



December 11, 2007

Mr. John Gysling
New Castle County
Department of Planning
87 Reads Way
New Castle, DE 19720

RE: Report on Source Water Protection for the Surface Water Intakes in New Castle County

Dear Mr. Gysling:

Enclosed is our report summarizing the natural resources protected by the Unified Development Code in the watersheds upstream from the four drinking water intakes in New Castle County. This GIS analysis tabulates the area already protected by the UDC as part of New Castle County's approach to meet the Delaware Source Water Protection Law of 2001. Our analysis indicates the watersheds upstream from the four intakes in New Castle County cover 130 square miles in Delaware. Of this area, the Unified Development Code resource protection levels and public/private open space protect 54 percent of the source watershed area including:

- Brandywine Creek above Wilmington (46 percent)
- White Clay/Red Clay Creeks above Stanton (59 percent)
- White Clay Creek above Newark (75 percent)
- Christina River at Smalleys Pond (45 percent)

Should New Castle County and the State of Delaware desire greater protection to the source watersheds, we recommend defining the following subwatersheds as water resource protection areas (WRPA) in the Unified Development Code as these catchments have high amounts of forests and open space and low amounts of impervious cover:

Brandywine Creek above Wilmington
Red Clay Creek above Wooddale
White Clay Creek above Newark

Middle Run
Mill Creek above Route 7
Muddy Run (tributary to Christina River)

Should you have any questions, please do not hesitate to contact our office at 302-831-4929.

Warmly;

Andrew Homsey

Gerald Kauffman

Cc: George Haggerty, New Castle County
John Barndt, DNREC

Roy Simonson, City of Newark
Sean Duffy, City of Wilmington

**Report on Source Water Protection for the Surface Water Intakes
New Castle County, Delaware
December 11, 2007**

Summary

This report summarizes the natural resources protected by the Unified Development Code in the watersheds upstream from the four drinking water intakes in New Castle County. This GIS analysis tabulates the area already protected by the UDC as part of New Castle County's approach to meet the Delaware Source Water Protection Law of 2001.

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Approach

The Delaware Source Water Protection Law of 2001 requires governments with population exceeding 2000 including New Castle County to develop source water protection regulations. Since 1991, New Castle County has administered a water resource protection area ordinance which protects wellhead, recharge, reservoir watershed, and limestone aquifer areas. New Castle County has four drinking water intakes with source waters in the watersheds of the Brandywine, Red Clay, White Clay and Christina Creeks. These watersheds are protected by resource protection levels set by the New Castle County Unified Development Code and public/private open space.

The purpose of this GIS analysis is to map the natural resources protected by the New Castle County UDC in the watersheds upstream from the four drinking water intakes in New Castle County. This GIS analysis is designed to tabulate the area already protected by the UDC as part of New Castle County's approach to meet the Delaware Source Water Protection Law of 2001.

Scope of Work

The University of Delaware, Institute for Public Administration, Water Resources Agency (IPA-WRA) conducted the following scope of work:

1. *Watershed Base Map* - Utilizing GIS, delineate the watersheds upstream from the following drinking water intakes in New Castle County:
 - Brandywine Creek at Wilmington
 - White Clay/Red Clay Creek at Stanton (United Water Delaware)
 - White Clay Creek at Newark
 - Christina River at Smalleys Pond (United Water Delaware)

2. *Land Use Map* - Map the land use/land cover in the watersheds upstream from the drinking water intakes using the following categories:

<ul style="list-style-type: none"> • Single Family Residential • Multi - Family Residential • Mobile Home Parks • Retail • Other Commercial • Industrial • Transportation/Communication • Utilities • Urban/Built-up 	<ul style="list-style-type: none"> Institutional/Government Recreational Agricultural Forest Wetlands Water Extraction Transition
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3. *Natural Resource Map* – Map and total the acreage of the natural resources protected by Article 10 of the New Castle County Unified Development Code in the source waters upstream from the intakes. Table 40.10.010 lists the natural resources protected by the UDC:
 - Floodplain
 - Wetlands
 - Riparian Buffer (50 ft from floodplain and wetlands, 100 ft from streams)
 - Cockeyville Formation WRPA
 - Cockeyville Formation Drainage Area WRPA
 - Wellhead Class A
 - Wellhead Class B and C
 - Recharge Area WRPA
 - Steep Slopes (15 – 25% and > 25%)
 - Forests (Mature, Young)
 - Public/Private Open Space
 - Reservoir WRPA

4. *Report* - Prepare a letter report summarizing the analysis including the acreage and percentage of the natural resources protected by the Unified Development Code upstream from the drinking water intakes in New Castle County.

