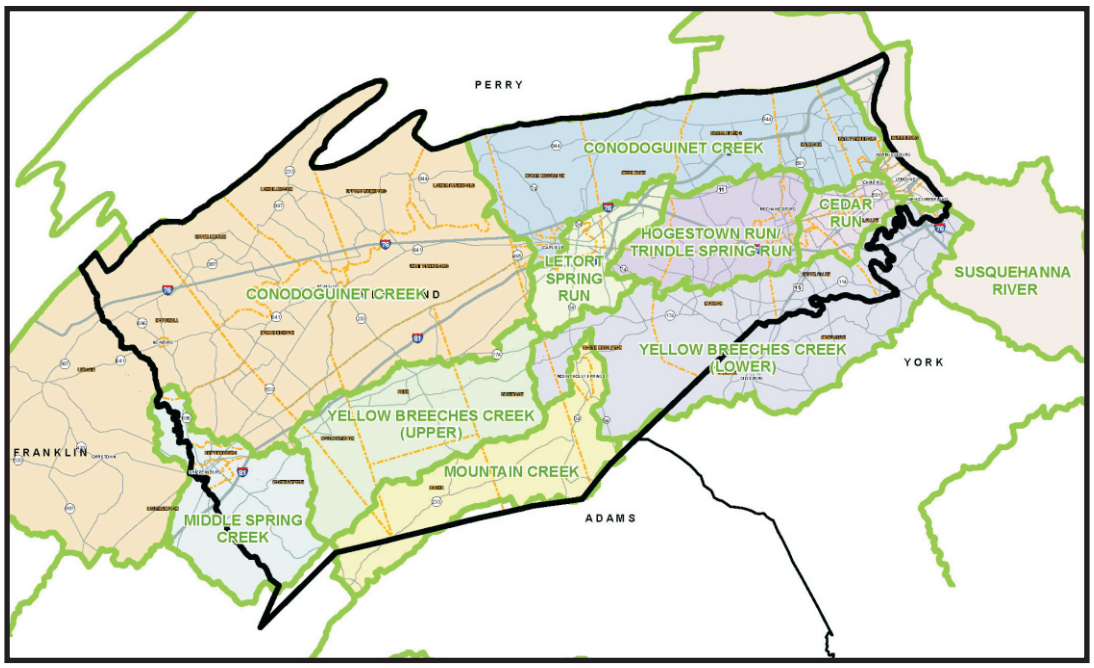
# CUMBERLAND COUNTY
# STORMWATER MANAGEMENT PLAN




PREPARED FOR

CUMBERLAND COUNTY PLANNING COMMISSION

PREPARED BY

SKELLY AND LOY, INC.

SEPTEMBER 2010

# CUMBERLAND COUNTY
# STORMWATER MANAGEMENT PLAN

PREPARED FOR

CUMBERLAND COUNTY PLANNING COMMISSION
18 NORTH HANOVER STREET
CARLISLE, PENNSYLVANIA 17013

PREPARED BY

SKELLY AND LOY, INC.
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HARRISBURG, PENNSYLVANIA 17111

SEPTEMBER 29, 2010

R07-0367.000.1

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# SECTION I INTRODUCTION

As Cumberland County increases in population and commercial enterprise, so follows the amount and extent of associated land development. As more natural land areas, land covers, and contours are converted to residential, commercial, and industrial land uses, the greater the amount of impermeable covering of land by asphalt roadways and parking lots, concrete pavements, and buildings. The reduction in available land area for absorbing water from rainstorms leads to increased volumes and velocities of runoff. The increased stormwater runoff has the potential to cause various problems both in and downstream of the newly developed areas – problems that include flooding, streambank erosion, silt deposition in stream channels, reduced groundwater recharge, and surface and groundwater pollution. Recognizing the interrelationship of land development activities with adjacent and nearby watersheds, the Cumberland County Planning Commission is seeking an innovative, all-inclusive approach to addressing potential stormwater problems caused by projected development through a County-wide Stormwater Management Plan. The purpose of this Plan is to:

1. Encourage planning and management of stormwater runoff in Cumberland County which is consistent with sound water and land use practices.

2. Authorize a comprehensive program of stormwater management designated to preserve and restore the flood-carrying capacity of Commonwealth streams; preserve to the maximum extent practicable natural stormwater runoff regimes and natural courses, currents, and cross sections of water of the Commonwealth; and protect and conserve ground waters and groundwater recharge areas.

3. Encourage local administration and management of stormwater consistent with the Commonwealth's duty as trustee of natural resources and the people's constitutional right to the preservation of natural, economic, scenic, aesthetic, recreational, and historic values of the environment.

