

Appendix E

Richmond Regional Planning
District Commission
Impervious Surface Report

October 28, 2010

This project was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA09N0S4190163 of the US Department of Commerce National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended.

Town of
Ashland
Counties of
Charles City
Chesterfield
Goochland
Hanover
Henrico
New Kent
Powhatan
City of
Richmond



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For the hearing impaired, call the
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Product #3: Impervious Surface Analysis
By the Richmond Regional Planning District Commission
For the Virginia Coastal Zone Management Program

Overview

The Richmond Region is comprised of nine localities and covers approximately 2,165 square miles. The region is the approximate size of Delaware.

During federal fiscal year beginning October 1, 2009 and ending September 30, 2010, Richmond Regional Planning District Commission staff focused their efforts on the following tasks:

- Digitizing structures added to the region from 2007 to 2009, approximately a two year period; and
- Improving the transportation layer; and
- Improving attribute definitions; and
- QA/QC for 1994, 2002 and 2007 data

Change in Regional Imperviousness

For the two year period from 2007 to 2009, the Richmond Regional Planning District Commission estimates that the region gained about 353 acres in impervious coverage due to an increase in *structures* only. As compared to previous years, this increase represents a growth rate of about 0.8 percent per year. This relatively lower rate of increase is likely due to both the slow economic growth and resulting 18-month recession. In addition, this amount of impervious cover does not yet include non-buildings, transportation and environmental features defined below. These attributes are planned to be digitized during FFY09 and added to the database.

Table 1 shows the total number of impervious cover by acres for the Richmond Region for 1994, 2002, 2007 and 2009, with the exception of 2009 data only representing structures. This represents an annual rate of growth from 1994 to 2002 of about 2 percent, 2.5 percent between 2002 and 2007, and a low annual estimate of 0.8 percent from 2007 to 2009 due to incomplete data and analysis.

Table 1

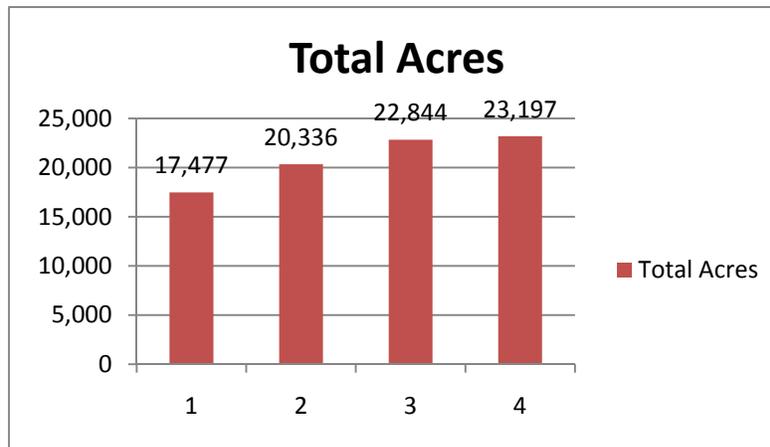
Year	Total Acres	Percent Change	% Change /Year
1994	17,477		
2002	20,336	16%	2.0%
2007	22,844	12%	2.5%
2009*	23,197	2%	0.8%

* Structures only

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Chart A shows the gradual increase in impervious cover for the region for year 1 (1994), year 2 (2002), year 3 (2007) and year 4 (2009 structures only.)

Chart A



Total Imperviousness

Total imperviousness for the region as of 2009 was 1.9 percent with water bodies removed from land area calculations. Total imperviousness for each locality within the region is approximated as follows:

- Town of Ashland: 4.2 percent
- Charles City County: 0.3 percent
- Chesterfield County: 2.9 percent
- Goochland County: 0.4 percent
- Hanover County: 1.0 percent
- Henrico County: 5.4 percent
- New Kent County: 0.6 percent
- Powhatan County: 0.5 percent
- City of Richmond: 28.1 percent

Regional and locality-specific maps showing imperviousness for benchmark years of 1994, 2002 and 2009 are included at the end of this report.

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Transportation Layer

Significant improvements have been made to the 1994, 2002 and 2007 regional transportation data. The U.S. interstate and highway system was reviewed and areas of data improvements include clean-up of roadway median areas, ramps and major interchanges. Similar reviews were also preformed for Virginia highways and also included changes in lane and parking lot footprints for tolling facilities and rest areas. Railroads were also added to the regional database.

Defining Attributes

Based on observations from past year's work, PDC staff derived four major categories to group features as follows:

- Buildings
- Non-buildings
- Transportation
- Environmental

These categories were further defined to draw attention to the types of growth and develop occurring with regards to land use planning practices. For example, **Buildings** were further defined into both primary structure and accessory structure. Accessory structures include out-buildings, storage and farm-related buildings such as silos. It should be noted that structures smaller than 100 square feet that are thought to include dog houses/runs and children's back yard play boxes are excluded from the definition of structures and not included in the data.

Non-building features include recreation/sports, patio/deck, tank farm, water/wastewater/tanks, building foundations and paved areas (not-transportation related.) Recreation and sports structures include objects such as tennis and basketball courts, baseball fields, bleachers, equestrian tracks, swimming pools and playgrounds.

Transportation features are significant throughout the region and include objects such as roads, alleys, railroads, train yards, airport runway/taxiway/tarmac, port/dock/pier, bus terminal surface areas, bike paths, sidewalks and parking/driveways. At this time, the road inventory includes hard surface, public roads with the emphasis on interstates, highways, rural highways and rural secondary roads. The parking/driveway inventory includes objects such as private roads, parking lots, parking pads (often used for outside storage for trailer, lumber and boats) and both public and private driveways. The surface can be hard (paved) or merely compacted (unpaved or gravel.)

