Characterization and Assessment of the Cedar Grove Brook Watershed

September 2009 – Final Draft

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Project Background

In November 2003, the New Jersey Department of Environmental Protection Division of Watershed Management funded the New Jersey Water Supply Authority's (NJWSA) Section 319(h) Nonpoint Source grant proposal, "Stormwater Management Plan for the Cedar Grove Brook Watershed". NJWSA submitted this project with support from Franklin Township, Somerset County and the Somerset-Union County Soil Conservation District.

This project focuses on developing a watershed-based stormwater management plan to improve water quality problems caused by nonpoint source pollution and stormwater. Total NJDEP funding is $150,000 with a match of approximately $50,000 from NJWSA (using the Source Water Protection Fund and general budget funds) and in-kind support from the Franklin Township. The project will have beneficial results for the Delaware & Raritan Canal. As needed, watershed-specific criteria will be developed for stormwater management from new developments and potential projects will be identified for reducing the impact pollution from existing land uses. Through implementation of the Plan, pollutant loads to the Canal will be reduced and controlled, and stream baseflow to the Canal will be maintained.

The characterization and assessment will provide an in-depth characterization of the current conditions within the Cedar Grove Brook Watershed, and an evaluation and assessment of the findings to determine the short-term and long-term management measures that will be required to allow the stream to achieve full attainment of its designated uses. The characterization and assessment report is intended for preliminary assessments of the watershed and cannot substitute for on-site testing and evaluations.

Physical Setting of the Cedar Grove Brook Watershed

Cedar Grove Brook (also known as Al's Brook), an FW2-NT (Fresh water Category 2, non trout) waterbody, is a significant tributary to the Delaware & Raritan Canal, one of New Jersey's major water supply facilities. The Brook is located in Franklin Township, Somerset County and discharges to the Canal approximately 2 miles upstream of the water supply intakes for Middlesex Water Company, the Township of East Brunswick and the City of New Brunswick (**Figure 1**).

The Cedar Grove Brook encompasses a drainage area of approximately 1788 acres, located completely within HUC14 02030105-120-160[1], the Lower Raritan River from Mile Run to I-287 Piscataway, in the Lower Raritan Watershed Management Area (WMA 9).

The Cedar Grove Brook watershed is the fourth largest direct drainage area to the Canal, and is over 63 percent urban land coverage (as of 2006) with development continuing. The D&R Canal between Ten Mile Lock and Landing Lane Bridge receives excess loads of total suspended solids and turbidity causing sedimentation in the Canal and increased costs for drinking water

[1] HUC is a Hydrologic Unit Code is used for identifying watersheds. The number indicates the level to which the larger watersheds are subdivided.

treatment. Cost-effective stormwater and stream channel management to address problems caused by current and past development is needed.

The Cedar Grove Brook including all its tributaries is 3.6 miles long and rises from the wooded wetlands near Amwell Road in Franklin Township. It flows north through residential, commercial and forested areas before discharging to the D&R Canal at Easton Avenue (see aerial photography in **Figure 2**).

Because population estimates are done based upon political boundaries instead of watershed boundaries, the exact population within the watershed can only be estimated. According to the US Census Bureau, the population in Franklin Township increased from 42,780 in 1990 to 50,903 (19% increase) in 2002, to 58,461 (14.8% increase) in 2005. Much of the development activity in the watershed occurred between 1970 and 1990. There is however, continued in-fill development, particularly along Cedar Grove Lane.