Within six months following County adoption and approval of this Stormwater Management Plan, each municipality in Cumberland County shall implement the developed ordinances and regulations (including zoning, subdivision and development, building code, and erosion and sedimentation ordinances) as are necessary to regulate development within the County in a manner consistent with the applicable watershed stormwater plan and the provisions of this Act.

## ACT 167 AND STORMWATER MANAGEMENT PLANNING

The Pennsylvania Stormwater Management Act of 1978 (Act 167) sums up the critical interrelationship among land development, accelerated runoff, and floodplain management by pointing out the following specifics:

1. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases floodflows and velocity, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines floodplain management and floodplain control efforts in downstream communities, reduces groundwater recharge, and threatens public health and safety.

2. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare and the protection of the people of the Commonwealth, their resources, and their environment.

Prior to the enactment of Act 167, stormwater management primarily addressed the increase in peak runoff rates discharged from individual land development sites. The intent was to design stormwater controls that protected properties located immediately downstream but offered little protection for those properties located further downstream. Stormwater management was regulated at the municipal level with little or no design consistency between adjoining municipalities, even when they shared parts of the same watershed. Act 167 corrected this imbalance by requiring Pennsylvania's counties to prepare and adopt Stormwater Management Plans for each watershed located in the county, as designated by the Pennsylvania Department of Environmental Protection (PA DEP). The municipalities within the county coordinate through a Plan Advisory Committee (PAC) to assist in the preparation of the Plan.

The types of stormwater controls prescribed in a Stormwater Management Plan are based on the projected development patterns and known hydrological characteristics of each watershed. The standards and criteria provided in the Plan are developed in response to the "cause and effect" nature of both existing and potential impacts of stormwater runoff. The goal of evaluating and managing individual watersheds has been noteworthy in terms of the numerous Stormwater Management Plans that have been successfully developed and implemented within well-defined local watersheds in Pennsylvania.

Due to recent changes in PA DEP policy based on the natural transport of environmental impacts across jurisdictional and naturally defined watershed boundaries, Cumberland County is expanding the stormwater planning arena across all watersheds within the County. This County-wide approach will allow Cumberland County to model the impacts of stormwater runoff between watersheds as well as promote regional stormwater management that benefits all County watersheds. As the County undergoes continued development, the boundaries between developing and undeveloped areas are blurring. The cumulative effects of reduced water infiltration in one area impose increased flooding in other areas, causing damage to property and natural resources. Cumberland County has developed a plan that models the impacts of stormwater runoff between watersheds as well as promotes regional stormwater management that benefits all County watersheds. A County-wide plan provides reasonable regulation of development activities to control accelerated runoff, erosion, and sedimentation, thus protecting public health, safety, and welfare.

In summary, implementation of a Stormwater Management Plan for Cumberland County is a major step towards promoting sound water and land use practices across Cumberland County while working to preserve the flood-carrying capacity of Commonwealth streams and protecting its groundwater and recharge areas. The overall benefit will be a meshing of responsible development and the preservation of effective functioning of the environment.

## REVIEW OF PAST STORMWATER MANAGEMENT PLANNING STUDIES

Stormwater Management Plans were developed earlier for four individual watersheds in Cumberland County. The Hogestown Run/Trindle Spring Run Stormwater Management Plan was prepared in 1994 by Hartman & Associates of Camp Hill, Pennsylvania. The intent of the plan was to provide a planning vehicle that would ensure that widespread development neither aggravated existing drainage problems nor created new drainage problems. The plan provided municipalities in the watersheds with an accurate and consistent implementation strategy for comprehensive stormwater management.

The Cedar Run Stormwater Management Plan was developed by Gannett Fleming, Inc. of Camp Hill, Pennsylvania, in 2001. The watershed was selected for review due to its hydrologic influence on all or portions of eight municipalities within its reach as well as the numerous tributary streams that flow into the main stem of Cedar Run. The plan was intended to address the pending construction of residential subdivisions and industrial parks in the watershed.

Skelly and Loy, Inc. of Harrisburg, Pennsylvania, prepared the Stormwater Management Plan for the Upper Yellow Breeches watershed in 2002. The purpose of the plan was to provide municipalities in the watershed with technically sound and administratively consistent standards and criteria for effective management of stormwater runoff from new development sites.

All three of these plans were reviewed in preparation of this County-wide Plan, and elements of the descriptive watershed data were incorporated into this Plan, where appropriate. The Cedar Run watershed, as well as the Hogestown Run and Trindle Spring Run watersheds, underwent detailed modeling for the present Plan, even though they have existing Stormwater Management Plans.