Environmental features for the purpose of this inventory include objects such as ponds used for stormwater management and farming operations, mud bogs and mining sites.

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Quality Control/Quality Assurance

Variations on Local Data: Points, polygons and non-residential uses only.

The preliminary data for each jurisdiction has been in various levels of completeness and required considerable interpretation in order to develop a consistent regional data base for analysis. For example, the 2002 data for one of the counties in the region consisted of centroids (dot) on parcels to mark the presence of a structure. The 2007 data was significantly improved to consist of a uniform polygon (rectangle) to approximate the location and size of structures. Similar to the centroid, the polygon was not necessarily representative of the actual building footprint, and did not necessarily include decks, patios, swimming pools etc. This information was collected by PDC staff through review of the data and individual digitization when necessary.

While the centroids and polygons are helpful to identify the location of structure, PDC staff had to digitize each structure to show actual impervious cover.

Another locality continues to work on digitizing non-residential structures. PDC staff focused its efforts on digitizing only residential structures to avoid a duplication of efforts and have provided this data to the county in exchange for the promise of future non-residential data. Again, while this provided useful as a starting point not all structures have been captured.

Another example is a locality that is surrounded on two sides by rivers. The locality did not include boathouses as part of its original structure inventory. PDC staff added these features to the regional database along with docks and piers that are an important feature in shoreline management planning.

Removal of 100 Small Structures

During the early years of the project, the goal was to capture all imperviousness. This goal has become unachievable as identifying all small structures on a region-wide scale is unrealistic. PDC staff queried 1994, 2002 and 2007 databases for each of the nine localities to remove these.

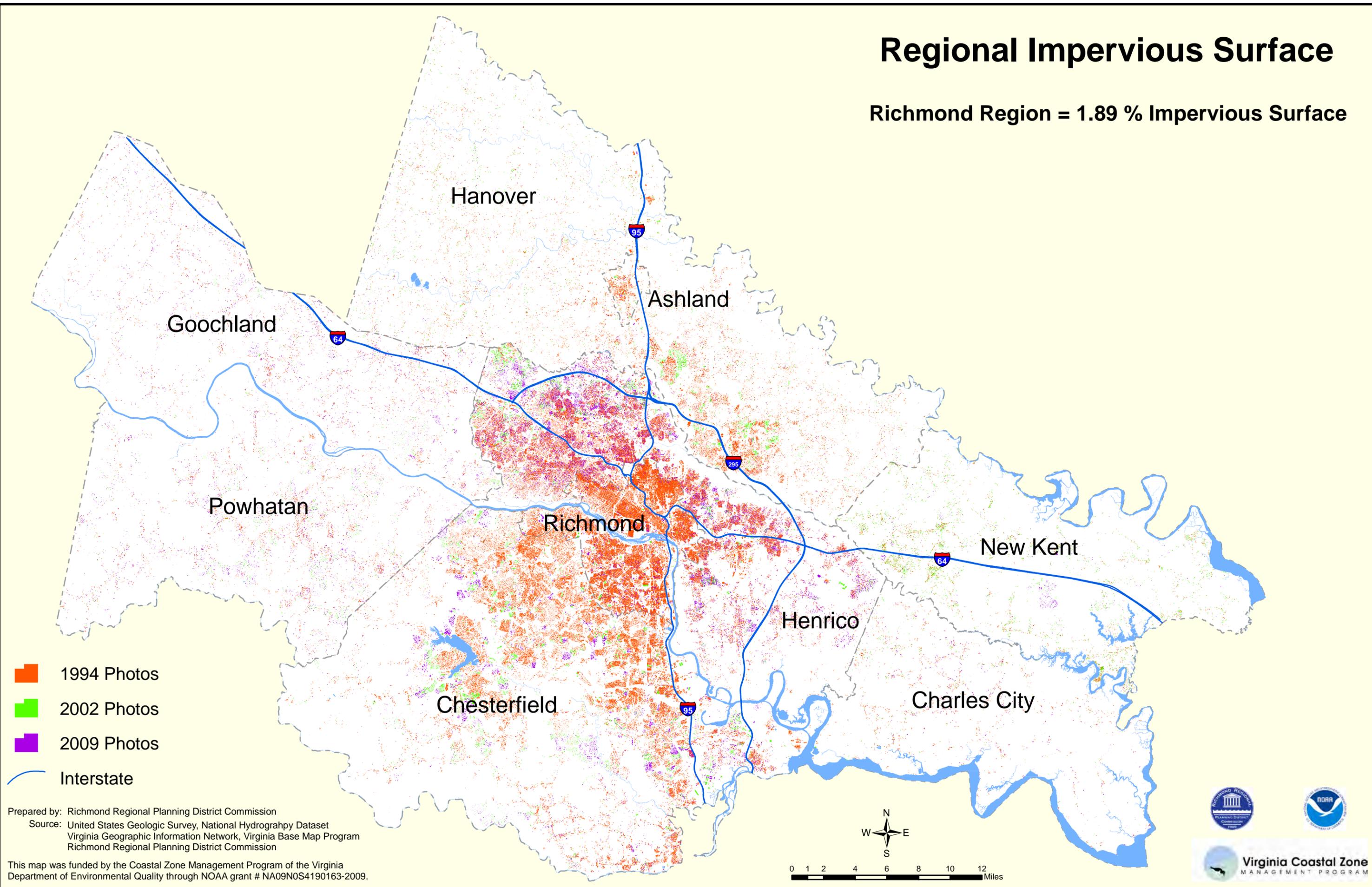
Next Steps

Completion of 2009 Inventory: This process will include the addition of non-buildings, and transportation and environmental features as defined.