Results

Figure 1 delineates the water resource protection area mapping for New Castle County, Delaware. The watershed boundaries (in red) delineate the source waters upstream from the drinking water intakes. The maps delineate WRPAs such as wellhead, recharge, Cockeyville limestone, reservoir, and floodplain areas which are protected by the New Castle County Unified Development Code.

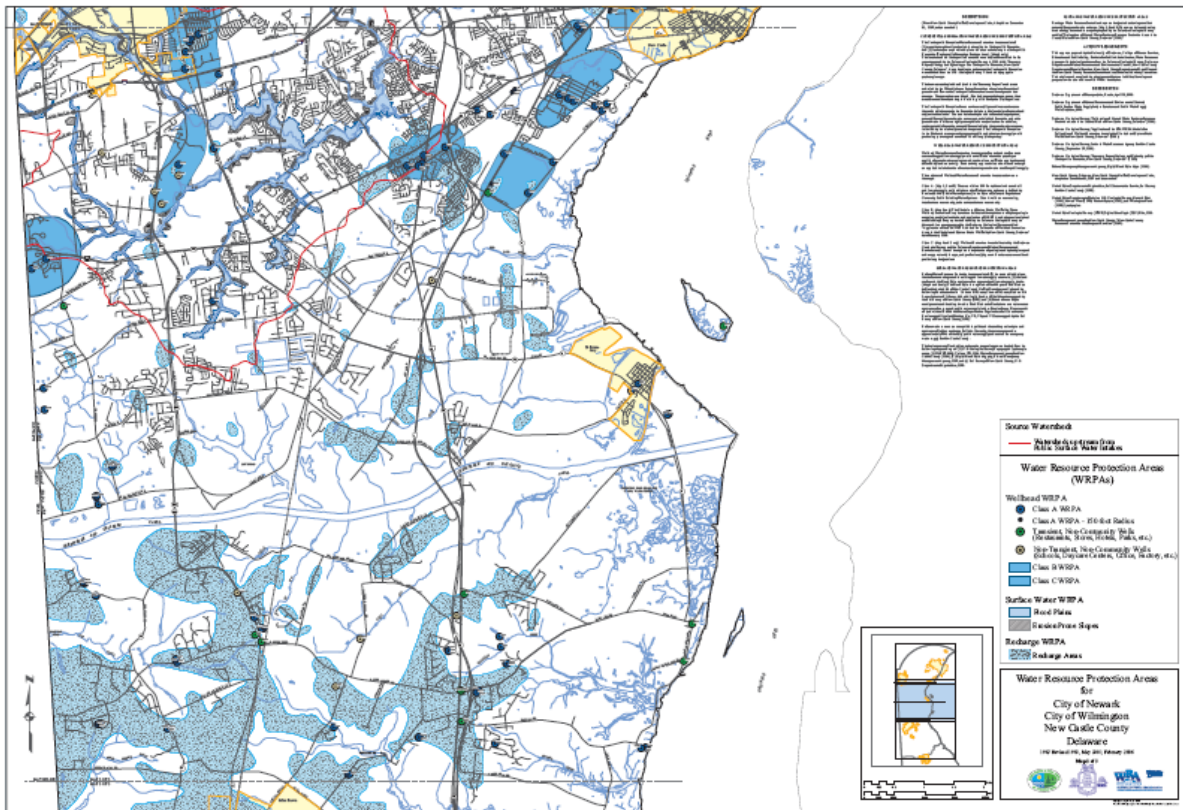
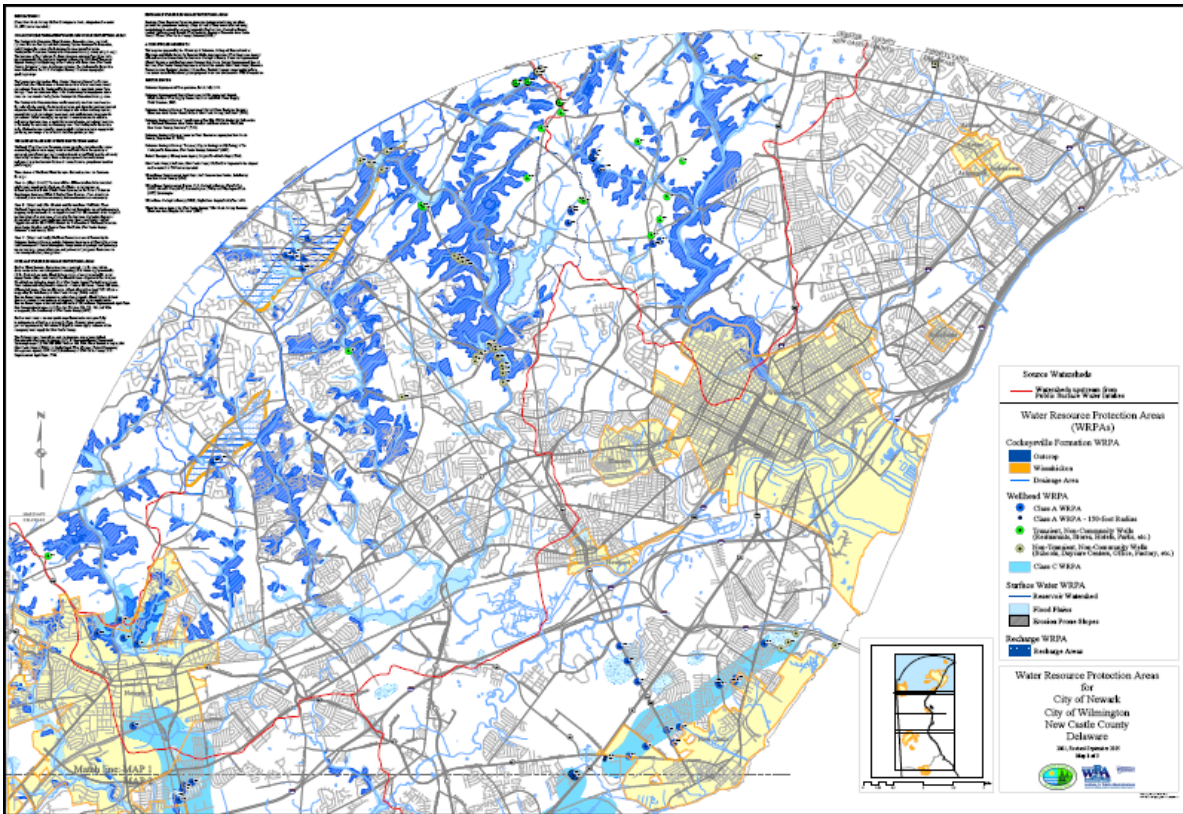


Figure 1 - Water resource protection area mapping for New Castle County, Delaware.

Figure 2 depicts the watersheds upstream from the drinking water intakes. The source watersheds drain 130 square miles in Delaware including:

Brandywine Creek above Wilmington	(20 sq mi)
White Clay/Red Clay Creeks above Stanton	(67 sq mi)
White Clay Creek above Newark	(7 sq mi)
Christina River at Smalleys Pond	(36 sq mi)

Table 1 and Figure 3 portray the land uses in the watersheds upstream from the drinking intakes. Approximately 53 percent of the watersheds upstream from the intakes are classified as developed urban/suburban land leaving the remaining 47 percent as forest, agriculture, wetlands or open space. Among the following source watersheds, the White Clay Creek above Newark is most protected as almost 80 percent is open space or forest.