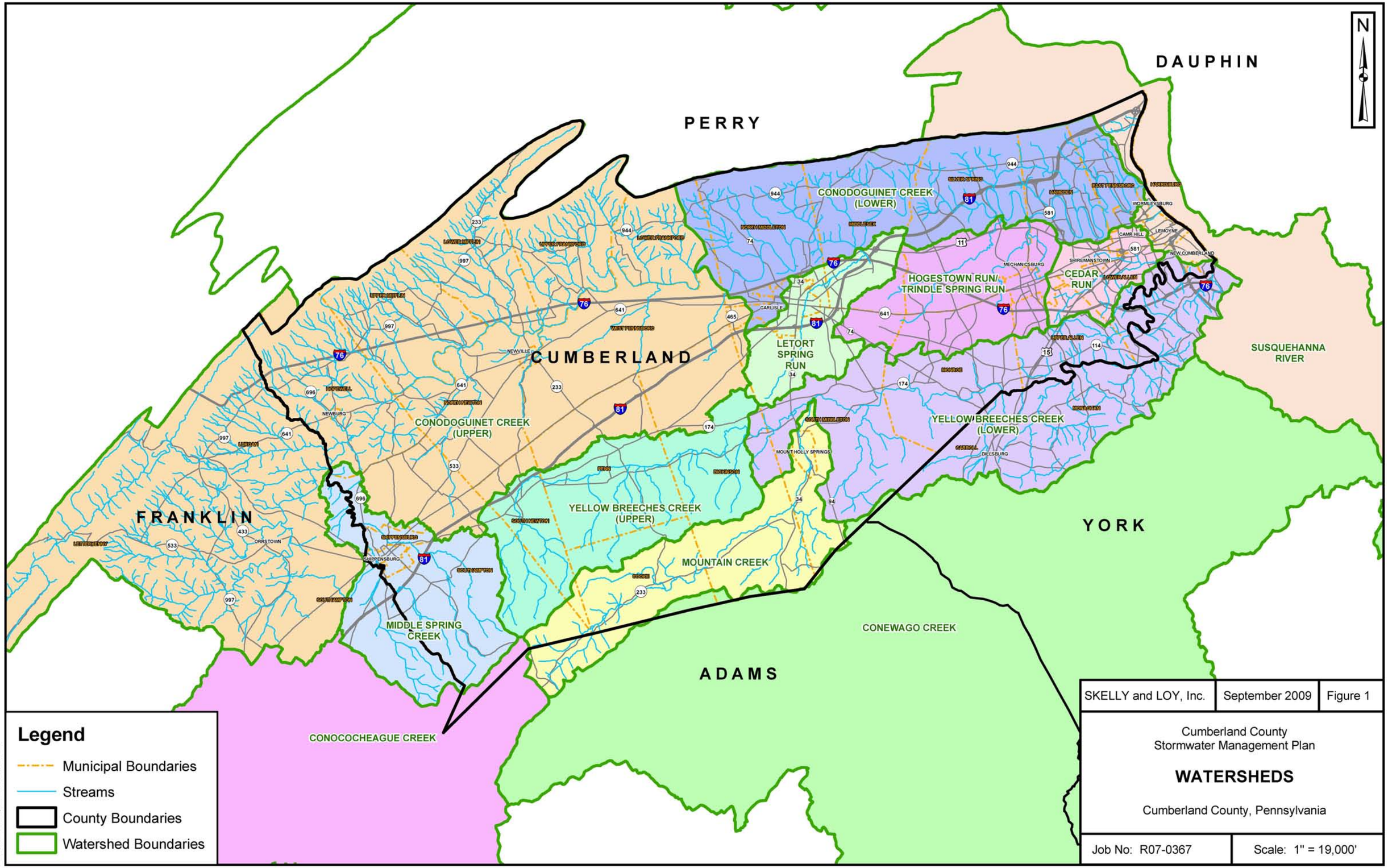
## WATERSHED LOCATIONS

Most of Cumberland County lies within the Cumberland Valley, stretching approximately 42 miles from the Susquehanna River in the east to the Borough of Shippensburg in the west. Having a total area of 551 square miles, about 1 square mile (0.18%) is water. PA DEP has designated for study the following eleven major watersheds in Cumberland County:

- Cedar Run
- Conodoguinet Creek
- Hogestown Run/Trindle Spring Run
- Letort Spring Run
- Middle Spring Creek
- Mountain Creek
- Yellow Breeches Creek (Lower Section)
- Yellow Breeches Creek (Upper Section)
- Susquehanna River
- Conewago Creek
- Conococheague Creek

As previously mentioned, Stormwater Management Plans have already been completed for the Cedar Run, Hogestown Run/Trindle Spring Run, and Yellow Breeches Creek (Upper Section) watersheds. This County-wide Stormwater Management Plan updates these three existing plans and provides a new overall plan that combines the three planned watersheds with the remaining eight watersheds. Figure 1 shows the locations of the watersheds.

