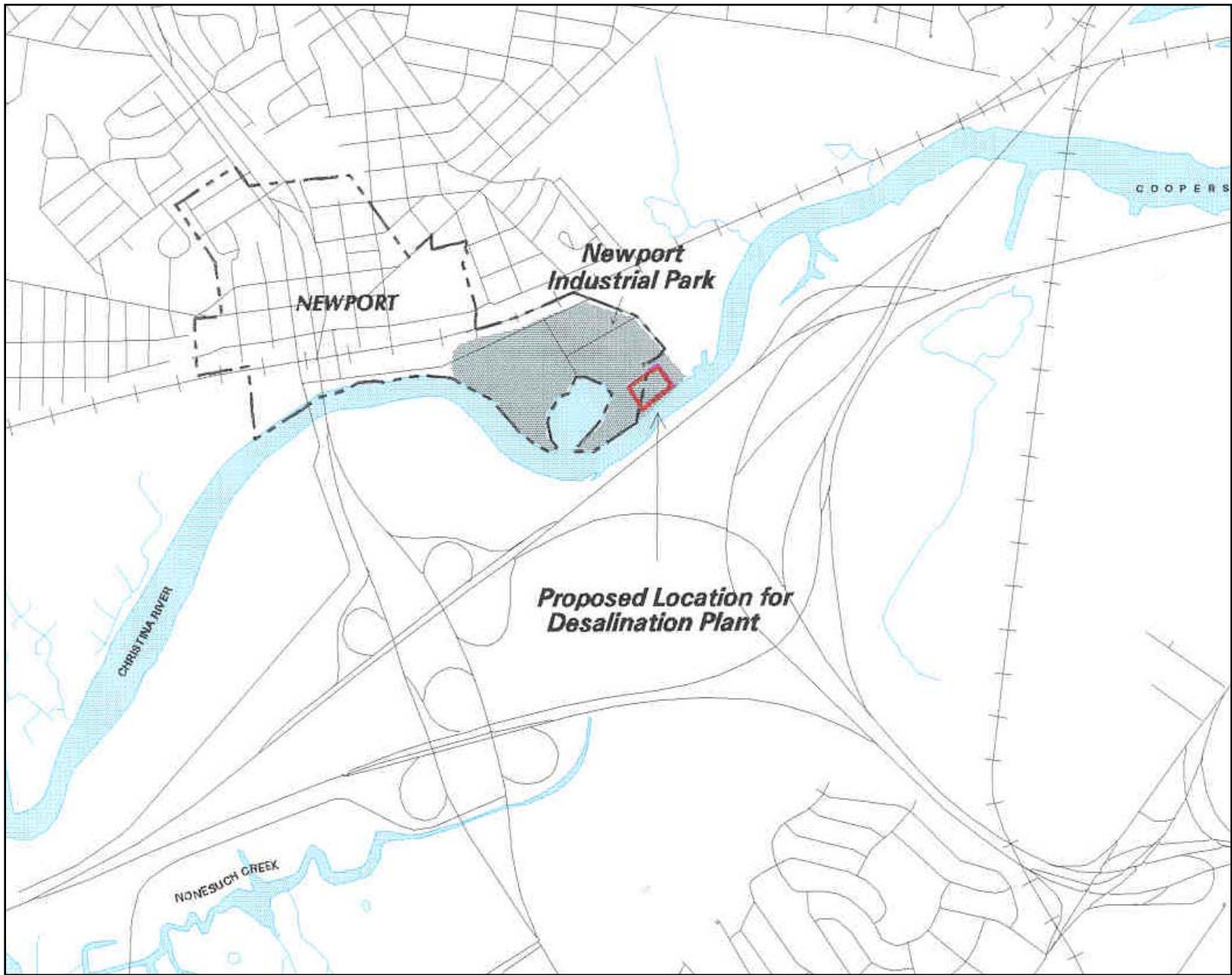
PHILADELPHIA PIPELINE (PROPOSED)