Review of 1994, 2002 and 2007 Database: PDC staff will continue to meticulously review each locality's attribute data to ensure it is categorized in accordance with the defined classification system.

Regional Impervious Surface

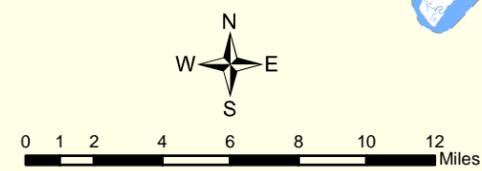
Richmond Region = 1.89 % Impervious Surface



- 1994 Photos
- 2002 Photos
- 2009 Photos
- Interstate

Prepared by: Richmond Regional Planning District Commission
Source: United States Geologic Survey, National Hydrography Dataset
Virginia Geographic Information Network, Virginia Base Map Program
Richmond Regional Planning District Commission

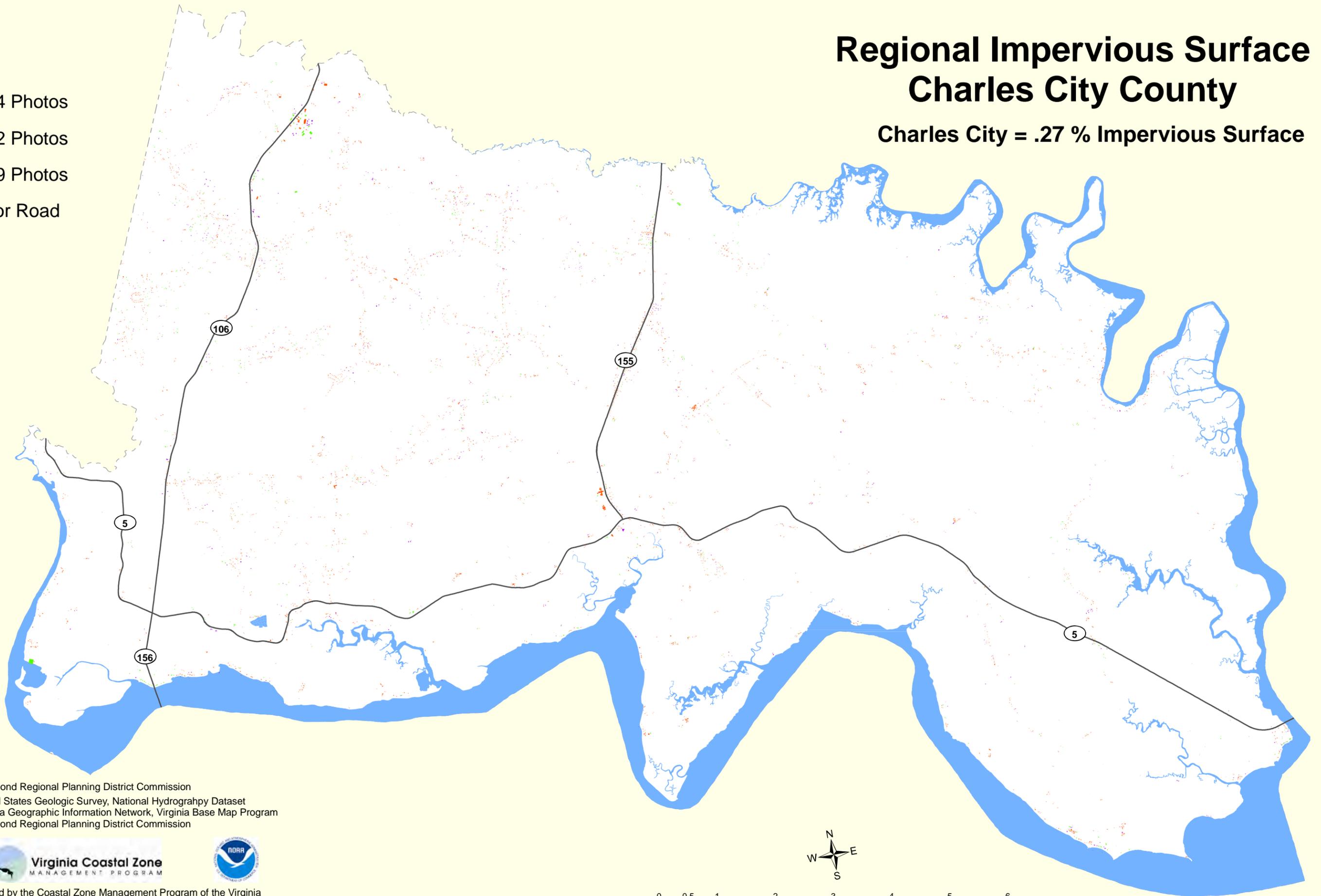
This map was funded by the Coastal Zone Management Program of the Virginia Department of Environmental Quality through NOAA grant # NA09N0S4190163-2009.