Brandywine Creek above Wilmington	(45% developed)
White Clay/Red Clay Creeks above Stanton	(56% developed)
White Clay Creek above Newark	(21% developed)
Christina River at Smalleys Pond	(58% developed)

Table 2 and Figures 4 and 5 summarize the natural resources protected by the New Castle County Unified Development Code in the watersheds upstream from the drinking water intakes. Also mapped are public/private open space as these areas protect the intakes from development. Of the 130 sq mi of watershed area upstream from the intakes, the Unified Development Code resource protection levels and public/private open space protect 54 percent of the source watershed area including:

Brandywine Creek above Wilmington	(46 percent protected)
White Clay/Red Clay Creeks above Stanton	(59 percent protected)
White Clay Creek above Newark	(75 percent protected)
Christina River at Smalleys Pond	(45 percent protected)

Table 1 – Summary of land use information from 2002 in surface water source protection areas, New Castle County, Delaware. Figures are in acres unless otherwise indicated.

	Brandywine Creek at Wilmington	White Clay/Red Clay at Stanton	White Clay Creek at Newark	Christina at Smalley's Pond	
Single Family Residential	3,151.5	16,598.9	847.4	7,203.0	
Multi-Family Residential	112.7	1,256.4	0.3	1,338.5	
Mobile Home Parks	22.3	127.0	0.0	404.7	
Retail	847.9	2,327.0	67.2	1,251.8	
Other Commercial	0.0	199.4	0.0	53.6	
Industrial	50.8	408.6	24.0	1,009.8	
Transportation/Communication	142.1	568.7	0.0	799.8	
Utilities	0.1	99.3	0.0	340.4	
Urban/Built-up	979.1	1,350.4	9.4	509.1	
Institutional/Gov't	490.4	1,268.7	0.0	502.8	
Recreational	1,337.1	2,155.9	147.4	326.5	
Agricultural	1,927.4	4,964.0	880.3	2,308.6	
Forestland	3,279.4	10,188.4	2,472.0	5,257.4	
Wetlands	47.1	578.6	34.0	978.2	
Water	235.3	582.7	40.9	193.2	
Extraction	0.0	0.0	0.0	140.8	
Transition	139.2	103.2	0.0	465.2	TOTAL
Total, Acres	12,762.5	42,777.2	4,523.0	23,083.3	83,146.0
Total, Square Miles	19.9	66.8	7.1	36.1	129.9

Table 2 – Summary of significant natural resources in surface water source protection areas, New Castle County, Delaware. Areas are in acres unless otherwise indicated.

	Brandywine Creek at Wilmington	White Clay/Red Clay at Stanton	White Clay Creek at Newark	Christina at Smalley's Pond	
Class A Wellhead	3.3	11.3	0.4	3.8	
Class B Wellhead	0.0	0.0	0.0	567.6	
Class C Wellhead	0.0	989.4	161.1	1,232.0	
Cockeysville Formation	0.0	1,490.2	0.3	0.0	
Cockeysville Drainage Area	0.0	6,323.6	62.8	0.0	
Recharge Areas	0.0	39.3	0.0	655.7	
Erosion Prone Slopes	1,614.5	4,874.8	646.4	582.1	
Slopes > 15%	2,584.7	7,273.6	1,438.1	341.4	
Forest	2,528.5	6,907.4	1,970.0	4,711.8	
Floodplains	880.8	4,027.0	349.5	2,050.1	
Wetlands	253.0	969.5	57.2	1,156.9	
Riparian Buffer	1,873.9	7,427.1	709.3	4,246.1	
Public/Private Open Space	1,857.7	7,966.2	2,445.5	3,203.1	
Hoopes Reservoir	10.0	1,240.4	0.0	0.0	
Newark Reservoir	0.0	1,207.1	1,207.1	0.0	TOTAL
<i>Non-exclusive Total, Acres</i>	11,606.4	50,747.0	9,047.9	18,750.6	131,851.0
<i>Exclusive Total, Acres</i>	5,840.4	25,334.5	3,389.1	10,291.4	44,855.5
<i>Exclusive Total, Sq. Miles</i>	9.1	39.6	5.3	16.1	70.1
<i>% of Watershed Protected</i>	45.8%	59.2%	74.9%	44.6%	