Only a very small eastern portion of the 566 square miles of the Conococheague Creek watershed is located in the southern portion of Cumberland County, where most of it lies in the Michaux State Forest. Franklin County adopted a Stormwater Management Plan for the


N
PERRY
DAUPHIN
CUMBERLAND
FRANKLIN
YORK
ADAMS
SUSQUEHANNA RIVER
CONODOGUINET CREEK (LOWER)
HOGESTOWN RUN/ TRINDLE SPRING RUN
CEDAR RUN
LETORT SPRING RUN
YELLOW BREECHES CREEK (LOWER)
CONODOGUINET CREEK (UPPER)
YELLOW BREECHES CREEK (UPPER)
MOUNTAIN CREEK
MIDDLE SPRING CREEK
CONEWAGO CREEK
CONOCOCHEAGUE CREEK
CARLISLE
NEWVILLE
SHIPPENSBURG
MECHANICSBURG
SHIREMANSTOWN
NEW CUMBERLAND
MOUNT HOLLY SPRINGS
DILLSBURG
ORRSTOWN
NEWBURG
Legend
Municipal Boundaries
Streams
County Boundaries
Watershed Boundaries
SKELLY and LOY, Inc.
September 2009
Figure 1
Cumberland County
Stormwater Management Plan
WATERSHEDS
Cumberland County, Pennsylvania
Job No: R07-0367
Scale: 1" = 19,000'
Wednesday, September 9, 2009 9:50 AM - JAM
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Conococheague Creek Watershed in 2003. Release rates for the small portion of the Conococheague Creek in Cumberland County shall comply with Figure 19 in Section III and the Release Rate Maps in Section V of this Stormwater Plan.

Conewago Creek is a 77.6-mile long tributary of the Susquehanna River located primarily in Adams and York Counties. The Conewago Creek watershed has a total area of 515 square miles and is part of the Chesapeake Bay drainage basin via the Susquehanna River. Very small northern sections of the watershed jut into the southern reaches of Cumberland County. The present management approach for the Conewago Creek watershed is directed by the Conewago Creek Watershed Conservation Plan prepared by Buchart-Horn, Inc. in 2007. The Conservation Plan recommends the use of infiltration and BMPs, which is consistent with the Cumberland County Stormwater Plan. The small portions of the Conewago Creek watershed in Cumberland County should comply with the provisions of the adjacent Mountain Creek watershed (Figure 19).