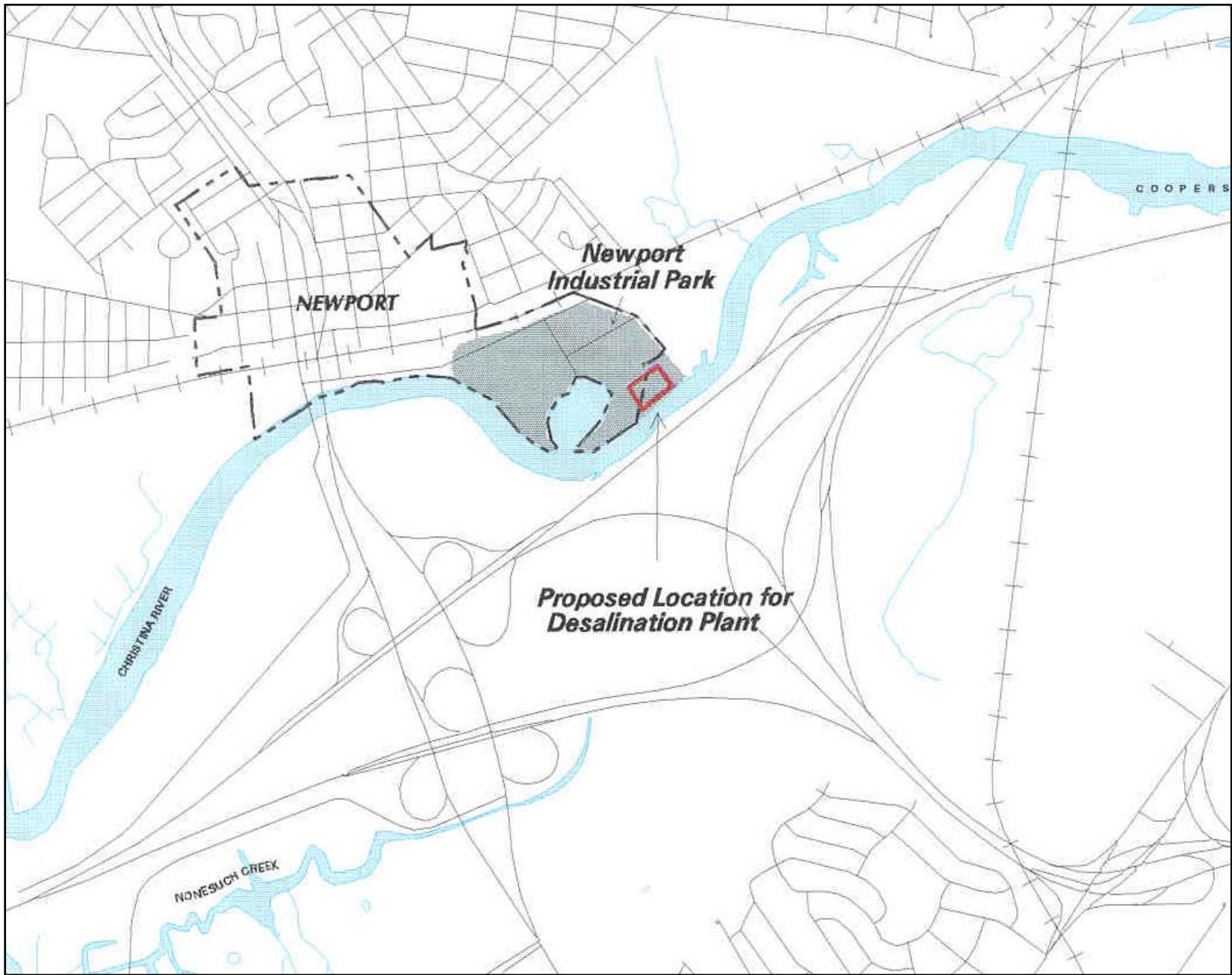
Philadelphia Pipeline

INDIRECT WASTEWATER REUSE

DESALINATION PLANT

SOURCES OF DATA:
Street Network and Roads:
Delaware Department of Transportation (1990)
Elevation: SRTM, Shuttle, and Topo Aztec







Wastewater Reuse

FUTURE WATER SUPPLY OPTIONS

INSTITUTIONAL/GOVERNANCE CHANGES

- **Water Master, Authority,
Public-Private Consortium (or other)**
- **Increase Intracounty Interconnections.**
- **Demand Side Management**
- **Overhaul CPCN Regulations.**
- **Review Subdivisions Under UDC for
Water Certification.**

Ownership and O&M Options

Regional Authority

Option	Advantages	Disadvantages
Regional Authority	<ul style="list-style-type: none">■ Enables regional and equitable approach to supply solutions■ Independence from customers■ Region-wide financing capability	<ul style="list-style-type: none">■ May require new enabling legislation and creation of new administrative structures■ Operational capability may need to be “ramped-up”

Ownership and O&M Options

State Authority

Option	Advantages	Disadvantages
State Authority	<ul style="list-style-type: none">■ Facilitates State-wide approach to water supply solutions■ Independence from customers■ Enhanced financing capability (bonding) <p>* Could be hosted in existing authority</p>	<ul style="list-style-type: none">■ Creates “Upstate” vs. “Downstate” issues■ Operational capability may need to be “ramped-up” <p>* Would require new legislation</p>