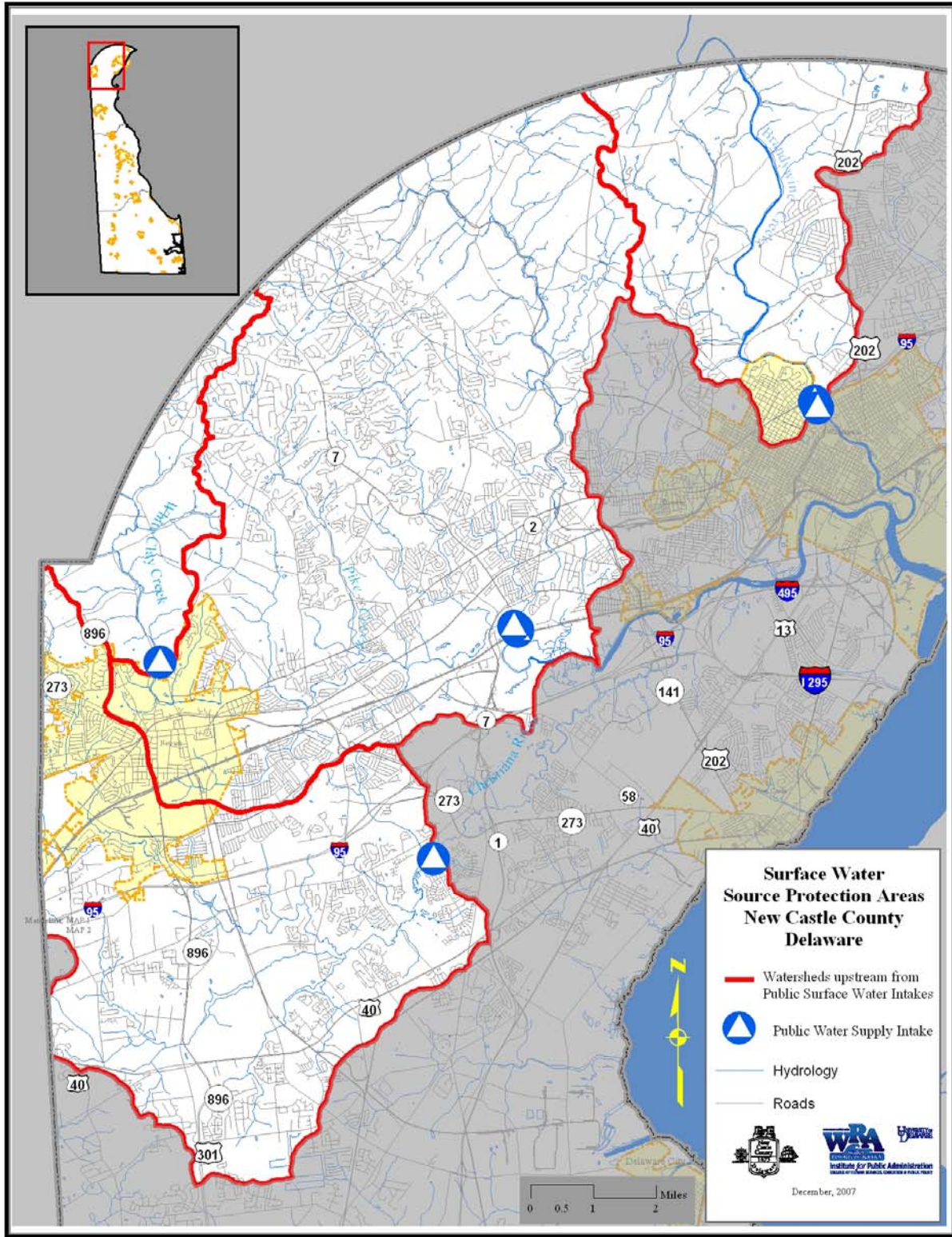


Figure 2 – Surface water source protection areas for New Castle County, Delaware, with locations of public water supply intakes shown.