# SECTION II CUMBERLAND COUNTY LAND FEATURES, LAND USE, AND HYDROLOGIC CHARACTERISTICS

## TOPOGRAPHY

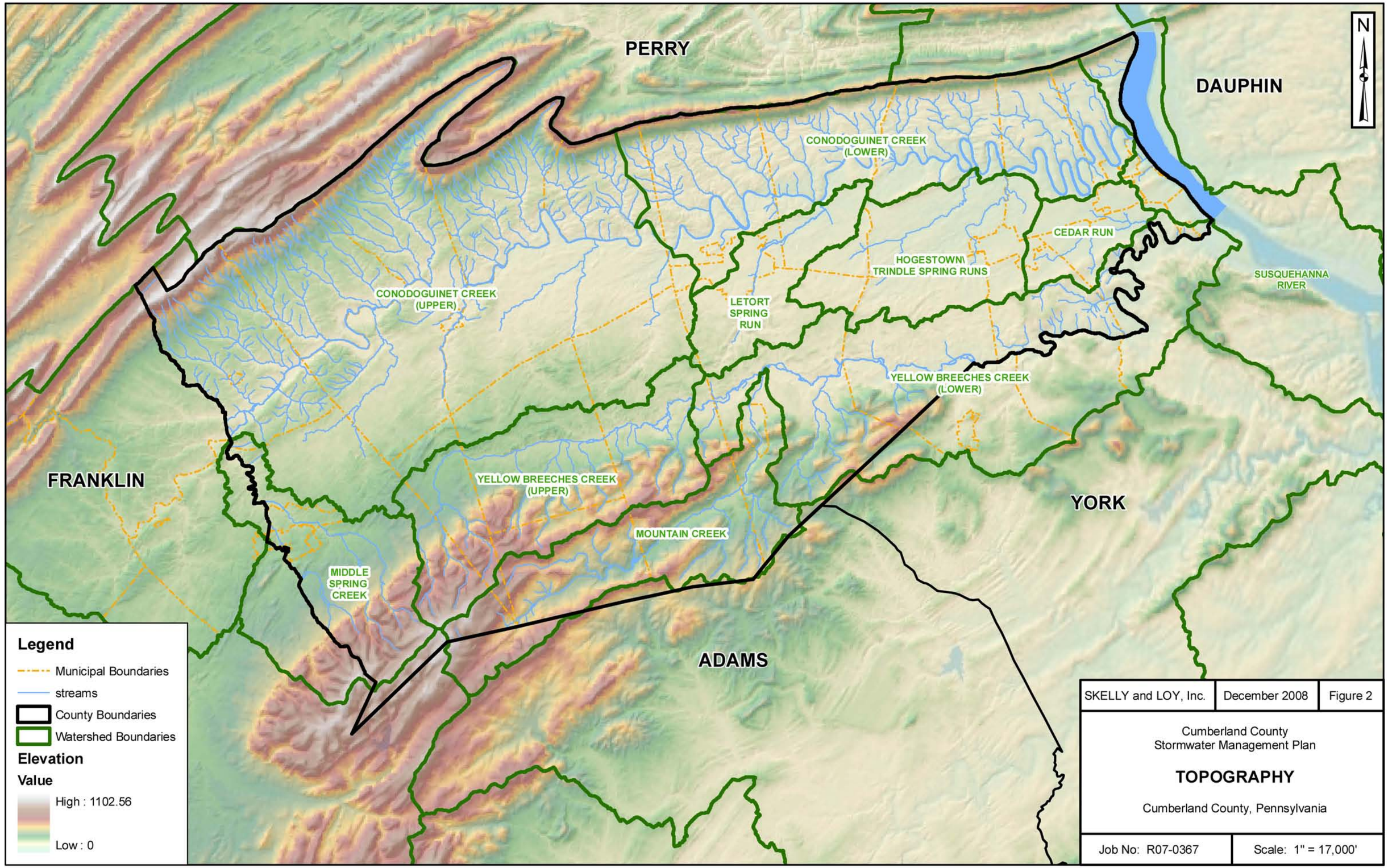
The topography of Cumberland County (Figure 2) varies from the low relief of the central valley floor to the prominent relief of the mountains bounding the County. The central valley floor runs roughly east-west through the County. The topographic features of Cumberland County derive from the structure and weathering characteristics of the underlying bedrock. Those areas containing the more erodible limestone are marked by low-lying valleys of moderate relief. The central valley floor is a broad expanse of land running east to west and has mild slopes of less than 8 percent. The areas underlain with more weather-resistant rock display terrain with steep slopes greater than 15 percent and contain Blue Mountain to the north and the South and Piney Mountains along the southern border.

Topography also helps determine optimal locations of population centers – the more level lands house the densely populated and urbanized areas while the steeper slopes of the mountain and hill areas present physical barriers to development.

## SOILS

Soils in the Cumberland County region have developed from a variety of parent materials and therefore exhibit significant variations in their physical and chemical characteristics. The eight generalized soil associations are listed below.

- **Berks-Weikert-Bedington Association:** Shallow to deep, gently sloping to very steep, well-drained soils that formed in material weathered from gray and brown shale, siltstone, and sandstone; on uplands.
- **Hagerstown-Duffield Association:** Deep, nearly level to moderately steep, well-drained soils that formed in material weathered from limestone; on uplands.
- **Hazleton-Laidig-Buchanan Association:** Deep, nearly level to very steep, well-drained to somewhat poorly drained soils that formed in material weathered from gray and brown quartzite, sandstone, siltstone, and shale; on uplands.
- **Monongahela-Atkins-Middlebury Association:** Deep, nearly level and gently sloping, moderately well-drained to poorly drained soils that formed in alluvium; on terraces and floodplains.