Regional Impervious Surface Charles City County

Charles City = .27 % Impervious Surface

- 1994 Photos
- 2002 Photos
- 2009 Photos
- Major Road



Prepared by: Richmond Regional Planning District Commission
Source: United States Geologic Survey, National Hydrography Dataset
Virginia Geographic Information Network, Virginia Base Map Program
Richmond Regional Planning District Commission

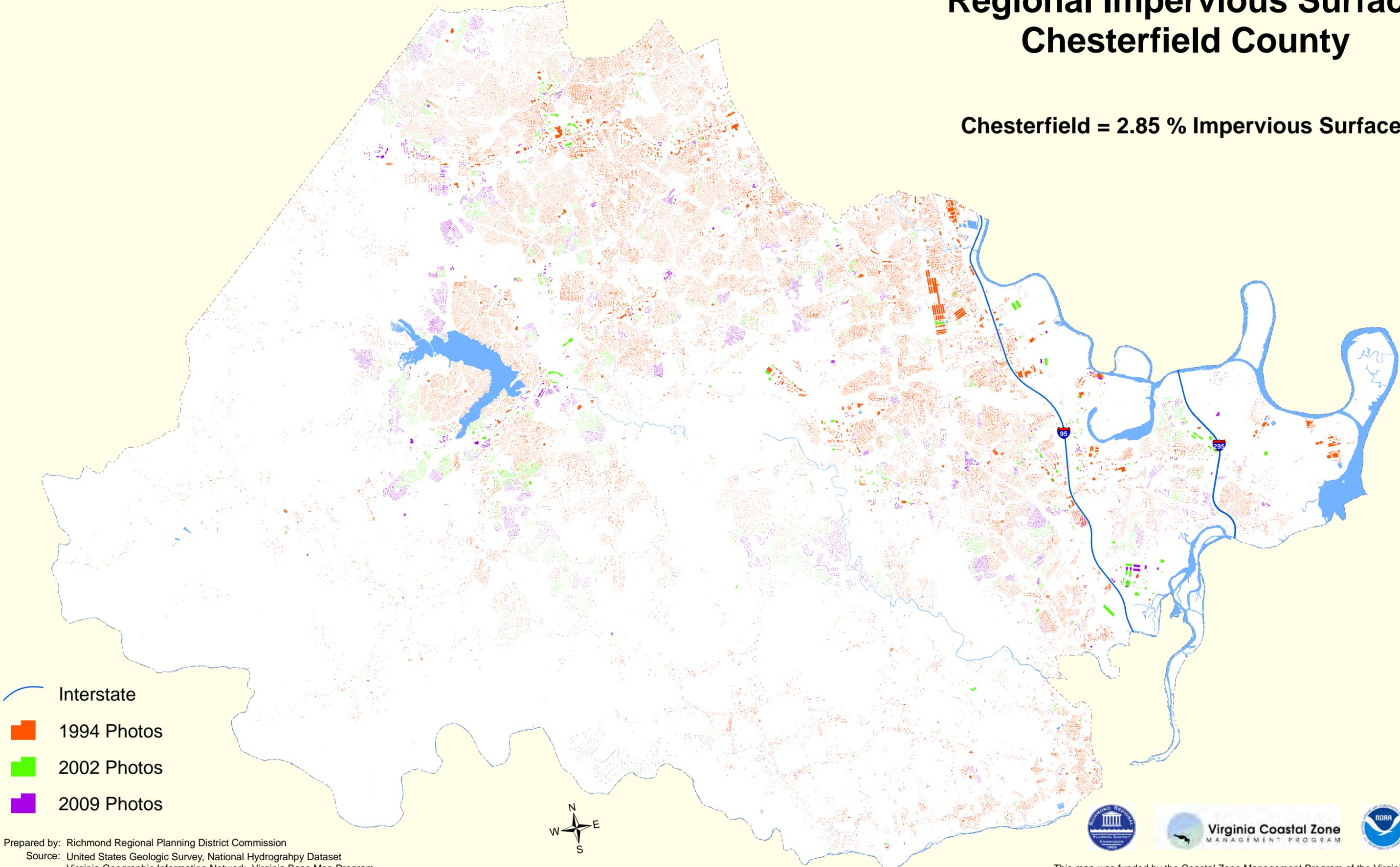


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0 0.5 1 2 3 4 5 6 Miles

Regional Impervious Surface Chesterfield County

Chesterfield = 2.85 % Impervious Surface