Figure 1: Location of Cedar Grove Brook Watershed

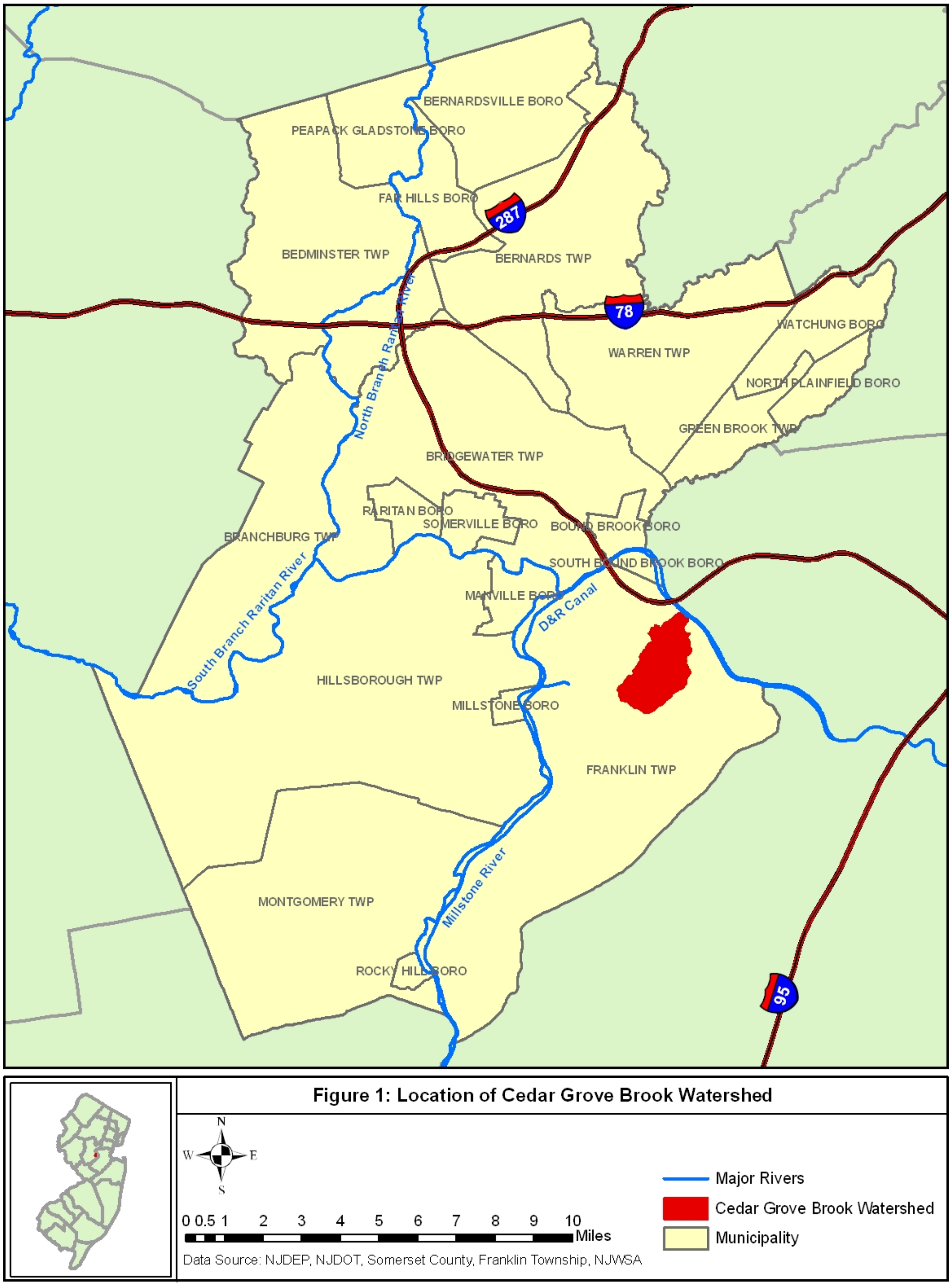

Figure 2: Aerial Photography of Cedar Grove Brook Watershed

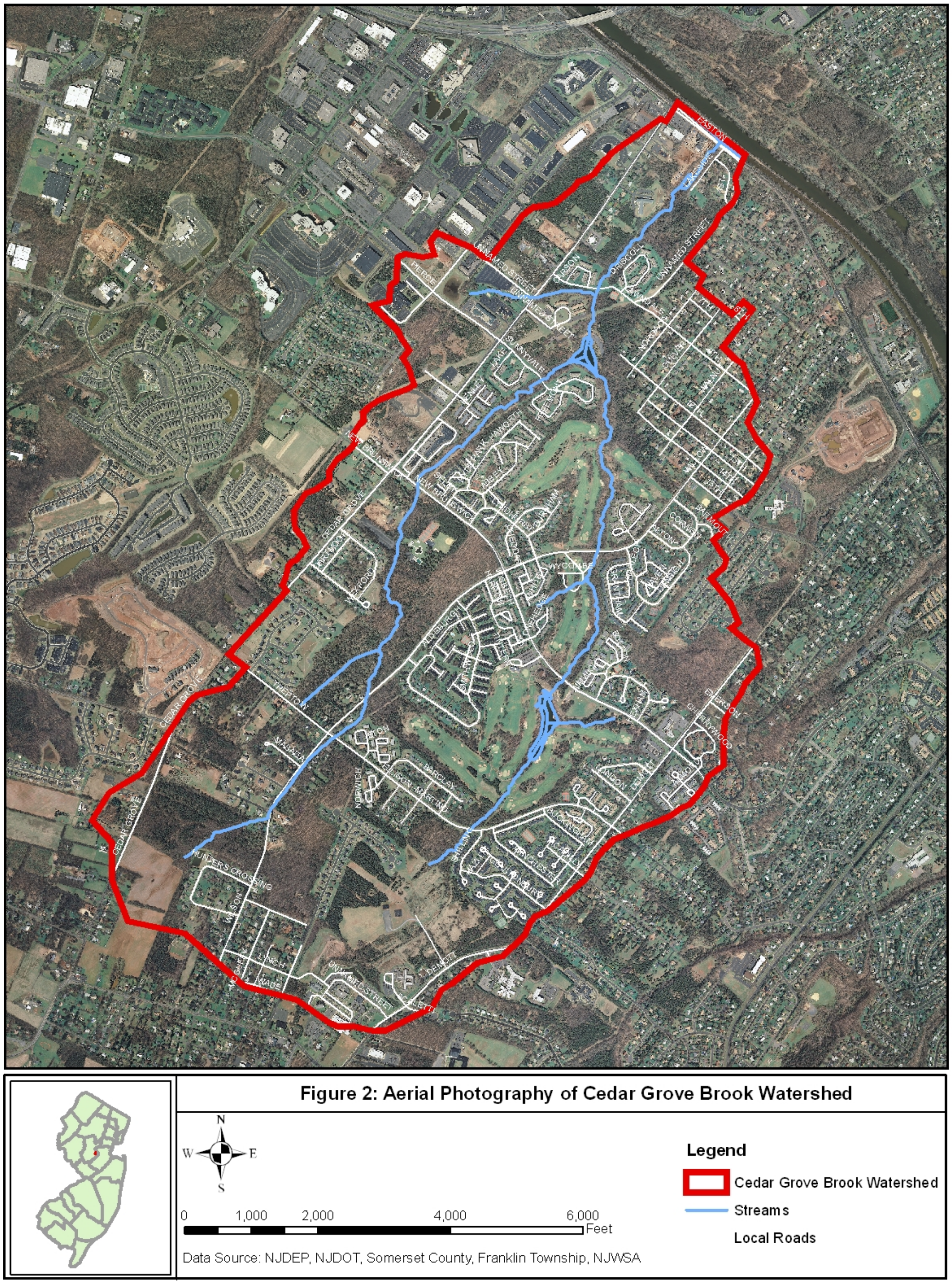

Figure 2: Aerial Photography of Cedar Grove Brook Watershed

Land Use Land Cover & Impervious Surface

The Cedar Grove Brook watershed is mostly developed; however, the riparian corridors are still forested in much of the watershed. Forested riparian corridors help to provide shade; stabilize stream banks and contribute to a stream's ability to support a variety of pollution sensitive species of aquatic life. Although at present the creek's corridors are lightly developed, pressure is mounting from the commercial development along Easton Avenue and highly populated residential areas within this watershed.

In November 2006, NJWSA staff revised the 2002 NJDEP land use land cover data based on field reconnaissance to analyze the pattern of land use change from 1986 to 1995, 1995 to 2002 and 2002 to 2006. Most of these changes may be characterized as impacts to natural habitats. These include (in order of frequency) a change from agriculture to residential use; forest to residential; wetlands to residential; forest to agriculture; and wetland to agriculture.

The Cedar Grove Brook watershed is primarily urban in nature (63% in 2006), with scattered forest and wetlands. By 2002, most of the area had already been developed, with only 27 acres converted to urban through 2006 (**Table 1**). While from 1995 to 2002, total 113 acres of new urban area has been added, developed in the previous forest, agriculture or wetland area (**Table 2**). An even faster development pace occurred during the period from 1986 to 1995 (**Table 3**), which added 290 acres of new urbanized area to this watershed. By sum, during the past 20 years from 1986 to 2006, a total of 431 acres have been converted to urban land in this watershed (**Table 4 and Figure 3, Figure 4 and 5**). Even though the development pace has slowed in the recent years, any new development could put further stress on the watershed.

A number of recent studies have shown that the hydrologic and pollutant loading in a watershed is directly related to the amount of impervious cover in that watershed[2]. Once the amount of impervious cover is greater than 5% to 10%, there is a drastic reduction in the health of a stream. Impervious surfaces do not allow rain and storm water to recharge naturally. Instead, this water becomes runoff, which is routed to the stream more quickly. Runoff from impervious areas can also contain a variety of pollutants that are detrimental to water quality, including sediment, nutrients, road salts, heavy metals, pathogenic bacteria, and petroleum hydrocarbons.

Currently the impervious surface in the Cedar Grove Brook watershed is 19.5% (total 348 acres of impervious cover according to the 2002 NJDEP land use/land cover data). Any future impervious cover development will further degrade this watershed.

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[2] Shueler, T.R. 1992. *Mitigating the Adverse Impacts of Urbanization on Streams: A Comprehensive Strategy for Local Government*. In Watershed Restoration Sourcebok. Publication #92701 of the Metropolitan Washington Council of Governments.

Table 1: Land Use Change from 2002 to 2006

Land Use Type	Acres 2002	Percent 2002	Acres 2006	Percent 2006	Acreage Change from 2002 to 2006	Percent Change from 2002 to 2006
AGRICULTURE	24.56	1.37	24.56	1.37	0.00	0.00
FOREST	316.39	17.70	308.60	17.26	-7.79	-0.44
URBAN	1102.37	61.65	1129.74	63.18	27.37	1.53
WATER	7.09	0.40	7.09	0.40	0.00	0.00
WETLANDS	330.08	18.46	318.02	17.79	-12.07	-0.67
BARREN LAND	7.51	0.42	0.00	0.00	-7.51	-0.42
SUM	1788.00	100.00	1788.00	100.00	0.00	0.00

Table 2: Land Use Change from 1995 to 2002

Land Use Type	Acres 1995	Percent 1995	Acres 2002	Percent 2002	Acreage Change from 1995 to 2002	Percent Change from 1995 to 2002
AGRICULTURE	49.14	2.75	24.56	1.37	-24.59	-1.38
BARREN LAND	3.80	0.21	7.51	0.42	3.71	0.21
FOREST	354.60	19.83	316.39	17.70	-38.20	-2.14
URBAN	988.91	55.31	1102.37	61.65	113.46	6.35
WATER	7.09	0.40	7.09	0.40	0.00	0.00
WETLANDS	384.47	21.50	330.08	18.46	-54.38	-3.04
SUM	1788.00	100.00	1788.00	100.00	0.00	0.00

Table 3: Land Use Change from 1986 to 1995

Land Use Type	Acres 1986	Percent 1986	Acres 1995	Percent 1995	Acreage Change from 1986 to 1995	Percent Change from 1986 to 1995
AGRICULTURE	52.80	2.95	49.14	2.75	-3.65	-0.20
BARREN LAND	83.69	4.68	3.80	0.21	-79.89	-4.47
FOREST	393.77	22.02	354.60	19.83	-39.18	-2.19
URBAN	698.77	39.08	988.91	55.31	290.14	16.23
WATER	4.70	0.26	7.09	0.40	2.39	0.13
WETLANDS	554.28	31.00	384.47	21.50	-169.81	-9.50
SUM	1788.00	100.00	1788.00	100.00	0.00	0.00

Table 4: Land Use Change from 1986 to 2006

Land Use Type	Acres 1986	Percent 1986	Acres 2006	Percent 2006	Acreage Change from 1986 to 2006	Percent Change from 1986 to 2006
AGRICULTURE	52.80	2.95	24.56	1.37	-28.24	-1.58
FOREST	393.77	22.02	308.60	17.26	-85.17	-4.76
URBAN	698.77	39.08	1129.74	63.18	430.97	24.10
WATER	4.70	0.26	7.09	0.40	2.39	0.13
WETLANDS	554.28	31.00	318.02	17.79	-236.26	-13.21
BARREN LAND	83.69	4.68	0.00	0.00	-83.69	-4.68
SUM	1788.00	100.00	1788.00	100.00	0.00	0.00