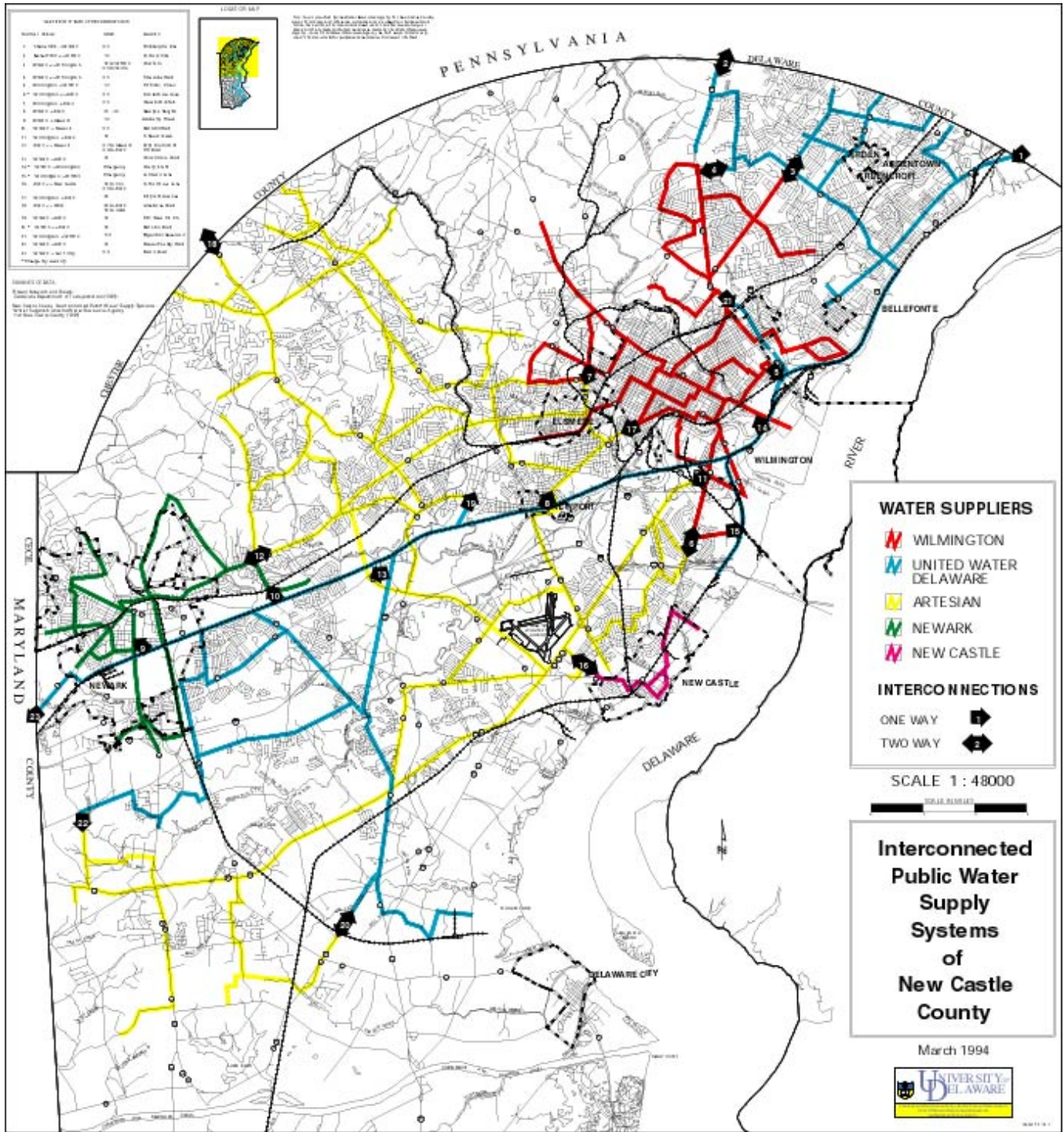


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184. Elkton	Elkton	Elkton
185. Harrington	Harrington	Harrington
186. Fenwick	Fenwick	Fenwick
187. Millsboro	Millsboro	Millsboro
188. Seaford	Seaford	Seaford
189. Delaware City	Delaware City	Delaware City
190. Middletown	Middletown	Middletown
191. Elkton	Elkton	Elkton
192. Harrington	Harrington	Harrington
193. Fenwick	Fenwick	Fenwick
194. Millsboro	Millsboro	Millsboro
195. Seaford	Seaford	Seaford
196. Delaware City	Delaware City	Delaware City
197. Middletown	Middletown	Middletown
198. Elkton	Elkton	Elkton
199. Harrington	Harrington	Harrington
200. Fenwick	Fenwick	Fenwick