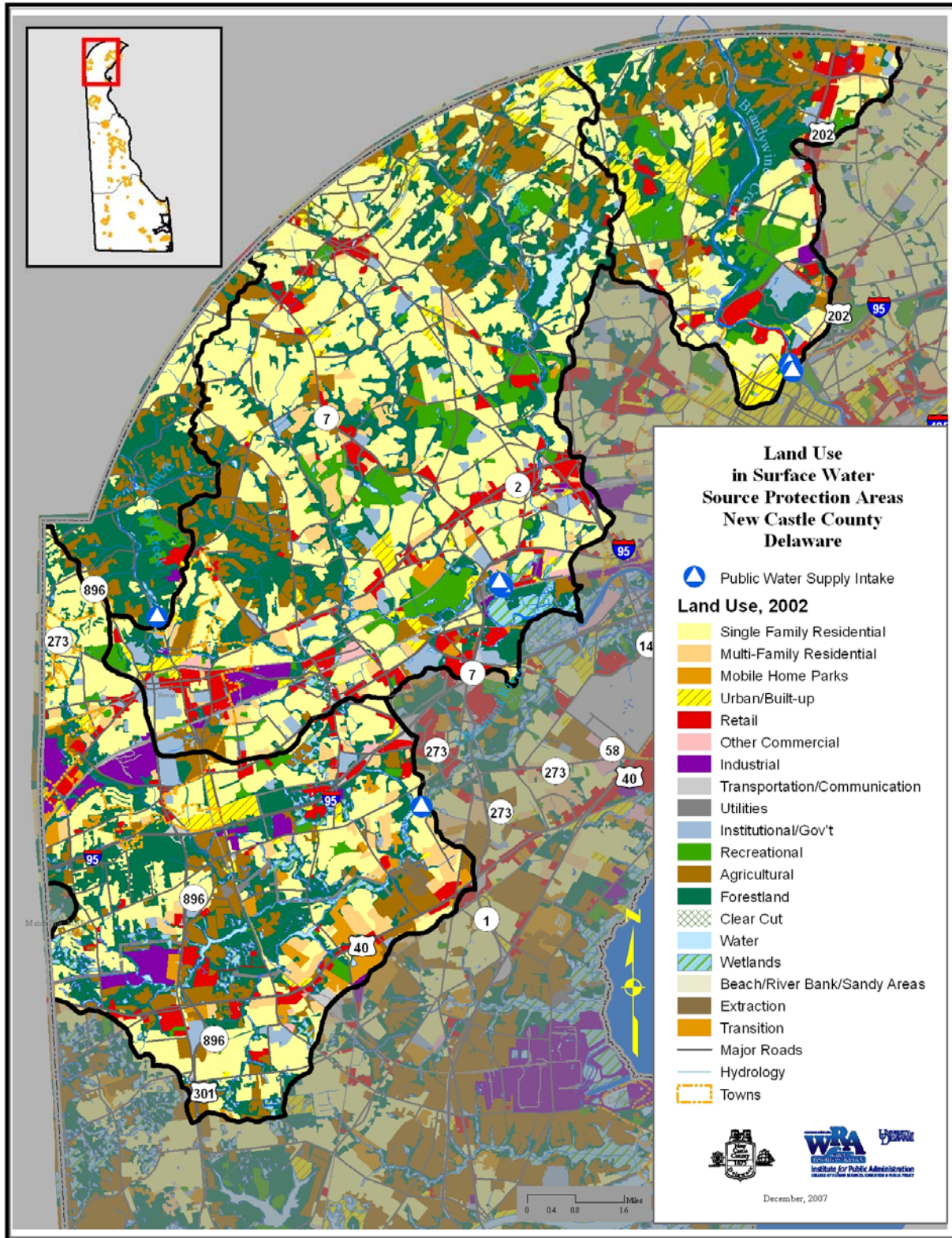


Figure 3 – 2002 land use within surface water source protection areas.