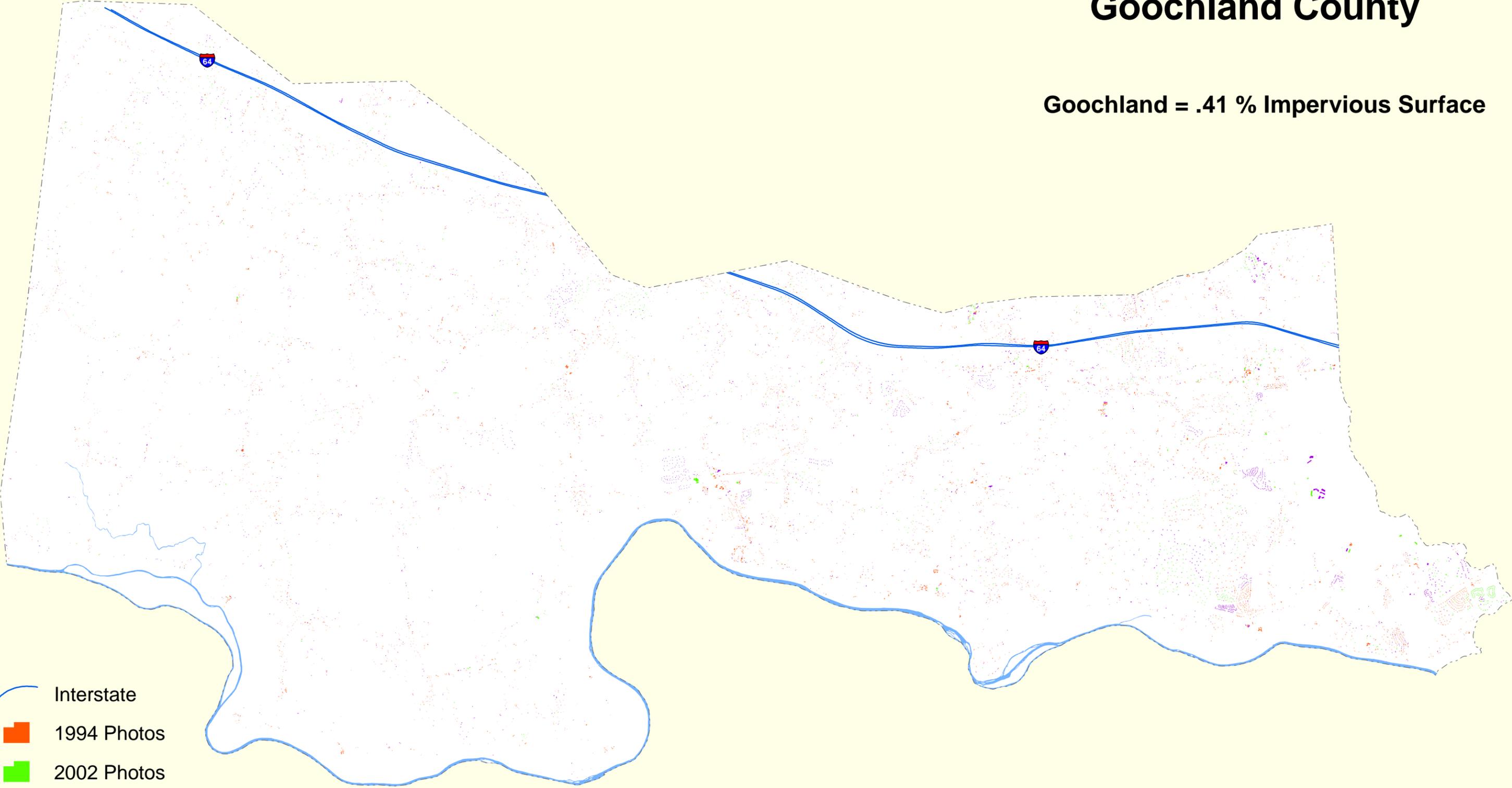
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Richmond Regional Planning District Commission



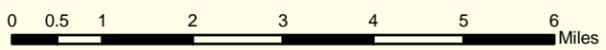
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Regional Impervious Surface Goochland County

Goochland = .41 % Impervious Surface



- Interstate
- 1994 Photos
- 2002 Photos
- 2009 Photos



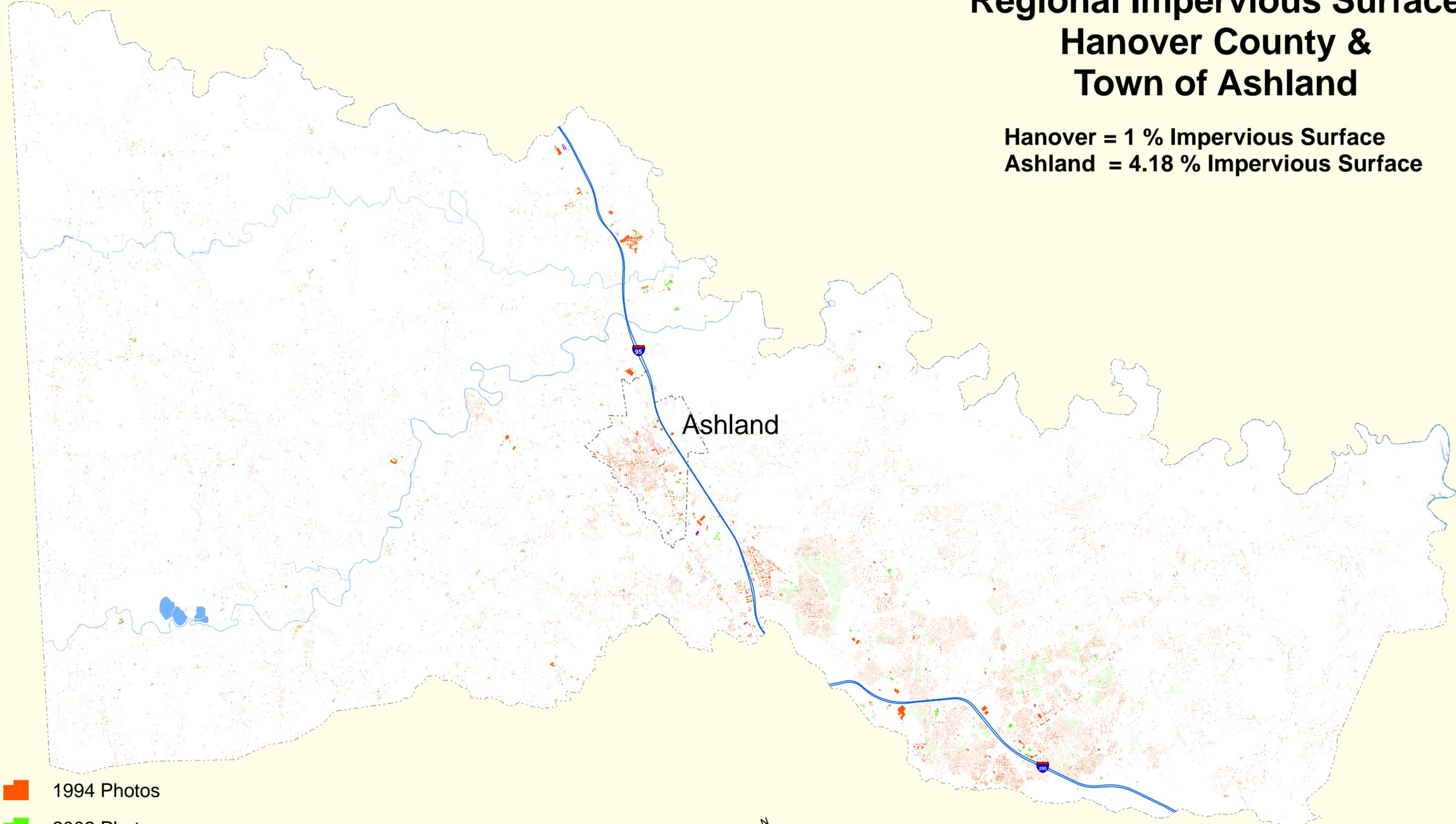
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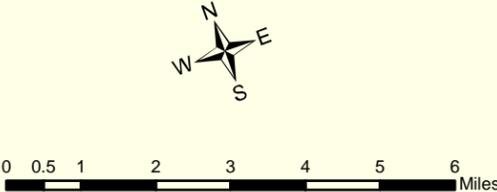
Regional Impervious Surface Hanover County & Town of Ashland