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MARYLAND

PENNSYLVANIA

DELAWARE

DELAWARE

DELAWARE CITY

March 1994

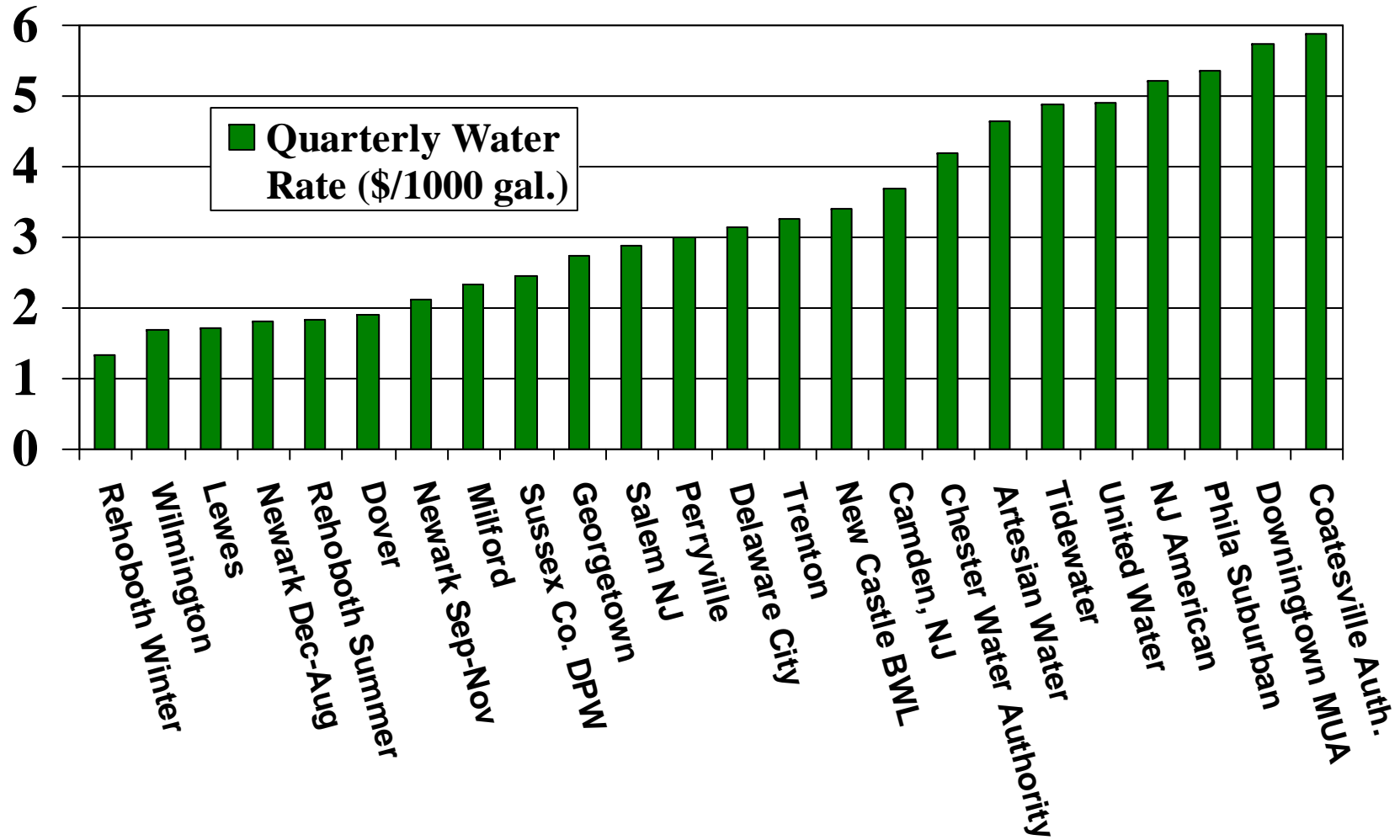


MAP 1-1

DEMAND SIDE MANAGEMENT

- Conservation Figured into Demand Forecasts
- Inclining Block Water Rates (Artesian)
- Conservation Rates/Seasonal (Newark)
- Drought Emergency Pricing (PADEP)
- Drought Warning/ Voluntary Restriction
- Drought Emergency/Mandatory Restriction