PERRY
DAUPHIN
N
CONODOGUINET CREEK (LOWER)
CEDAR RUN
HOGESTOWN\ TRINDLE SPRING RUNS
SUSQUEHANNA RIVER
CONODOGUINET CREEK (UPPER)
LETORT SPRING RUN
YELLOW BREECHES CREEK (LOWER)
FRANKLIN
YELLOW BREECHES CREEK (UPPER)
YORK
MOUNTAIN CREEK
MIDDLE SPRING CREEK
ADAMS
Legend
Municipal Boundaries
streams
County Boundaries
Watershed Boundaries
Elevation
Value
High : 1102.56
Low : 0
SKELLY and LOY, Inc.
December 2008
Figure 2
Cumberland County
Stormwater Management Plan
TOPOGRAPHY
Cumberland County, Pennsylvania
Job No: R07-0367
Scale: 1" = 17,000'

- **Murrill-Laidig-Buchanan Association:** Deep, nearly level to moderately steep, well-drained to somewhat poorly drained soils that formed in colluvium from gray sandstone, conglomerate, quartzite, and limestone; on uplands.

- **Athol-Neshaminy Association:** Deep, gently sloping and sloping, well-drained soils that formed in material weathered from conglomerate, breccias, and diabase; on uplands.

- **Hazleton-Clymer Association:** Deep, nearly level to very steep, well-drained soils that formed in material weathered from gray sandstone and quartzite; on uplands.

- **Highfield-Glenville Association:** Deep, nearly level to moderately steep, well-drained to somewhat poorly drained soils that formed in material weathered from schist and rhyolite; on uplands.

The infiltration of excess water during a storm event relates to the Hydrologic Soil Group present in the area. The Natural Resources Conservation Service (NRCS) has nationally classified soils into four hydrologic soil groups (A, B, C, and D) based on drainage characteristics. Each hydrologic group is a group of soils having similar runoff potential under similar storm and cover conditions. Soil properties that influence runoff potential and infiltration rate include a seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a very slowly-permeable layer. Definitions of the classes are as follows:

**A** – Low runoff potential. The soils have a high infiltration rate even when thoroughly wetted. They consist mainly of deep, well-drained to excessively drained sand or gravels. They have a high rate of water transmission

**B** – The soils have a moderate infiltration rate when thoroughly wetted. They consist mainly of deep to moderately well-drained to well-drained soils that have moderately fine to coarse textures. They have a moderate rate of water transmission.

**C** – The soils have a slow infiltration rate when thoroughly wetted. They mainly have a layer that impedes downward movement of water or have moderately fine to fine texture. They have a slow rate of water transmission.

**D** – High runoff potential. The soils have a very slow infiltration rate when thoroughly wetted. They consist mainly of clay soils that have a high swelling potential; soils that have a permanent high water table; soils that have a clay layer at or near the surface; and shallow soils over nearly impervious material. They have a very slow rate of water transmission.

(Jarrell, W. and L. Bundy, Discovery of Farms Program, Department of Soil Science, University of Wisconsin. 2002.)

Figure 3 shows that the majority of soils in Cumberland County are Hydrologic Soil Group B. Soils of Hydrologic Soil Groups C and D are primarily found in the existing and historic floodplain areas of streams and their tributaries.

## GEOLOGY

The key geologic features in Cumberland County that affect stormwater are the presence and distribution of deep colluvium and limestone (karst geology) in the southern and central portions of the County, shale geology found along the Conodoguinet Creek, and metamorphic rocks that form the North Mountain and Blue Ridge (see Figure 4). Karst refers to a type of topography formed over limestone by dissolution of the carbonate bedrock. Water percolating through the bedrock forms a weak acid which slowly dissolves the limestone. Over time, the resulting fractures in the rocks yield to the formation of sinkholes and caves. The presence of karst and colluvial geology accounts for the rapid infiltration of water, resulting in a lack of surface streams. In addition, rapid infiltration and the solution cavities associated with karst geology also raise concerns about groundwater contamination. The high degree of infiltration is often difficult to reflect in computer models, rendering it difficult to depict reasonably accurate existing and future conditions. A primary focus of this Stormwater Management Plan is to address the water quantity and quality concerns created by the County's geologic conditions.

## EXISTING RUNOFF CHARACTERISTICS

Figure 5 presents the existing landcover displayed on Anderson Land Use Mapping. The low-lying east-west corridor of Cumberland County contains an intensely populated urban center in the eastern portion of the county and a smaller, centrally located urban concentration. The remainder of the central corridor is primarily agricultural land with scattered forested lands. The steeper slopes along the northern and southern portions of the county contain vast reaches of forests. The vegetative groundcover of the forests and the tilled soils of croplands provide adequate absorptive capacity for floodwaters during both major and minor storms. The high-density urban areas, however, with their concentrations of impermeable surfaces are, of course, more prone to damage from stormwater runoff. This is especially true of those areas located adjacent to major creeks where major storms cause overtopping of the creek banks.