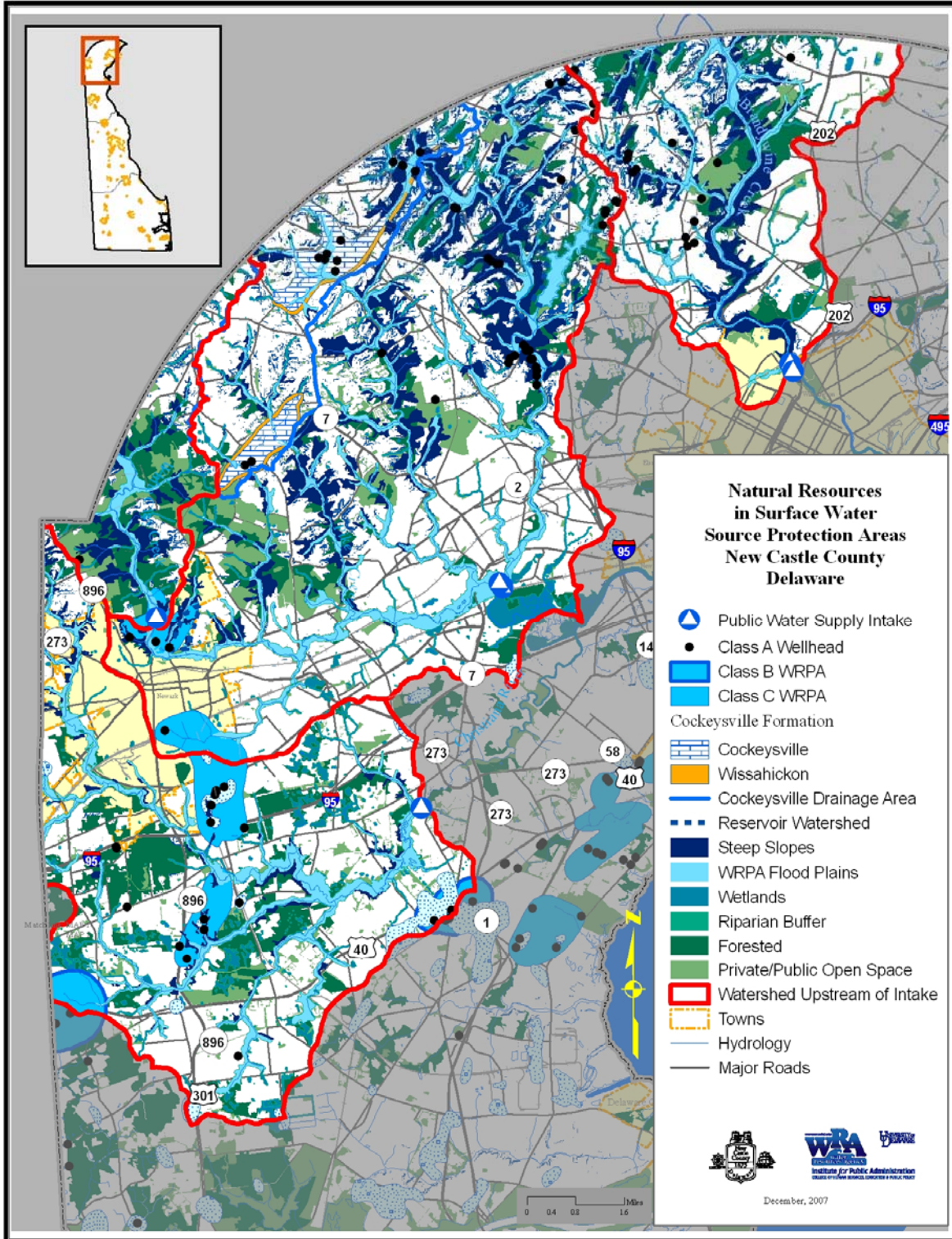


Figure 4 – Areas of significant natural resources within surface water source protection areas, including areas protected by WRPA ordinance and the Universal Development Code (UDC) for New Castle County.