Figure 3: Land Use Acres Comparison between 1986 and 2006

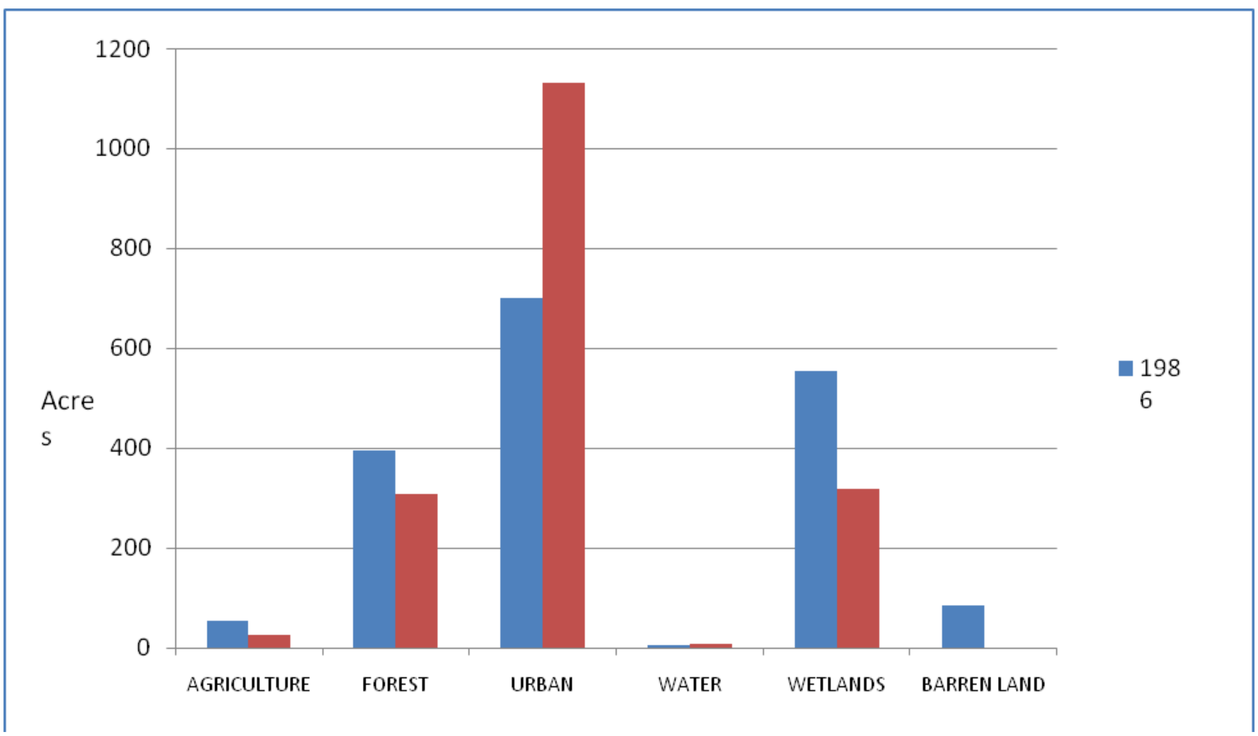


Figure 4: Cedar Grove Brook Watershed 1986 Land Use

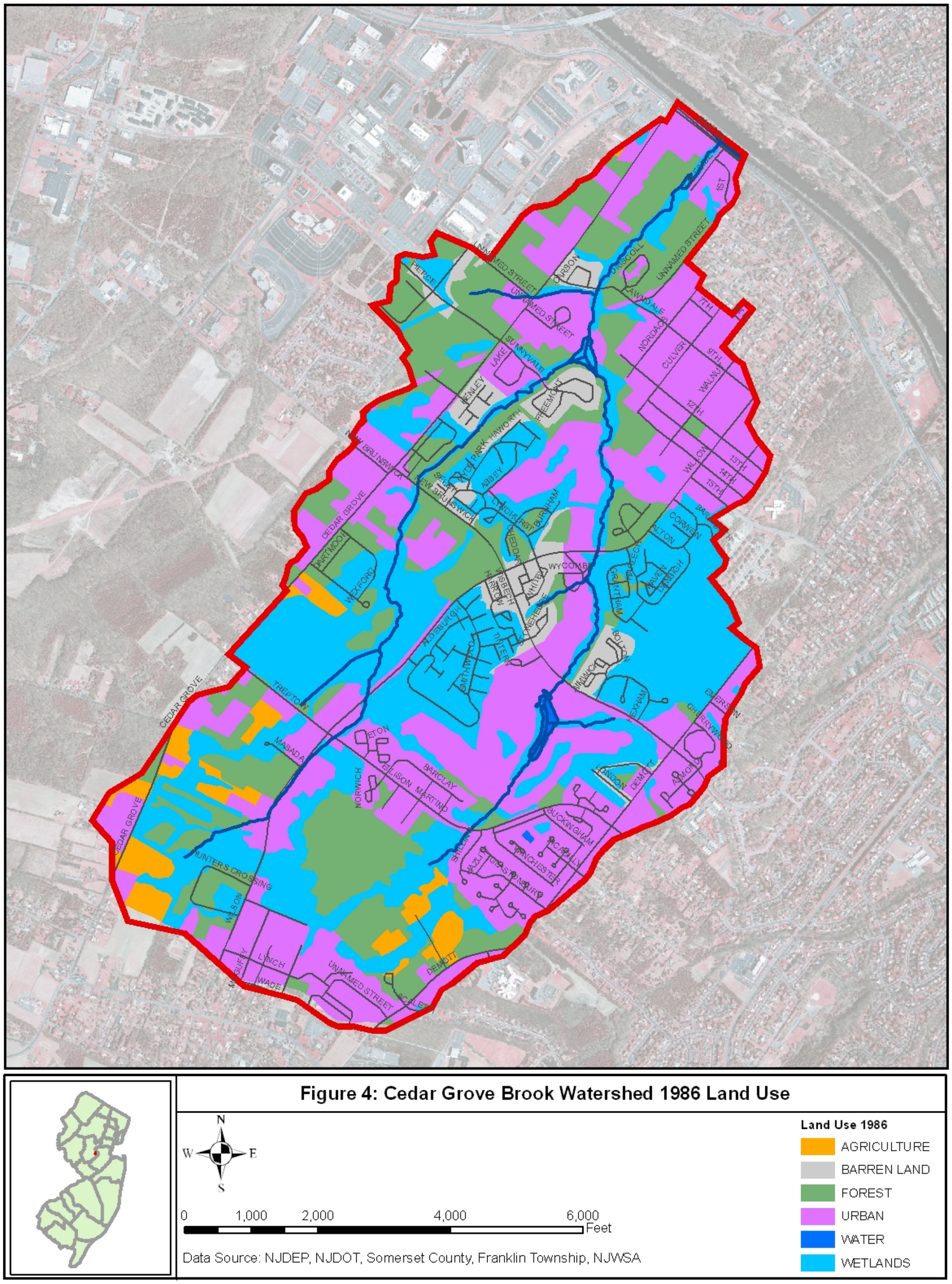
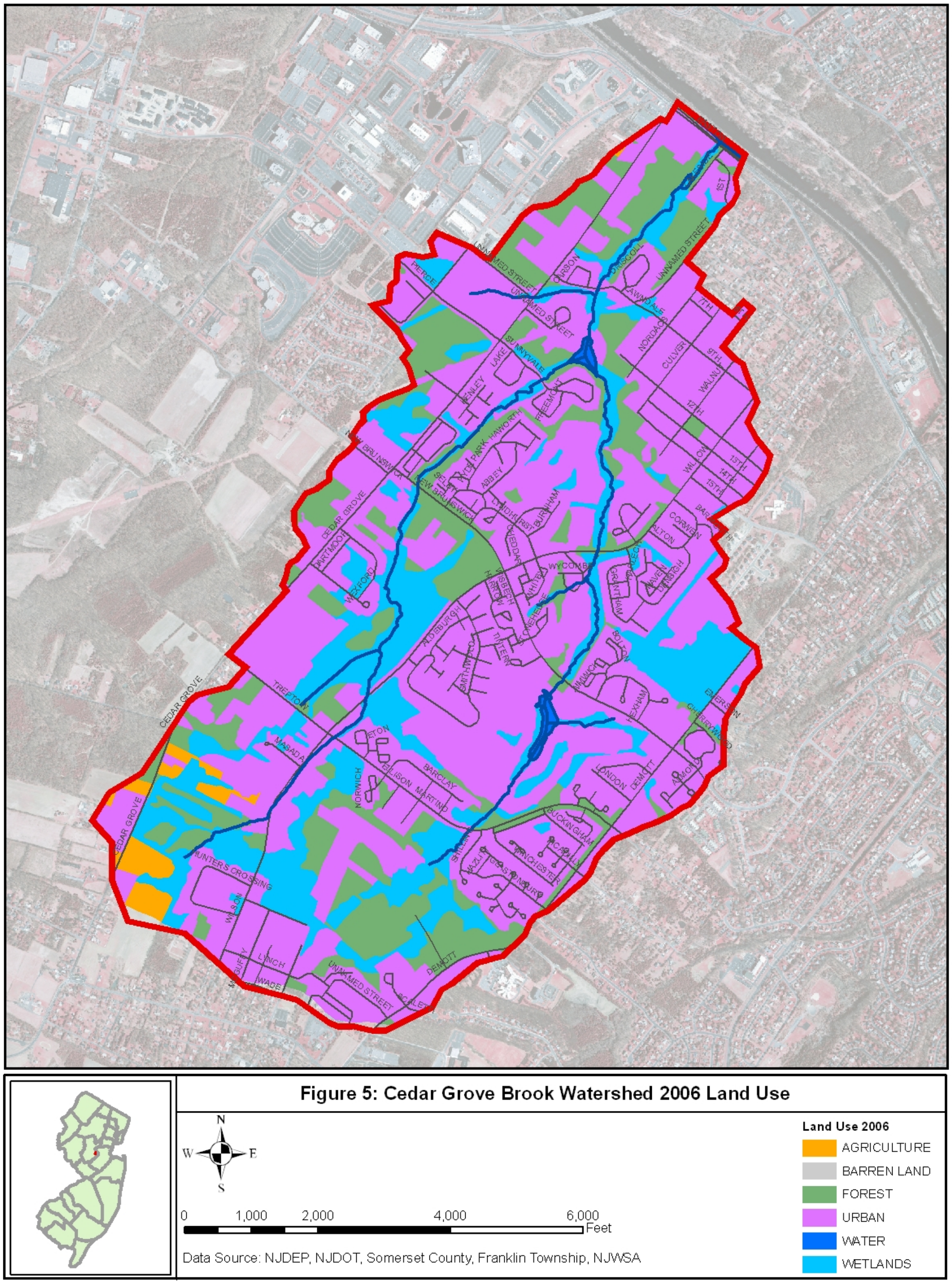