PERRY

CONODOGUINET CREEK (LOWER)

HOGESTOWN TRINDLE SPRING RUNS

CEDAR RUN

SUSQUEHANNA RIVER

LETORT SPRING RUN

CONODOGUINET CREEK (UPPER)

CUMBERLAND

YELLOW BREECHES CREEK (LOWER)

YELLOW BREECHES CREEK (UPPER)

FRANKLIN

YORK

MOUNTAIN CREEK

MIDDLE SPRING CREEK

ADAMS

N

Legend

- Municipal Boundaries
- County Boundaries
- Watershed Boundaries

**Hydrologic Soil Groups**

- A
- B
- B/D
- C
- C/D
- D
- Other

| SKELLY and LOY, Inc. | December 2008 | Figure 3 |
|---|---|---|

Cumberland County
Stormwater Management Plan

## HYDROLOGIC SOIL GROUPS

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 19,000' |
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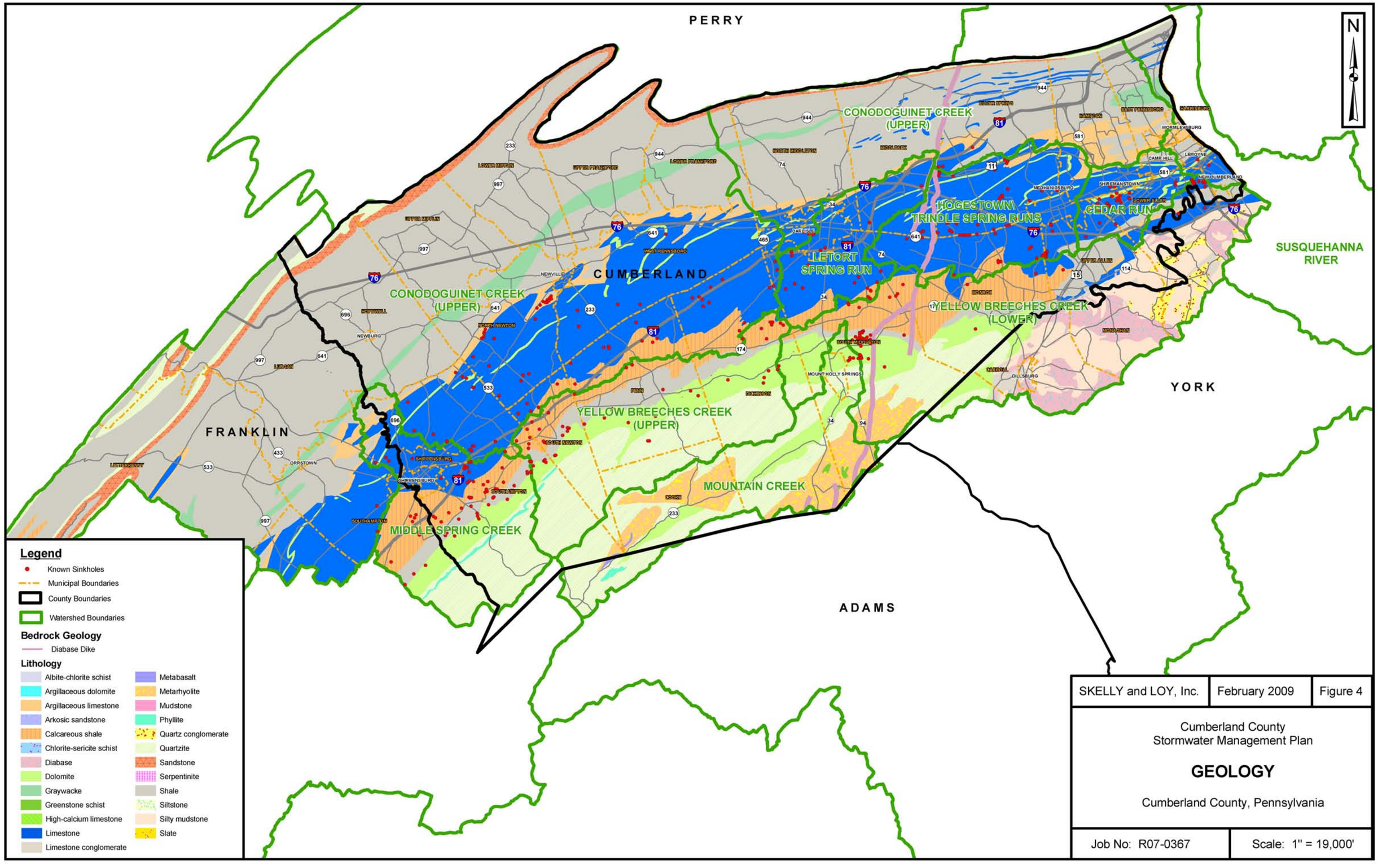