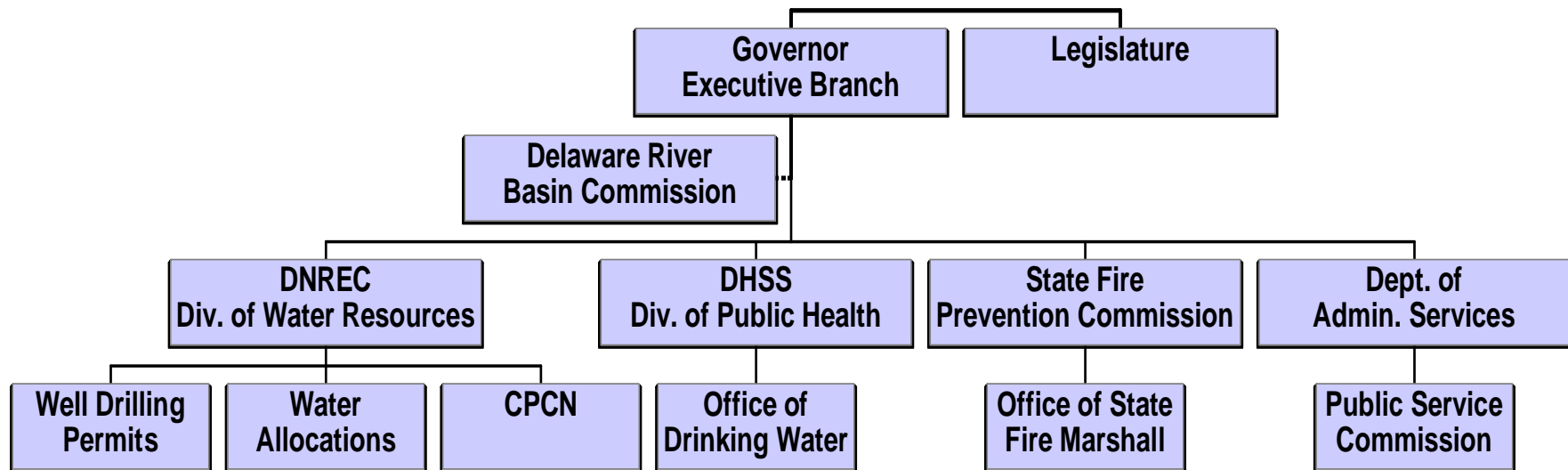
Water Rates in Delaware



Delaware

Drinking Water Regulatory

Universe



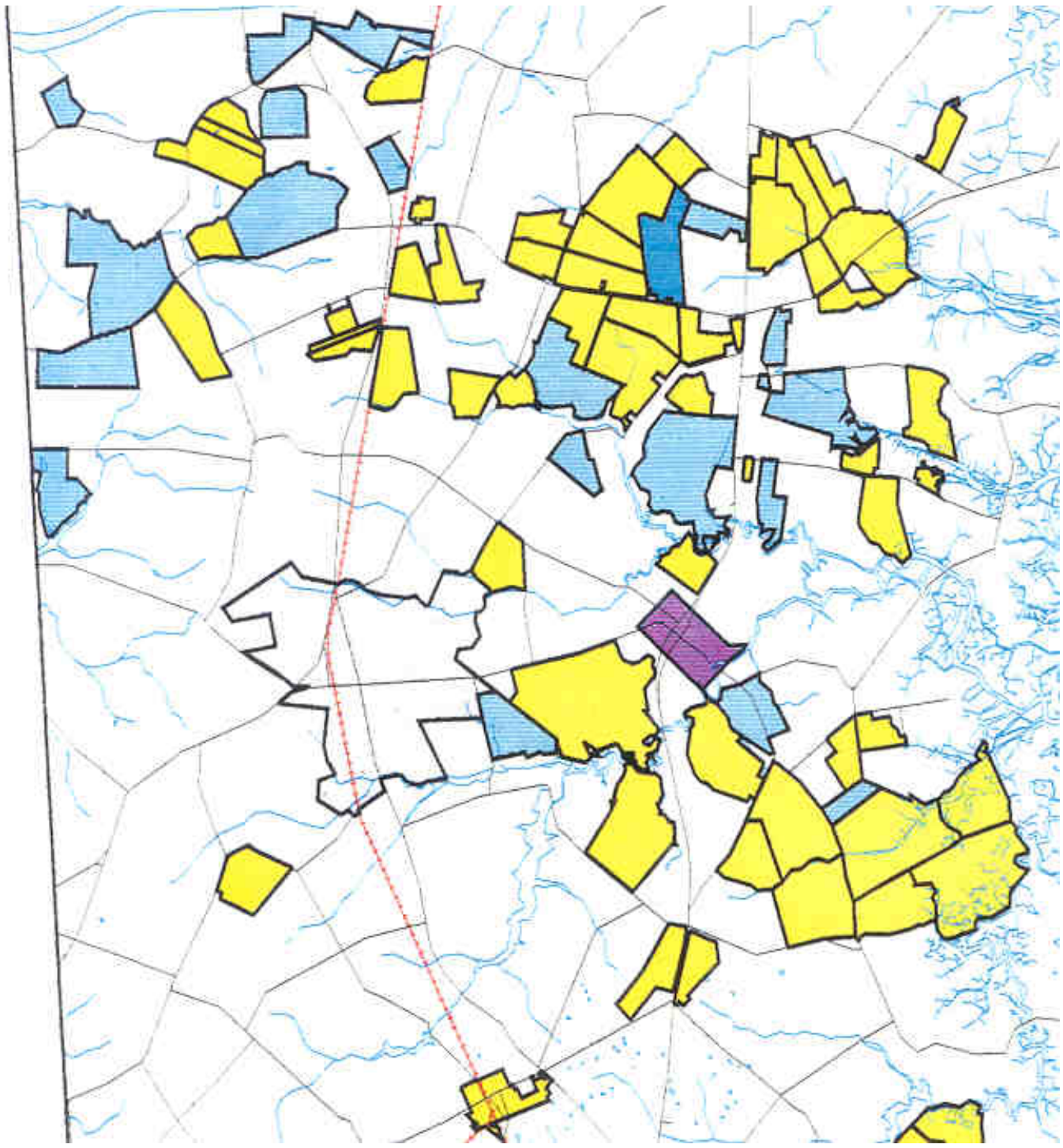
Advisory: DGS

UD WRA

New Castle County UDC

OVERHAUL CPCN REGULATIONS

- Need to improve ability to plan and coordinate water supply for future growth
- CPCNs awarded subdivision by subdivision
- Potential for overlapping pipes and overuse of resource
- Consider:
 - Watershed-based service areas
 - Short-term/Long-term master plans



RECOMMENDATIONS

FINAL REPORT

GOVERNOR'S WATER SUPPLY TASK FORCE

December 2, 1999



Prepared by:

Delaware Department of Natural Resources
and Environmental Control



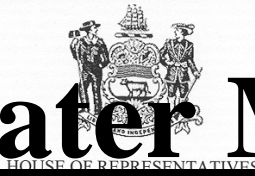
Delaware Geological Survey



University of Delaware, Institute for
Public Administration, Water Resources
Agency



In cooperation with the Water Supply Task Force members



1. Appoint Water Master or Coordinator

140th GENERAL ASSEMBLY

OF DELAWARE

HOUSE AMENDMENT NO. 3

AN ACT TO AMEND CHAPTER 13, TITLE 26 OF THE DELAWARE CODE RELATING TO THE ESTABLISHMENT OF A TEMPORARY WATER COORDINATOR AND A WATER SUPPLY COORDINATING COUNCIL.

WHEREAS, the General Assembly finds that the enhancement of existing water supplies in northern New Castle County is essential to avoid a repeat of the difficulties experienced during the drought of 1999; and

Facilitate and work with water providers

WHEREAS, on August 26, 1999, the Governor's Water Supply Task Force was created and charged with providing Delaware citizens and projected water supply along with current and projected demand; and

WHEREAS, the Task Force was further charged with providing recommendations to the Governor and the General Assembly concerning short-term and long-term solutions to northern New Castle County's water supply needs; and

Accountability to ensure that "A" list committed to and possibly "B" list projects are implemented without slippage

WHEREAS, on December 1, 1999, the Governor's Water Supply Task Force submitted its final Report which recommends various actions and undertakings by utilities and others to move toward ensuring adequate water supply in the future; and

WHEREAS, in its Report, the Task Force identified a series of water supply enhancement projects which, if implemented, will provide a sufficient supply of water for northern New Castle County citizens during any future drought periods; and

WHEREAS, in its Report, the Task Force also recommends the establishment of a temporary Water Coordinator and a Council composed of water providers and others knowledgeable in water supply to monitor the implementation of the enhancement projects; and

Report back to Governor and Legislature

WHEREAS, the General Assembly finds that the implementation of the projects recommended in the Report, or similar projects providing a commensurate increase in water supply, is critical to ensuring adequate water supply in northern New Castle County during any future drought periods; and

Executive Order and Law Passed (HB 549)

Page 1 of 4
HD : BDS : SRS:531400294
LC : WGF : RAY:2981400352

2. Appoint Water Supply Coordinating Council

- Work cooperatively with water master
- Executive order and law passed (HB 549)
- Government officials, water providers, business & environmental interests
- Functions not limited to:
 - Implement “A” list water supply options
 - Conduct interconnected network tests
 - Adopt conservation water rates