Hanover = 1 % Impervious Surface
Ashland = 4.18 % Impervious Surface



-  1994 Photos
-  2002 Photos
-  2009 Photos
-  Interstate

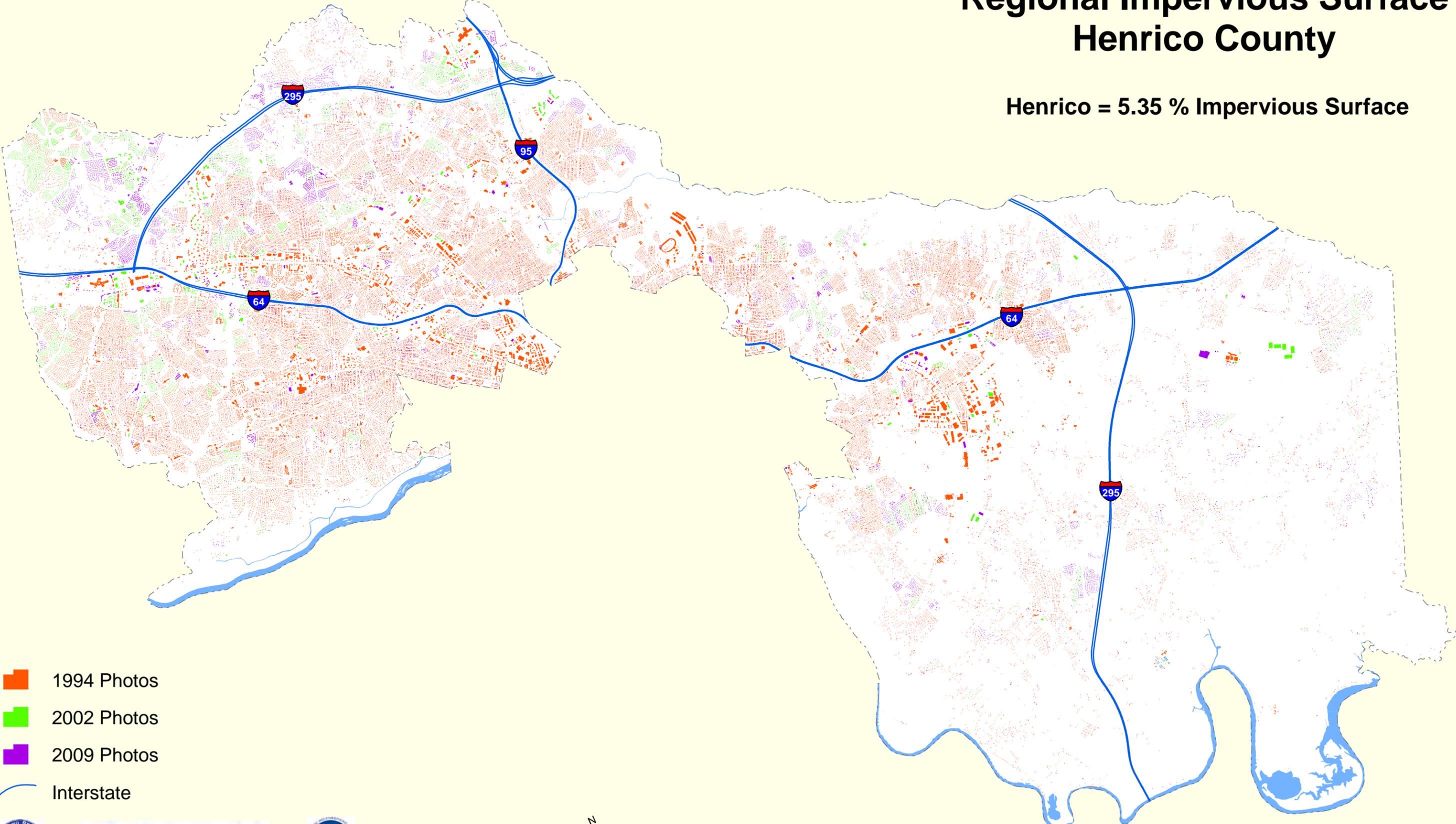
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 Source: United States Geologic Survey, National Hydrography Dataset
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Regional Impervious Surface Henrico County