Figure 5: Cedar Grove Brook Watershed 2006 Land Use

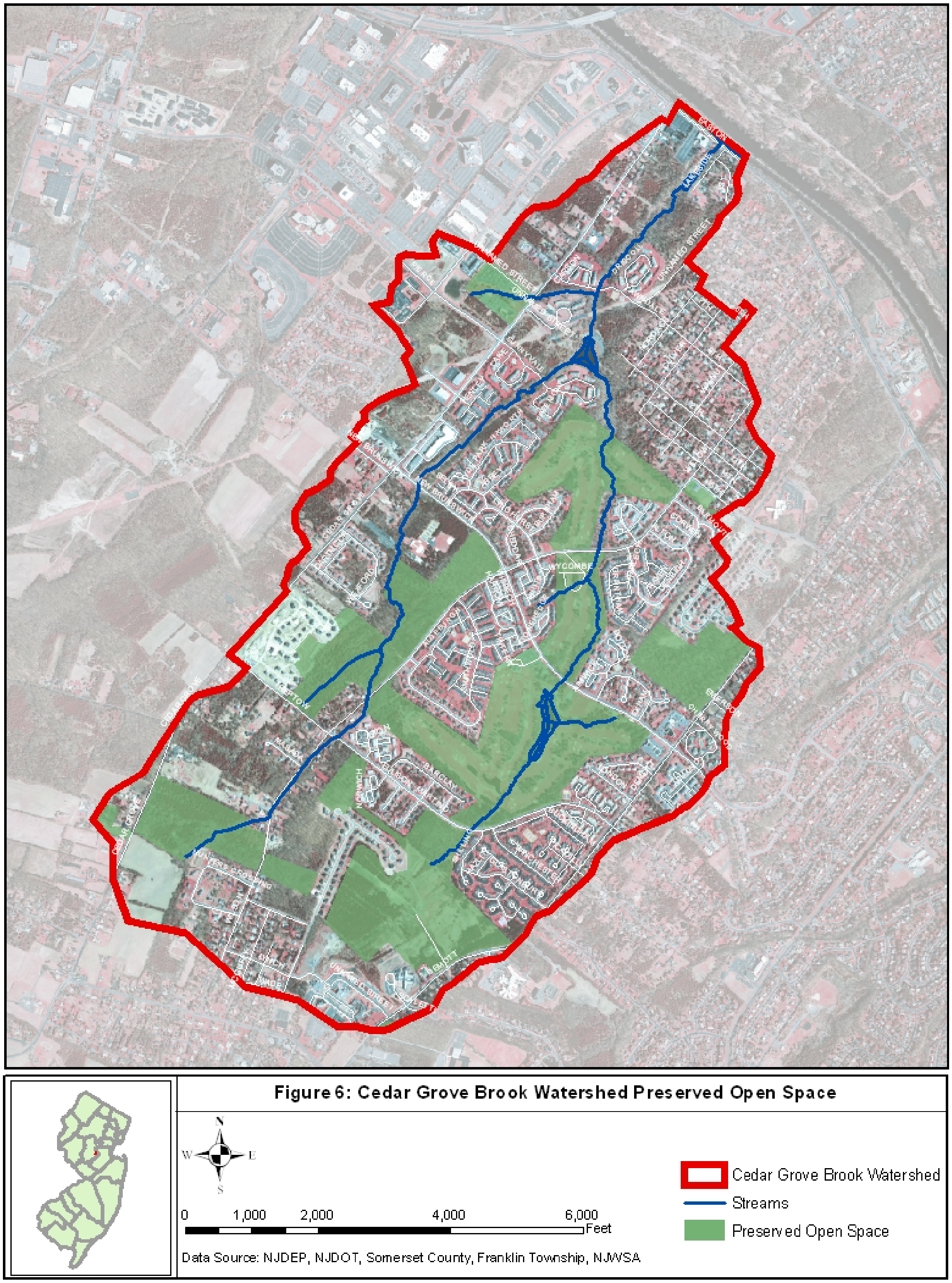


Open Space Preservation in the Watershed

The preservation of open space is beneficial to the health of our watersheds, and is perhaps the single most effective tool for protecting water quality and quantities. Open space, particularly those which are kept as forest or other vegetation, provides areas for natural infiltration of runoff and vegetation slows the movement of stormwater. The benefits of preserving land include limiting the amount of impervious cover in the landscape, increasing the infiltration of stormwater, decreasing flooding and erosion, decreasing non-point source pollution, providing habitat, increasing biodiversity, supporting agriculture, providing recreational opportunities, protecting quality of life and increasing nearby land values. Open space preservation should be conducted on a regional basis to avoid the creation of isolated islands of open space. New Jersey has taken a bold step with the creation of the Garden State Preservation Trust, which strives to save 1 million acres of open space and farmland. Franklin Township and Somerset County could take advantage of the funds from Garden State Preservation Trust, and have adopted open space and farmland preservation plans, and have dedicated taxes to finance acquisitions.

The total preserved open space in the Cedar Grove Watershed is 447 acres as of 2009, 25 percent of the total watershed area (**Figure 6**), there is no state owned open space in this watershed and Quail Brook Golf Course is owned by the County, all other open space belongs to Franklin Township. As of 2006, approximately 26 acres of farmland were present in the watershed, primarily along Cedar Grove Lane. These farms are surrounded by residential and other urban development. None are preserved through state or local programs, perhaps due to their small size.

Figure 6: Cedar Grove Brook Watershed Preserved Open Space



Water Quality

The Delaware and Raritan Canal transfers water from the Delaware River Basin to the Raritan River Basin, where the raw water is treated to become drinking water for approximately 600,000 people living in and outside of the Raritan Basin. The drinking water is treated and distributed by three water purveyors, Middlesex Water Company, the Township of East Brunswick and the City of New Brunswick. The entire length of the Canal is classified as FW2-NT.

The water supply purveyors have reported increased levels of total suspended solids (TSS), Turbidity, and total organic carbon (TOC) in the Canal during and immediately after precipitation events, requiring increased chemical use for removal and increased sludge generation from residuals. There are no groundwater or surface water discharges permitted in this watershed based on NJDEP NJPDES data, so the source of pollution is 100% nonpoint source pollution. A United States Geological Survey (USGS) study from 1998 and 1999 reported that turbidity and sediments were entering the Canal from influent streams and discharges to the Canal between 10 Mile Lock and Landing Lane Bridge and pointed to Cedar Grove Brook as a likely contributor.

To examine the water quality problems reported by water purveyors and the issues found in USGS's report, NJWSA contracted with Omni Environmental, LLC to provide field services and water quality sampling to determine watershed runoff rates and volumes and associated sediment loads, and then utilize a watershed computer model (WinSLAMM) to predict turbidity and total suspended solids (TSS) loading. These data were then used to target areas within the watershed for remedial actions.