3. Propose Legislation to Overhaul CPCN Process

DELAWARE STATE SENATE
14th GENERAL ASSEMBLY
SENATE BILL NO. 37

MAY 19 2000

AN ACT TO AMEND TITLES 7, 16 AND 26 OF THE DELAWARE CODE RELATING TO THE CERTIFICATION AND REGULATION OF WATER UTILITIES AND WELL PERMITS AND TO TRANSFER TO THE PUBLIC SERVICE COMMISSION THE DUTIES AND FUNCTIONS OF THE PUBLIC SERVICE AND SUCCESSOR TO WATER UTILITIES STATE FINANCIAL UNIT.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF DELAWARE:
Section 1. Amend Title 7, Chapter 60, Subchapter V, sections 6075, 6076, 6077, 6078, 6079, and 6080 by deleting

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Tie award of water service areas to certify adequate capacity and quality.

Law passed and governor signed (SB 370)

Transfers authority from DNREC to PSC to establish regulations for:

Regional service areas (watersheds/other ?)

Cross-link DNREC well drilling/allocation permits

Cross-link PSC pressure/capacity & rate certifications

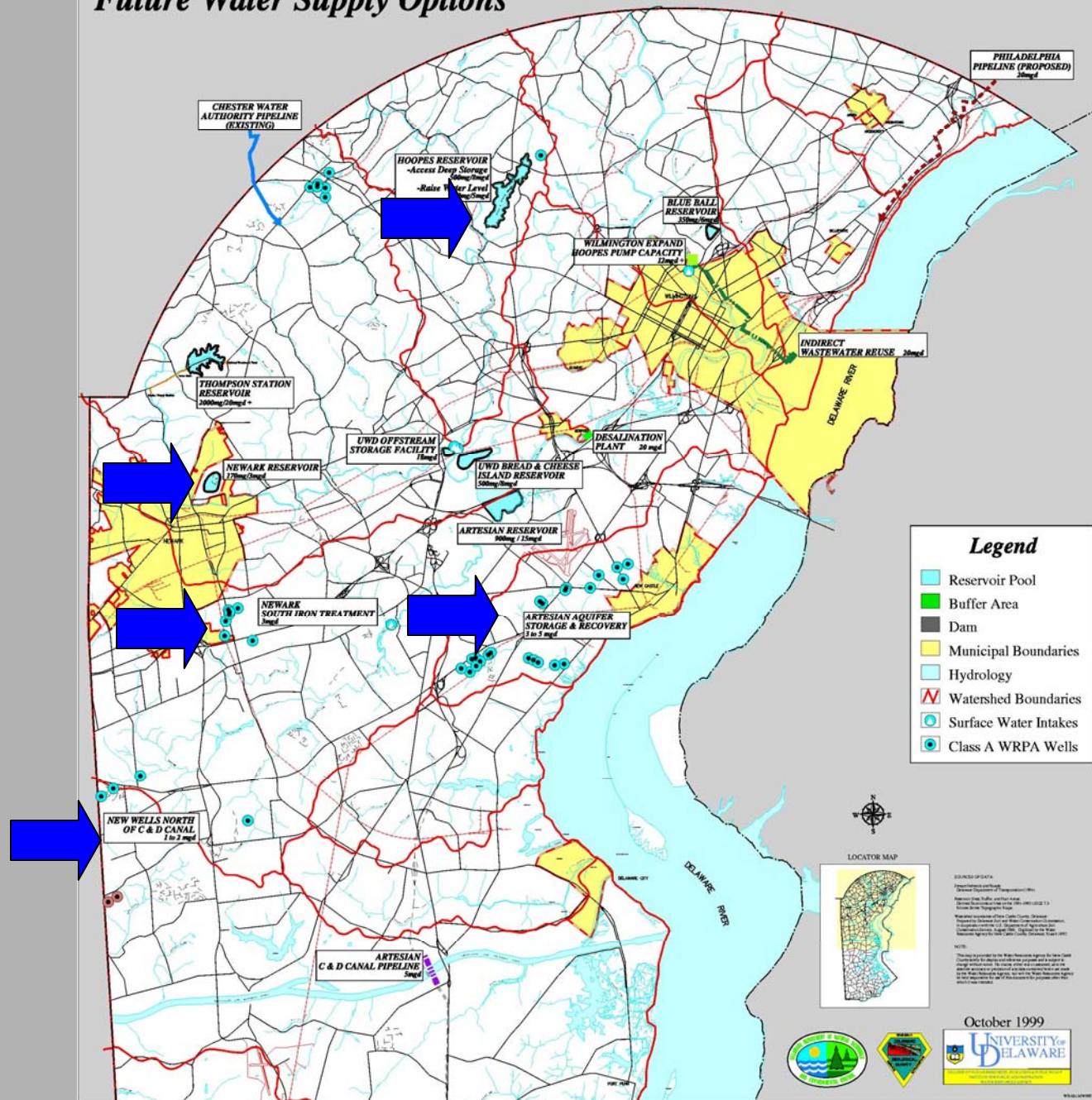
FUTURE WATER SUPPLY OPTIONS

“A” LIST

COMMITTED TO BY WATER PROVIDERS

- Newark Reservoir 200 mg/3 mgd
- Access Hoopes Reservoir (deep) 500 mg/8 mgd
- AWC Wells N. of C & D Canal 120 mg/2 mgd
- Newark S. Wells Iron Treatment 60 mg/1 mgd
- Artesian ASR Wells 300 mg/5 mgd
- Total 1180 mg/19 mgd