Henrico = 5.35 % Impervious Surface



- 1994 Photos
- 2002 Photos
- 2009 Photos
- Interstate



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Prepared by: Richmond Regional Planning District Commission
Source: United States Geologic Survey, National Hydrography Dataset
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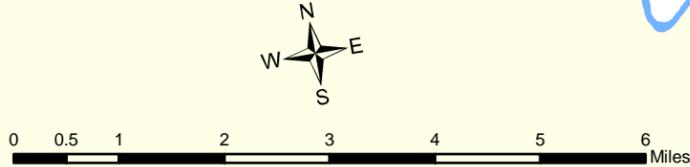
Regional Impervious Surface New Kent County

New Kent = .55 % Impervious Surface



- 1994 Photos
- 2002 Photos
- 2009 Photos
- Interstate

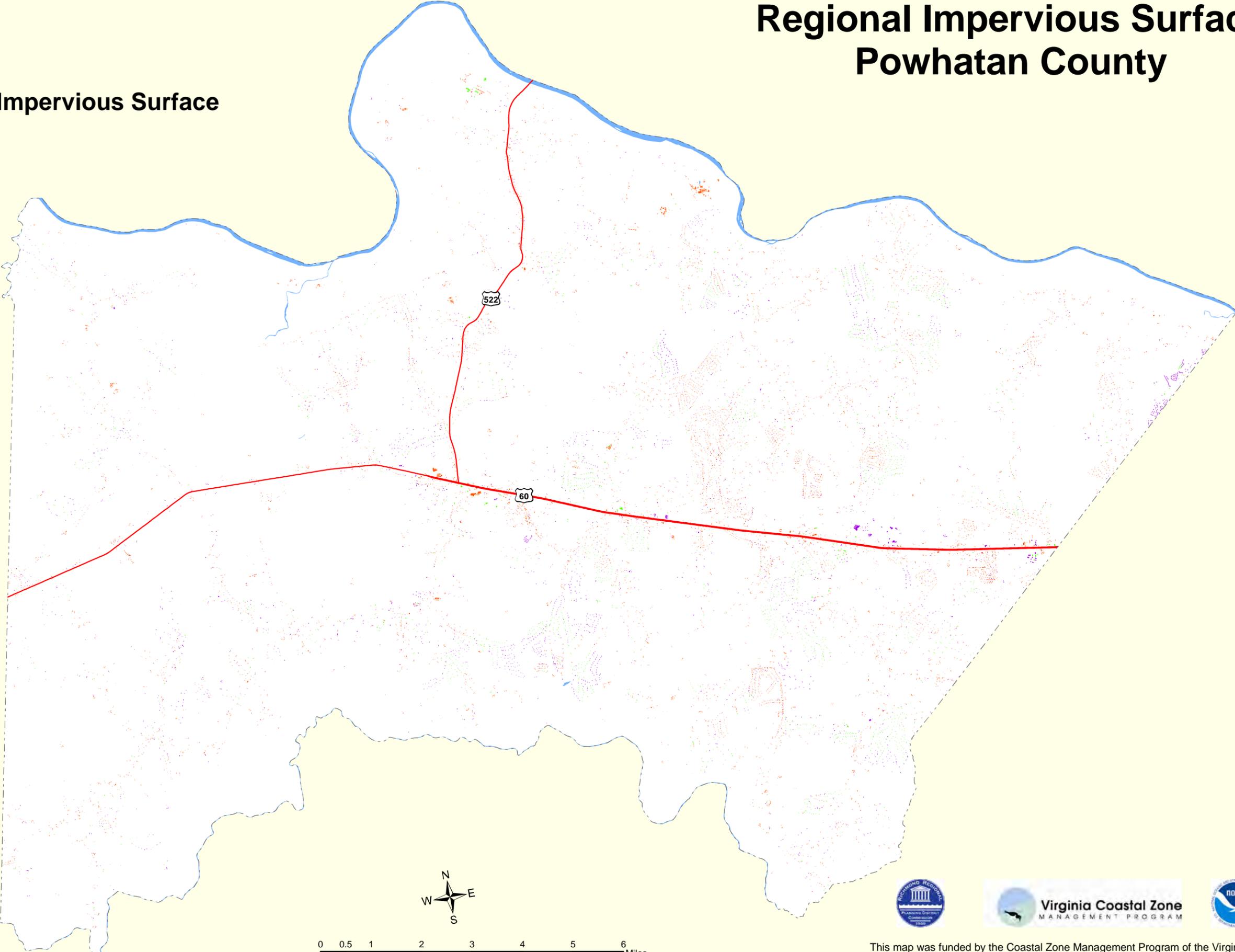
Prepared by: Richmond Regional Planning District Commission
 Source: United States Geologic Survey, National Hydrography Dataset
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Regional Impervious Surface Powhatan County