TRC Omni prepared a Quality Assurance Project Plan (QAPP) to obtain the necessary data to evaluate targeted pollutants with respect to flow conditions, seasonal variations and pertinent weather conditions. The sampling plan was designed to assess water quality impacts due to erosion and stormwater runoff in order to determine the effectiveness of BMP installations within the Cedar Grove Brook watershed. The field services and water quality sampling were performed in accordance with the Quality Assurance Project Plan (QAPP) for six (6) stormwater locations, six (6) low flow locations, and eight (8) intensive stormwater locations to evaluate the targeted pollutants. The parameters measured during this study were Total Suspended Solids (TSS) and turbidity. Omni submitted an initial report in July 2006.

Omni's Cedar Grove Brook Watershed Water Quality Characterization and Assessment Report (July 2006) concluded the overall in-stream criteria for Cedar Grove Brook are regularly met for TSS and turbidity and concentrations and loads are relatively low throughout the watershed. When concentrations are elevated, it appears that the issue resolves itself before the stream's confluence with the Canal due to a high settling rate in the tributary. The observed concentrations of TSS and turbidity were low enough that it appeared that Cedar Grove Brook may not be a large contributing factor to TSS and turbidity problems in the Canal. During low flow conditions, Ukrainian Pond appeared to be a source of TSS and turbidity due to its phytoplankton production (**Figure 7**: Drainage Area to Three Ponds). During high flow conditions moderate stream bank erosion and construction projects cause increased concentrations of TSS and turbidity in the Brook. This issue is partially resolved when the Ukrainian Village Pond settles suspended solids from upstream areas. Stream bank stabilization projects and buffer plantings downstream of the pond would aid in reducing TSS and turbidity near the streams confluence with the Canal.

Overall, the sampling results were not sufficient to exclude the possibility that Cedar Grove Brook delivers a substantial turbidity load affecting water quality in the Canal; nevertheless, the lack of direct sampling confirmation left open the possibility that efforts to minimize TSS and turbidity loads in the Cedar Grove Brook watershed may not address the water quality problems observed at the water supply intakes in the Canal. To further investigate the water quality issues, continuous turbidity monitoring was performed in the fall of 2008.

The continuous turbidity monitoring results suggest that Cedar Grove Brook can significantly increase the turbidity peaks in the D&R Canal that occur during storm events. Since the long-term monitoring indicates that such turbidity peaks can be very high, the impact of Cedar Grove Brook on turbidity peaks in the Canal appears to be important from a water quality perspective, given the proximity to the water supply intake. Water quality sampling in both Cedar Grove Brook and the D&R Canal demonstrate that high values of turbidity occur together with high values of TSS; it is therefore likely that measures to reduce TSS loads to the Canal, which is the parameter of interest for the D&R Canal Nonpoint Source Implementation Project[3], will also reduce turbidity.

For the reasons stated above, the Cedar Grove Brook watershed was evaluated for potential stormwater BMP improvements. A windshield survey of the Cedar Grove Brook watershed was performed on January 8, 2009. A long-term WinSLAMM simulation was developed in order to evaluate potential BMPs to reduce the particulate load exported from Cedar Grove Brook to the D&R Canal.

According to the WinSLAMM model analysis, most of the sediment load in the Cedar Grove Brook watershed originates from pervious (wooded or landscaped), private residential areas. This limits the effectiveness of many structural and non-structural BMPs that might otherwise be contemplated in the watershed. Non-structural BMPs that would potentially yield a positive result in terms of improved water quality include public education aimed at local residents and improved fill management at the golf course. Efforts to reduce stormwater runoff from landscaped areas, such as the installation of rain gardens, would directly address the major source of sediment in the watershed.

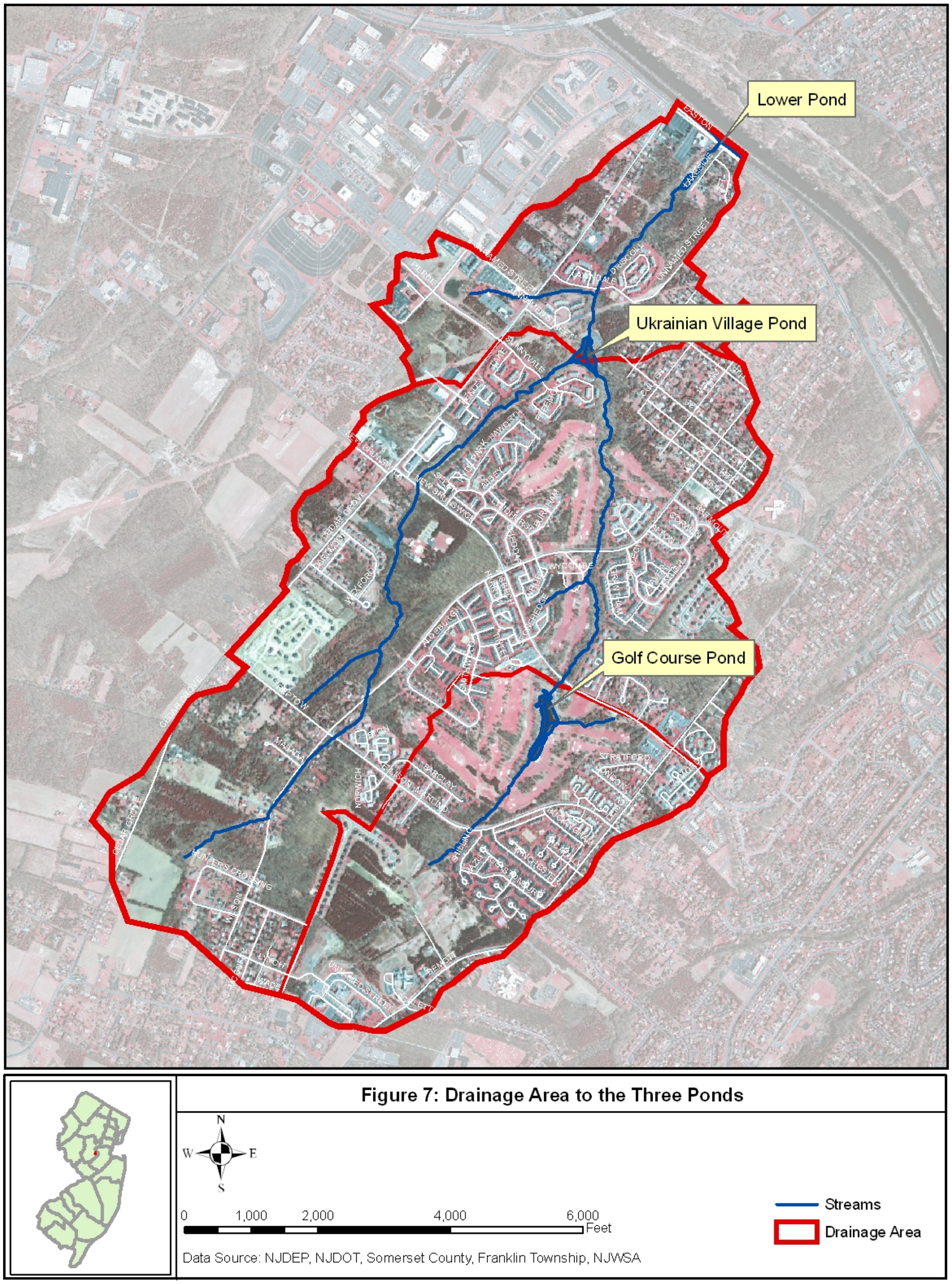
The three existing pond structures in Cedar Grove Brook (Golf Course Pond, Ukrainian Village Pond, and Lower Pond) are providing significant sediment removal such that Cedar Grove Brook is currently discharging far less sediment to the D&R Canal than it would otherwise . However, these same pond structures also act as sediment sources due to the resuspension of accumulated sediment under certain storm conditions. Given the above considerations, the highest

[3] A major restoration project (Delaware and Raritan Canal Nonpoint Source Implementation Project) is currently underway by NJWSA to reduce sediment loads to the Canal from the many stormwater infalls between Amwell Road and the Route 18 spillway, the last 11 miles of the Canal.

prioritization should be given toward improving the pond structures that already exist in order to optimize their water quality benefits. Each pond feature was evaluated for BMP opportunities, and the outlet structure of each pond was evaluated using long-term WinSLAMM simulations to explore possible modifications to enhance sediment removal.

The detailed information about the recommended structural BMPs for each of the existing pond structures can be found in Omni's report "Cedar Grove Brook Watershed Restoration Planning Project" dated April 2009.