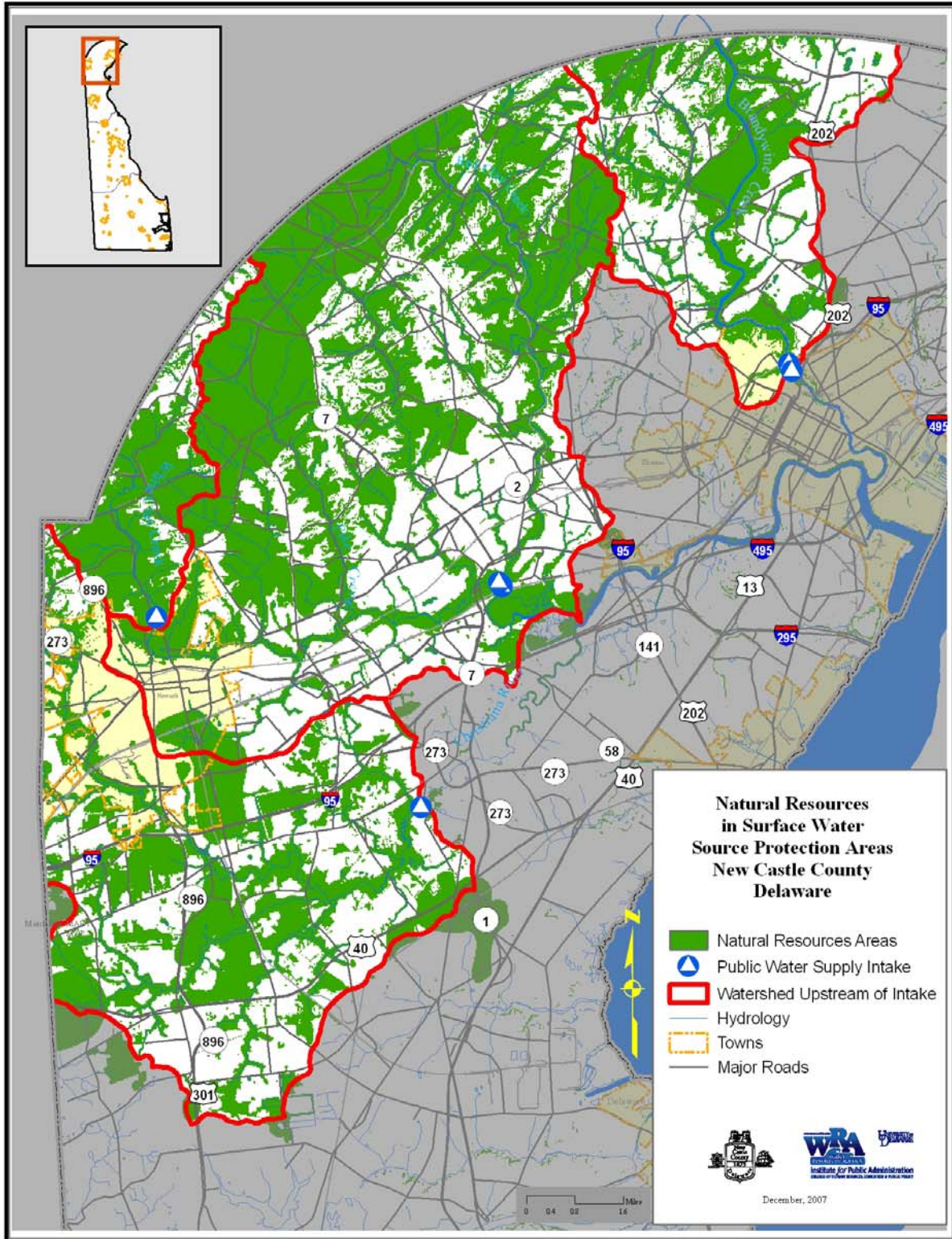


Figure 5 – Combined view of areas of significant natural resources within surface water source protection areas for New Castle County.