Powhatan = .50 % Impervious Surface



- Highway
- 1994 Photos
- 2002 Photos
- 2009 Photos

Prepared by: Richmond Regional Planning District Commission

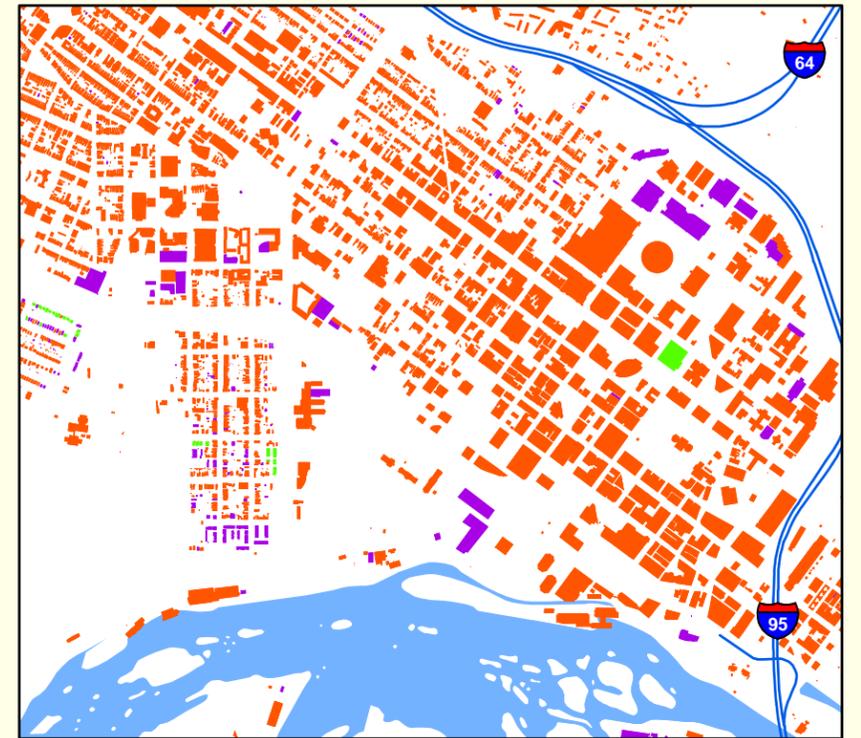
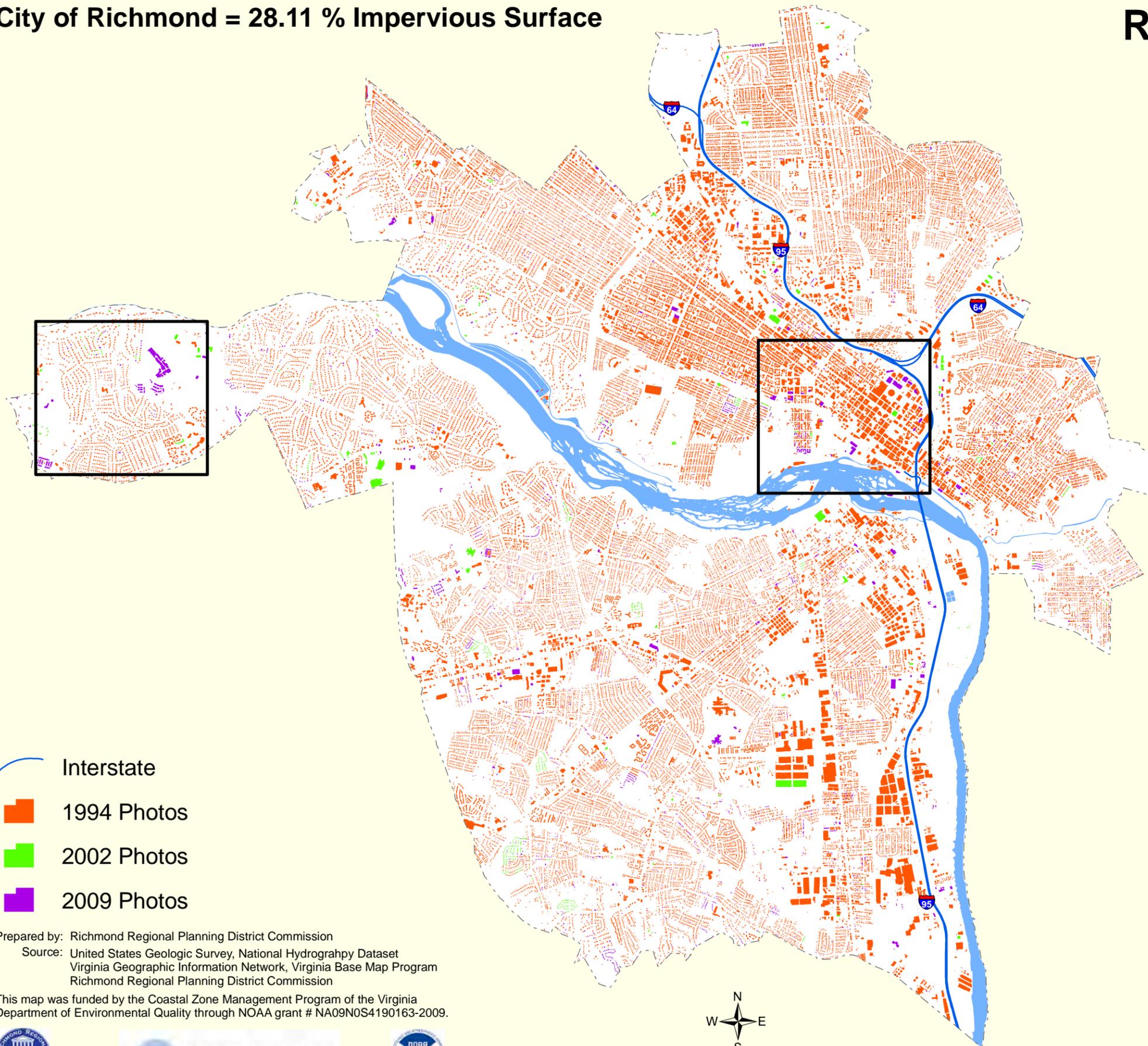
Source: United States Geologic Survey, National Hydrography Dataset, Virginia Geographic Information Network, Virginia Base Map Program, Richmond Regional Planning District Commission



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City of Richmond = 28.11 % Impervious Surface

Regional Impervious Surface City of Richmond



Central Business District



0 0.25 0.5 1 Miles

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Source: United States Geologic Survey, National Hydrography Dataset
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