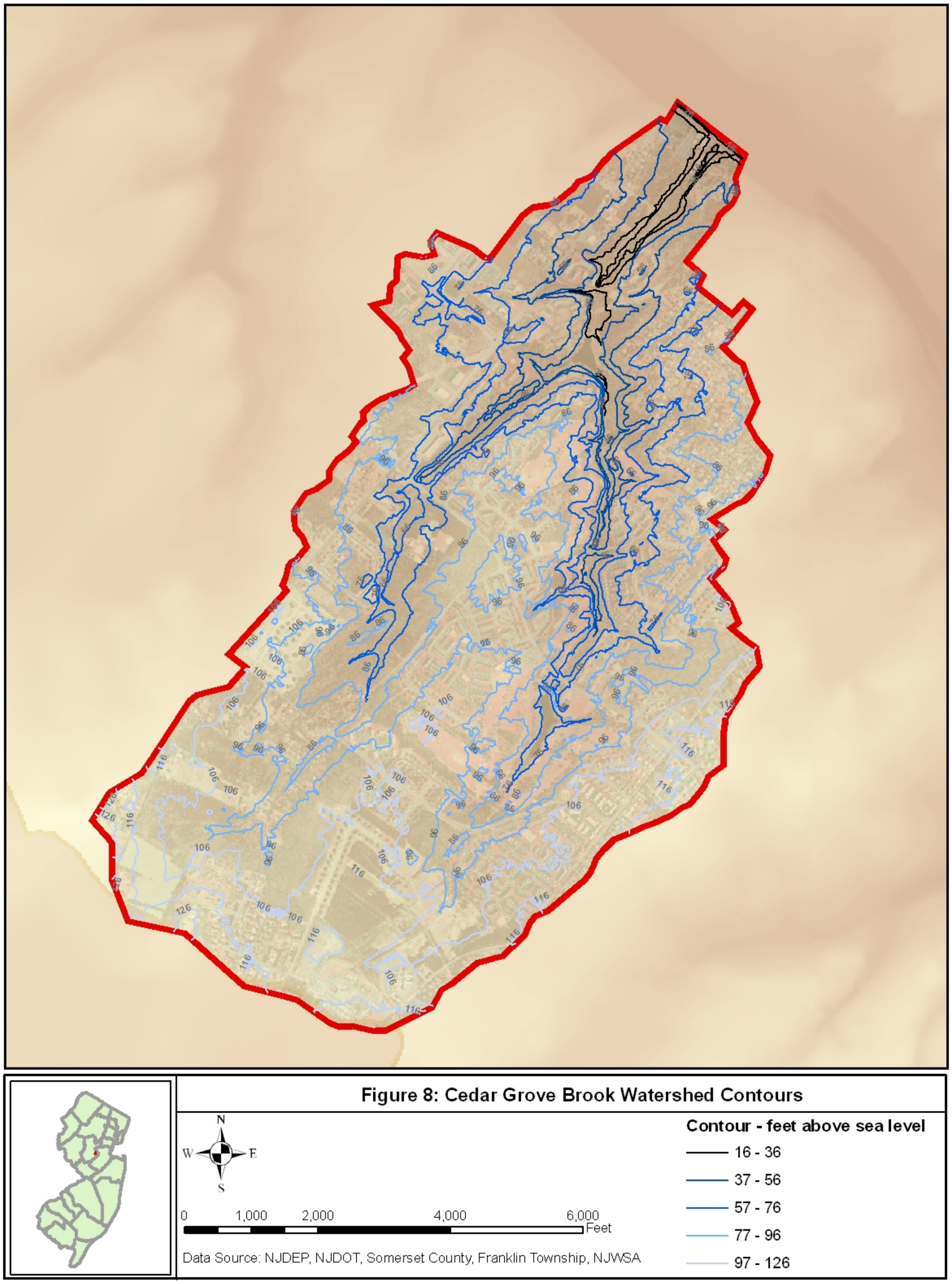
Figure 7: Drainage Area to the Three Ponds



Topography

The elevation in the Cedar Grove Brook watershed ranges from 6 feet to 132 feet above mean sea level. Contour data was obtained from Franklin Township; **Figure 8** presents the contours within the watershed. Inspection of the contours demonstrates the gentle slope of the watershed as well as the steeper sloped areas. Most of the banks along the Cedar Grove Brook are between 5 to 10 percent slope. As the gradient or percent of slope increases, the velocity of runoff water increases, which increases its erosive power. A doubling of velocity of runoff water increases the erosive power fourfold and causes 32 times the amount of material of a given particle size that can be carried (Foth, 1978).

Figure 8: Cedar Grove Brook Watershed Contours



Ground Water, Soil & Known Contaminated Sites

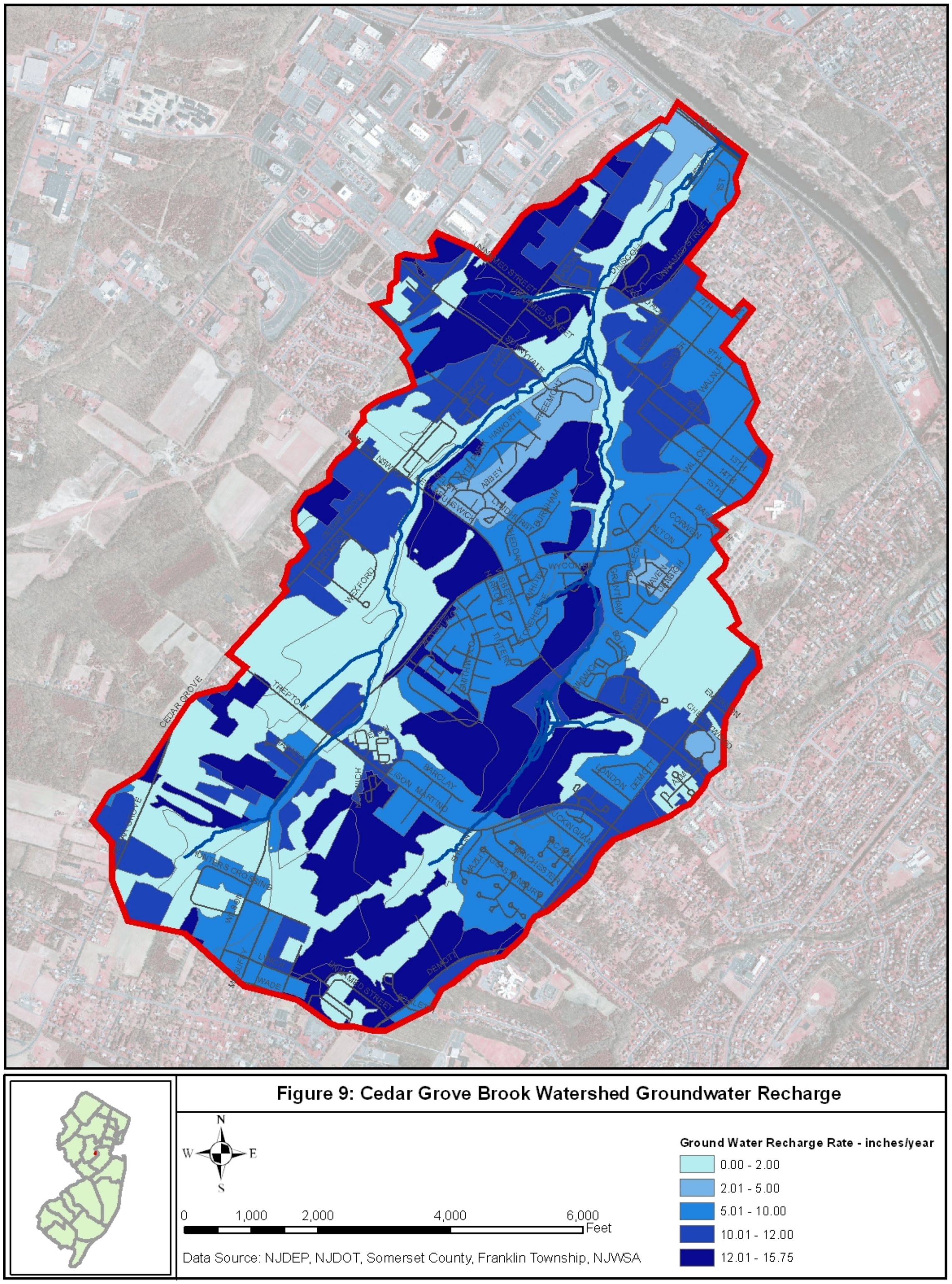
Ground Water

Ground water recharge is defined as water added to an aquifer (for example, precipitation that seeps into the ground). A ground water recharge area is the land area that allows precipitation to seep into the saturated zone. These areas are generally at topographically high areas with discharge areas at lower elevations, commonly at streams or other water bodies (i.e. the ground water returns to surface water). Groundwater recharge areas provide base flow to streams that support both aquatic ecosystems and surface water supplies. They also serve as a direct source of water supply for a wide variety of human uses, including potable water, industrial, agricultural and recreational supplies. Most ground water flows through the shallow layers of soil and weathered bedrock to the nearest stream. A smaller percentage penetrates deeper and recharges the aquifer. Aquifers often are used for water supply, and surface waters support both human water uses and aquatic ecosystems. Estimating the relative recharge rates of various land areas provides a way by which the most critical ground water recharge areas can be mapped and protected through various mechanisms, including zoning, development regulation and land preservation.