Future Water Supply Options



FUTURE WATER SUPPLY OPTIONS

“B” LIST

ACHIEVABLE IN LONGER TERM

- **Increase CWA/AWC Inter.** 180 mg/3 mgd
- **Raise Hoopes Reservoir WL** 300 mg/5 mgd
- **AWC C&D Canal Pipeline** 300 mg/5 mgd
- **Philadelphia to DE Pipeline** 1200mg/20 mgd
- **UWD Bread & Cheese Is. Reservoir** 500 mg/ 8 mgd

FUTURE WATER SUPPLY OPTIONS
“C” LIST
LESS ACHEIVABLE , LONGEST TERM

- **Wilmington Blue Ball Reservoir** 350 mg/ 6 mgd
- **Artesian Reservoir** 900 mg/15 mgd
- **Thompson Station Reservoir** 1200mg/20mgd
- **Desalination Facility** 1200mg/20 mgd
- **Indirect Wastewater Reuse** 1200mg/20 mgd

**EXHIBIT 2. "A" LIST PROJECTS
 AGREED UPON SCHEDULE OF MILESTONES
 GOVERNOR'S WATER SUPPLY COORDINATING COUNCIL**

"A" LIST PROJECTS	Vol.	Rate	2000				2001				2002				2003		
			Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep
Newark Reservoir	200 mg	3 mgd															
* Acquire Land																	
* Additional State Funding																	
* Obtain Permits																	
* Design and Specifications																	
* Construct Reservoir,Pumps and Recreation																	
Wilmington Hoopes Reservoir Deep Storage	500 mg	8 mgd															
* Conduct Dam Safety Inspection																	
* Prepare Water Supply Operating Plan																	
Artesian Water Wells N. of C&D Canal	48 mg	0.8 mgd															
* Install New Well at Artisans Village	24 mg	0.4 mgd															
* Place New Well at Middle Run Crossing	24 mg	0.4 mgd															
Newark So.Wellfield Iron Treatment Plant	60 mg	1 mgd															
* Obtain Permits																	
* Design WTP																	
* Construct WTP																	
Artesian Water Aquifer Storage & Recovery	300 mg	5 mgd															
* Commence ASR at Llangollen/Fairwinds Wellfields	140 mg	2.3 mgd															
* Delaware R. Wellfields, Feasibility/Permits																	
- Pilot Testing																	
- Commence ASR	100 mg	1.7mgd															
* Route 40 Wells ASR, Feasibility/Permits																	
- Pilot Testing																	
- Commence ASR	60 mg	1.0 mgd															
Total	1108 mg	17.8 mgd															

Public Water System Interconnections in Northern New Castle County

Number	Parties	Capacity (MGD)	Location	Capacity (MGD)	Location
		1994	1994	2000	2000
1.	Chester Water Authority -> United Water	0.5	Philadelphia Pike	0.3	Philadelphia Pike/Post Road
2.	Bethel TWP <-> United Water	1.5	Concord Pike	1.5	Concord Pike
3.	United Water <-> Wilmington	1.0 to United	Chatham	1.5 to United	Chatham
		0.5 to Wilm.		0.5 to Wilm.	
4.	United Water <-> Wilmington	0.5	Silverside Road	0.5 to Wilm.	Silverside Road
				to UWD (Emergency)	
5.	Wilmington -> United Water	1.3	35th/Gov. Printz	0.25	35th/Gov. Printz
6.	Wilmington <-> Artesian Water Company	0.5	Moorehouse Lane	0.5	Moorehouse Lane
7.	Wilmington -> Artesian Water Company	0.5	Cleveland & Taft	0.7	Cleveland & Taft
8.	United Water <-> Artesian Water Company	2.0 - 3.0	Newport Heights	3.0	Newport Heights
9.	United Water -> Newark	1.6	Academy Street	3.0	Academy Street
10.	United Water -> Newark	1.0	Red Mill Road	1.4	Red Mill Road
11.	Wilmington <-> Artesian Water Company	1.0	S. Heald Street	2.0	S. Heald Street
12.	Artesian Water Company <-> Newark	0.7 to Newark	Polly Drummond Hill Rd.	0.7 to Newark	Polly Drummond Hill Rd.
		0.4 to AWC		0.4 to AWC	
13.	United Water <-> Artesian Water Company	1.0	Churchmans Road	2.0	Churchmans Road
14.*	United Water -> Wilmington	Emergency	Cherry Island	Emergency	Cherry Island
15.	Wilmington -> United Water	Emergency	Lambson Lane	0.5	Lambson Lane
16.	Artesian Water Company <-> New Castle BWL	1.0 to N.C.BWL	School Lane	1.0 to N.C.BWL	School Lane
		0.5 to AWC		0.8 to AWC	
17.	Wilmington -> Artesian Water Company	3.0	Maryland Avenue	5.0	Maryland Avenue
18.	Artesian Water Company <-> Chester Water Authority	4.0 to AWC	Limestone Road	6.0 to AWC	Limestone Road
		1.0 to CWA		1.0 to CWA	
19.	United Water <-> Artesian Water Company	1.0	First State Industrial Park	2 to AWC	First State Industrial Park
				1.5 to UWD	
20.*	United Water <-> Artesian Water Company	1.0	Red Lion Road	Emergency	Red Lion Road
21.	Wilmington <-> United Water	10.0	Edgemoor Reservoir	1.0 to UWD	Christiana Ave.
				0.5 to Wilm.	
22.	United Water <-> Artesian Water Company	1.0	Pleasant Valley Road	0.5 to AWC	Pleasant Valley Road
				1.0 to UWD	
23.	United Water -> Cecil County	0.4	Elkton Road	0.4	Elkton Road
24.	Wilmington -> United Water Delaware (raw water)			10.0	Hoopes Reservoir to Red Clay Cr
25.	Artesian Water Co. <-> New Castle BWL			1.0	Riveredge Industrial Park
					(under construction)
26.	Wilmington <-> United Water			1.5	Wilson Rd. (proposed)
	*Emergency Use Only	35.5		46.75	
			October 2, 2000		Revised in 2000