Recharge can be reduced through changes in soil permeability (e.g., impervious surfaces, soil compaction), soil aspect (e.g., slope, surface roughness), and vegetation. Recharge can be contaminated by a wide variety of intentional discharges (e.g., septic systems), accidental discharges (e.g., spills) and incidental discharges (e.g., fertilizer and pesticide applications targeted to specific targets that penetrated past the root zone, beyond those targets). Relative to land use, recharge rates in forests are much higher than those in urban areas (Heath, 1983). This is because urban areas have large areas covered with impervious surfaces, hastening runoff to surface water, instead of allowing precipitation to percolate into the ground. Cedar Grove Brook watershed is mostly developed; ground water resources are critical to this watershed.

Recharge rates are expressed in terms of the amount of precipitation that reaches the aquifer per unit of time (e.g. inches/year). Recharge rates vary from year to year, depending on the amount of precipitation, its seasonal distribution, air temperature, land use and other factors. The estimated recharge rates of this watershed from NJGS 95/97 dataset indicate that the maximum recharge rate in non-drought condition is 15.75 inches per year, with the highest infiltration rates predicted to occur in the downstream forest area along the Cedar Grove Brook (**Figure 9**).

Figure 9: Cedar Grove Brook Watershed Groundwater Recharge



Soil

Soil is the unconsolidated mineral material on the immediate surface of the earth which serves as the medium for growth of land plants. The characteristics of each soil type have developed over time (usually many thousands of years) under the influence of the parent material (the bedrock that has broken down into small fragments to form the soil), climate (including moisture and temperature regimes), macro- and microorganisms, and topography. Soil is a basic resource for food production, in addition to its essential role in collecting and purifying water before it enters the ground water. However, soil itself can be a pollutant as dust in the air or as sediment in water.

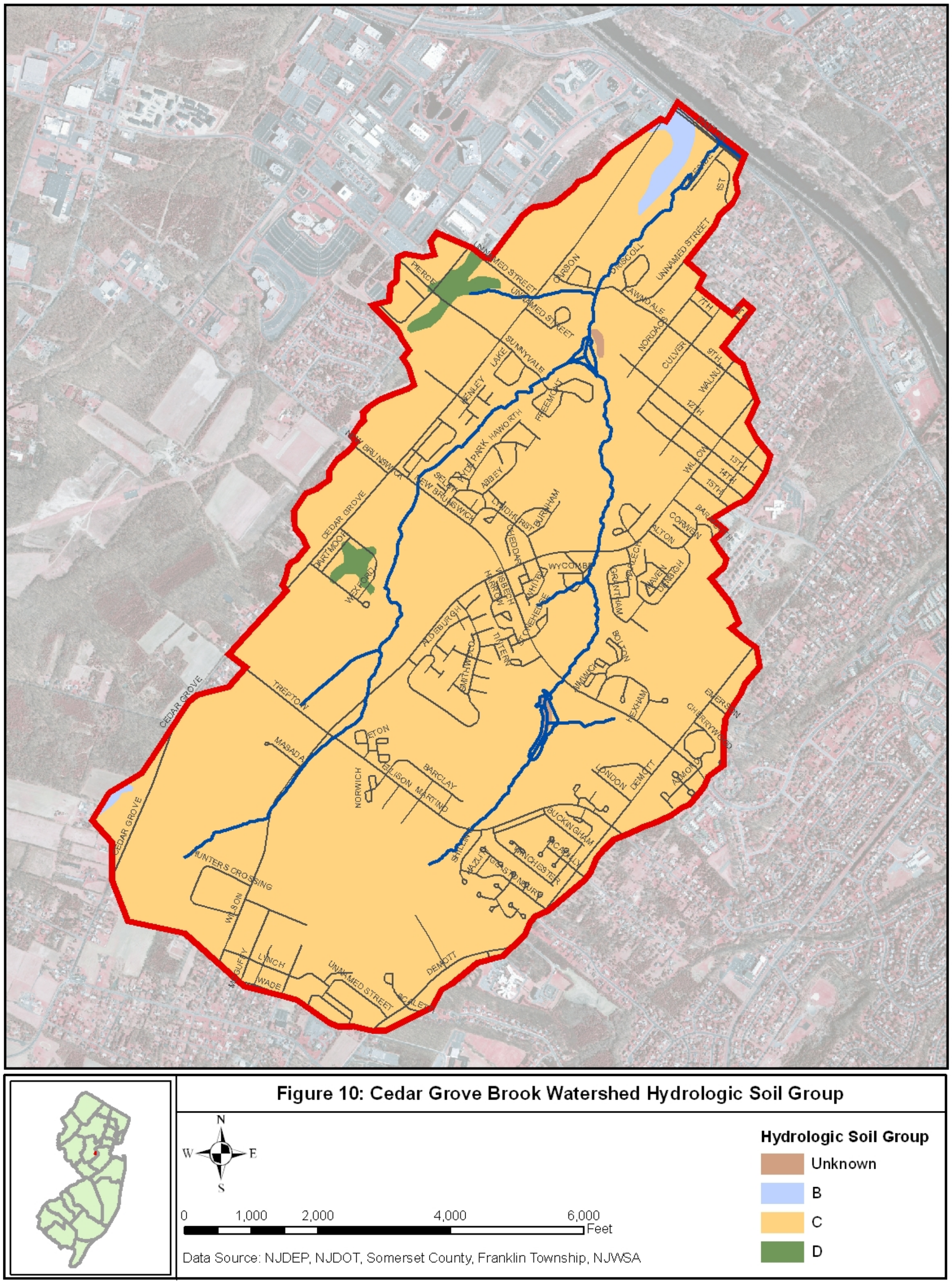
The US Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) prepared soil surveys in 1974 to determine soil characteristics and capabilities and to help people understand soils and their uses. The soil survey was updated in 1986 and digitized into GIS in 1999, and then updated in 2006 to a Microsoft Access database with GIS format. The objective of soil mapping is to separate the landscape into segments that have similar use and management requirements. Therefore, this data set is not designed for use as a primary regulatory or management tool, but may be used as a broad scale reference source.

The soil characteristics vary from place to place in slope, depth, drainage, erodibility and other properties. The hydrologic soil grouping describes the rate that water infiltrates into the ground. The majority of the Cedar Grove Brook watershed has slow infiltration rates which fall into the class C soils (**Table 5** and **Figure 10**); these soils indicate a moderately risk for seepage to local surface and ground water resources.

Table 5: Hydrologic Soil Group

Class	Definition	Acres	Percent within the Watershed
A	**High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.**	**0**	**0%**
B	**Moderate infiltration rates. Deep and moderately deep, moderately well and well drained, soils that have moderately course textures.**	**14.7**	**0.8%**
C	**Slow infiltration rates. Soils with layers impeding downward movement of water, or soils that have moderately fine or fine textures.**	**1760.5**	**97.9%**
D	**Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.**	**17.7**	**1%**
Unknown		**3.9**	**0.2%**
Source: NRCS Soil Survey Geographic (SSURGO) Database.			

Figure 10: Cedar Grove Brook Watershed Hydrologic Soil Group



Known Contaminated Sites

A "known contaminated site" is a place where contamination of soil or ground water has been confirmed and where remediation is either underway or pending. Known contaminated sites include those which have or had contamination present at levels greater than the applicable soil cleanup criteria, ground water quality standards and/or maximum contaminant levels of the Safe Drinking Water Standards. Contamination is normally identified at a site through sampling of the soil, sediment, surface water and/or ground water. There have also been instances where visual inspection has been used to confirm the existence of contamination (e.g., identification of floating hazardous substance or free product on water).

NJSA 58:10-23.16-17, the New Jersey statute on the discharge of petroleum products, debris and hazardous substances into waters, requires that the NJDEP prepare, adopt and update a master list for the cleanup of all hazardous discharge sites throughout the State. The master list, called the Contaminated Sites List (of which the Known Contaminated Sites list is a sub-list), must include an inventory of the sites that have been cleaned up, that have been identified as in need of cleanup, and that will be cleaned up. The list of sites used in this report is based on the most recent GIS coverage (April 2008 Known Contaminated Sites list) obtained from the NJDEP Site Remediation Program. Remedial levels are based on the NJDEP Site Remediation Program's 1989 Case Assignment Manual, which determines levels based on the overall degree of contamination at a site.

Sites identified in the Known Contaminated Sites database can undergo a variety of activities, ranging from relatively simple soil removals to highly complex remedial activities. The sites included in this dataset are handled under various regulatory programs administered by the NJDEP's Site Remediation Program, including the New Jersey Brownfield and Contaminated Site Remediation Act, Industrial Site Recovery Act, Solid Waste Management Act, Spill Compensation & Control Act, Underground Storage of Hazardous Substances Act, Water Pollution Control Act and the Federal Comprehensive Environmental Response, Compensation and Liability Act, Superfund Amendments and Reauthorization Act, and Resource Conservation and Recovery Act Corrective Action Program. A site can be regulated under more than one of these regulatory programs and often proceed through several remedial levels over time. Site remedial levels are classified as follows:

- "A" – An emergency action taken to stabilize an environmental and/or health threatening situation from sudden or accidental release of hazardous substances. Appropriate remedial actions involving a single phase of limited or short-term duration.
- "B" – A single phase remedial action in response to a single contaminant category effecting only soils. May be a sub-site of a more complex case. Does not include ground water investigation or remediation. Examples of level B cases include, but are not limited to "cut-n-scrape"; surface drum removals; fences; temporary capping.
- "C-1" – A remedial action that does not involve formal design where the source is known/identified. May include the potential for (unconfirmed) ground water contamination. Examples of C-1 cases are regulated or unregulated storage tanks containing gas or heating oil; septic tanks, etc.

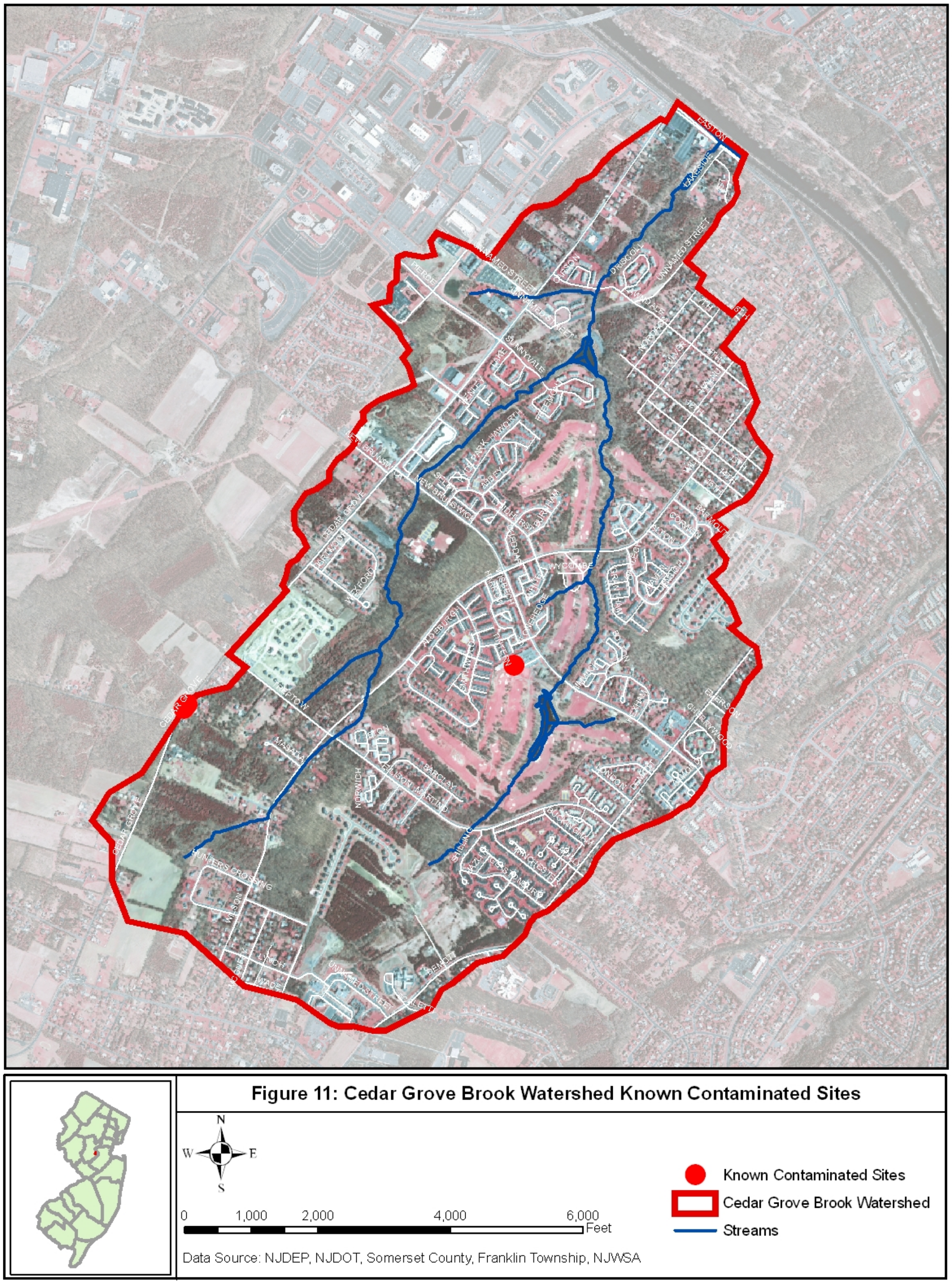
- "C-2" – A remedial action that consists of a formal engineering design phase, and is in response to a known source or release. Since the response is focused in scope and address a known, presumably quantifiable source, this remedial level is of relatively shorter duration than responses at sites with higher remedial levels. Usually involves cases where ground water contamination has been confirmed or is known to be present.
- "C-3" – A multi-phase remedial action in response to an unknown and/or uncontrolled source or discharge to the soils and/or ground water. In this remedial level, the contamination is unquantifiable (or presumed unquantifiable) and, therefore, no determinable timeframe for the conclusion of the remedial action is known.
- "C-4" or "D" – A multi-phase remedial action in response to multiple, unknown and/or uncontrolled sources or releases affecting multiple media which includes known contamination of ground water. In this remedial level, the contamination is unquantifiable (or presumed unquantifiable) and, therefore, no determinable timeframe for the conclusion of the remedial action is known.

Table 6 provides a listing of three known contaminated sites within the Cedar Grove Brook watershed that are classified as level C as defined above (**Figure 11**). Two of the known contaminated sites fall within major transportation corridors on the Cedar Grove Lane, very close to each other, while the third is within a parking lot. Additional information and identification of sites within a specified area are available from the NJDEP Site Remediation Program at www.state.nj.us/dep/srp.

Table 6: Known Contaminated Sites within the Cedar Grove Brook Watershed

TRACKING NUMBER	ADDRESS	LIST DATE	TYPE	REMEDIATION LEVEL AND STATUS
162135	300 CEDAR GROVE LANE	8/14/2002	HO - UST	C2: Formal Design - Known Source or Release with GW Contamination – CLOSED 6/2005 – no detail.
164971	302 CEDAR GROVE LANE	9/30/2002	N/A	C2: Formal Design - Known Source or Release with GW Contamination
031476	QUAIL BROOK GOLF COURSE - 625 NEW BRUNSWICK AVE	12/17/2001	UST – Unleaded Gas	C2: Formal Design - Known Source or Release with GW Contamination CLOSED – 10/1997 - 1,000 Gallon Tank Removed
HO=Homeowner; UST= Underground Storage Tank Data from NJDEPs 2008 known contaminated sites GIS coverage and data miner				

Figure 11: Cedar Grove Brook Watershed Known Contaminated Sites



Conclusions

Cedar Grove Brook Watershed is primarily an urbanized watershed with about two third of the area being built out. The predominant land use in the area is residential with a very high percent of impervious surface. Any development or redevelopment that does not address water quality or soil conservation strategies could have significant negative effects on the ecological health of the watershed, increase stormwater runoff and degradation to surface and ground water quantity and quality.

Pollutant loadings, particularly total suspended solids, in the surface waters of this watershed are primarily from nonpoint sources. Non-point source pollution is negatively affecting some areas of the watersheds, most likely due to development activities, which have not properly implemented soil conservation and best management practices. Construction activity, known sources of sediment loading, along with runoff from the suburban landscape and storm drains, known sources of nutrient and sediment loading, all contribute to the nonpoint source pollution in the Cedar Grove Brook watershed.

Franklin Township, Somerset County, the Delaware and Raritan Canal Commission and the New Jersey Water Supply Authority recognize the vulnerability of this watershed and its effects on the D&R Canal and should work together to protect the health of this waterway. The Cedar Grove Brook Watersheds Restoration and Protection Plan, currently in progress, will prioritize remediation strategies, and provide guidance for the long-term protection of this watershed.

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