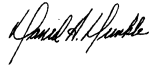
**FINAL REPORT
GOVERNOR'S WATER SUPPLY TASK FORCE**

December 2, 1999

This report was prepared and approved by the Governor's Water Supply Task Force in accordance with Executive Order No. 65. The members of the task force are in general concurrence and agree in principal with the findings and recommendations of the report as attested by:



Jeffrey W. Bullock
Governor's Chief of Staff



Daniel A. Dunkle
Acting General Manager
United Water Delaware

Thomas P. Gordon
County Executive
New Castle County

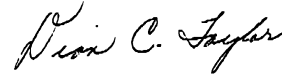
Jeffrey P. Featherstone
Deputy Executive Director
Delaware River Basin Commission



Nicholas A. DiPasquale
Secretary
Delaware Department of Natural
Resources and Environmental Control



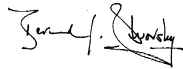
Robert R. Jordan
Director
Delaware Geological Survey



Dian C. Taylor
President & CEO
Artesian Water Company



Joseph A. Dombrowski
Director, Water Department
City of Newark



Bernard L. Dworsky
Project Director
Water Resources Agency



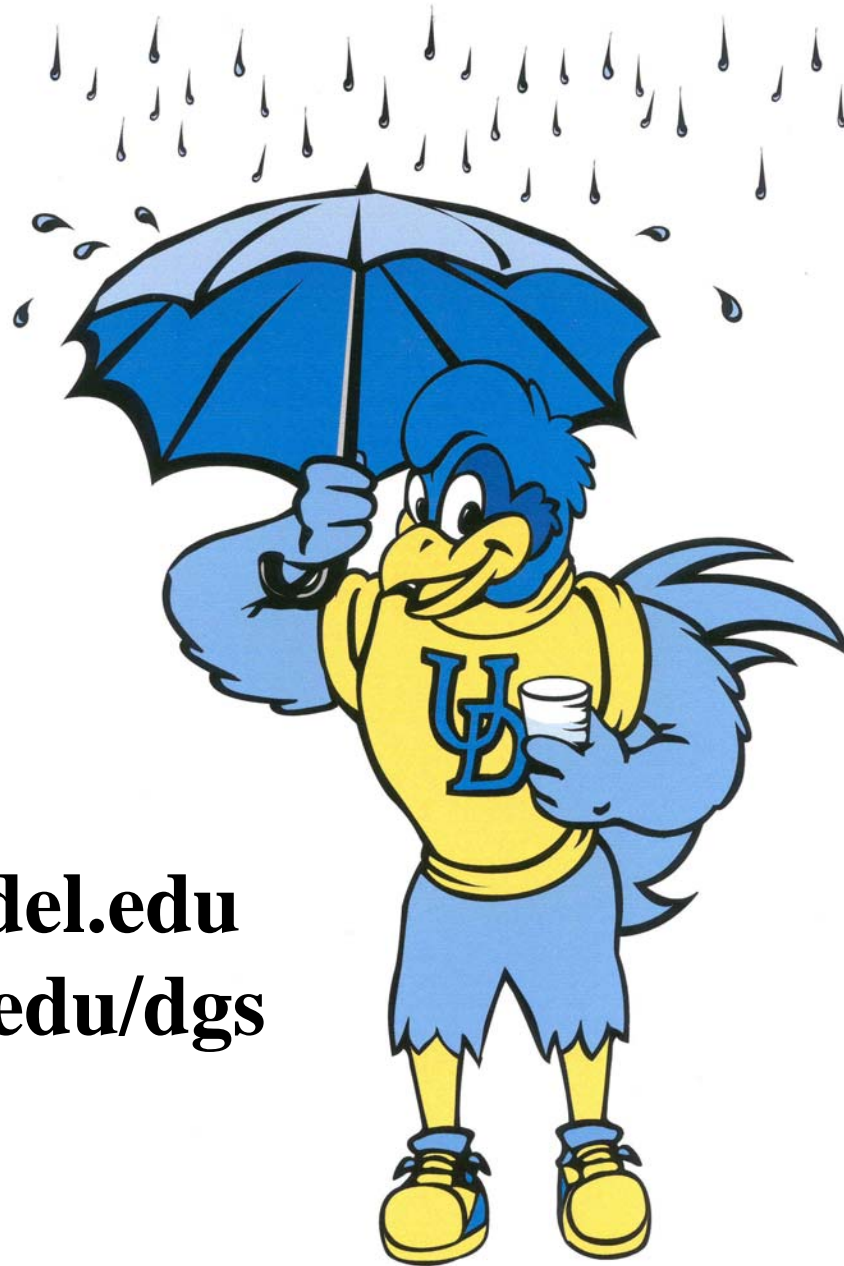
Ulder Jane Tillman, MD, MPH
Director
Delaware Division of Public Health



Kash Srinivasan
Commissioner, Department of
Public Works
City of Wilmington



Robert S. Appleby
President
New Castle Board of Water & Light



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www.udel.edu/dgs