| SKELLY and LOY, Inc. | February 2009 | Figure 4 |
|---|---|---|

Cumberland County
Stormwater Management Plan

# GEOLOGY

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 19,000' |
|---|---|

PERRY COUNTY

DAUPHIN COUNTY

YORK COUNTY

FRANKLIN COUNTY

ADAMS COUNTY

N

LEGEND

- Residential
- Commercial / Industrial
- Agricultural Land
- Forested Land
- Open, Pasture
- Emergent Wetlands
- Surface Water
- Forested Wetlands
- Mines & Quarries

Source: PaMap Landcover - 2005

| SKELLY and LOY, Inc. | August 2009 | Figure 5 |
|---|---|---|

CUMBERLAND COUNTY STORMWATER MANAGEMENT PLAN

**EXISTING LANDCOVER**

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 16,000' |
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## EXISTING AND PROPOSED STORMWATER COLLECTION SYSTEMS

Existing stormwater collection systems in Cumberland County include curbside street drains with underground collection and conveyance pipes as well as some swales and detention basins in some areas with limited development. All 11 boroughs in the County (New Cumberland, Lemoyne, Camp Hill, Wormleysburg, Shiremanstown, Mechanicsburg, Mt. Holly Springs, Carlisle and the surrounding region, Newville, Newburg, and Shippensburg and the surrounding region) have existing stormwater collection systems. In addition, the villages of Enola and West Fairview in East Pennsboro Township, the eastern portion of Lower Allen Township (including Highland and Cedar Cliff), the southeast portion of Hampden Township (south of the Conodoguinet to the U.S. Navy Depot), and Boiling Springs also have existing stormwater collection systems.

The existing collection systems were planned for effective management of stormwater runoff during storm events. As growth has expanded around some of the highly developed urban-like areas, the collection systems have proven successful, for the most part, in capturing excess runoff from impermeable surfaces during heavy rainfall and snowmelt. As evidenced from the surveys returned from municipalities, occasional deficiencies can occur when debris blocks the intake pipes or excessively heavy rainstorms occur in a short period of time, overburdening the system.

The following proposed commercial/industrial and residential developments in Cumberland County are planned to include stormwater collection systems.

Commercial/Industrial

- **Wentworth Corporate Center** – in Hampden Township, at Exit 61 off I-81
- **Silver Spring Commerce Park** – in Silver Spring Township at Exit 57 off I-81
- **114 Associates** – in Silver Spring Township on PA 114
- **I-81 Commerce Park** – in Southampton Township at Exit 29 off I-81

Residential (300 units or more)

- **The Hills at Silver Spring** – in Silver Spring Township on Rich Valley Road
- **Pennterra** – in Middlesex Township on Country Club Road
- **Cumberland Knoll** – in Middlesex Township
- **The Villages at Orchard Hills** – in Southampton Township
- **Heritage Village** – in South Middleton Township at the intersection of York Road and Fairview Street
- **Orchards at Marsh Run** – in South Middleton Township on Marsh Drive

All planned developments will have internal street systems with stormwater piping that empties into detention basins and swales.

## EXISTING STATE, FEDERAL, AND LOCAL FLOOD-CONTROL PROJECTS

There are no state, federal, or local flood-control projects in Cumberland County. While there are several dams associated with lakes within the Cumberland County watersheds (including Double Gap Lake in Colonel Denning State Park and Fuller Lake and Laurel Lake in Pine Grove Furnace State Park), these structures were constructed for the purpose of providing recreational opportunities such as boating, swimming, fishing, etc. and were not intended to function as flood-control measures.

## ANALYSIS OF DEVELOPMENT IN FLOOD HAZARD AREAS

In the past, buildings were allowed to be constructed in floodplains with little regulation. We have since reversed this approach as we have witnessed the social and economic costs incurred from flooding, and we have come to appreciate the important function of floodplains in terms of slowing down and absorbing stormwater. However, a closer analysis does reveal pockets of development situated in floodplains in the County. Figure 6 combines mapping of existing structures overlaid on a map containing 100-year floodplains along the major creeks in the County. The series of development clusters are numbered to highlight the existing flood-plain development. Table 1 shows the sites and locations that correspond to Figure 6.

**TABLE 1**
**EXISTING DEVELOPMENT WITHIN FLOODPLAINS**

| SITE | WATERWAY FLOODPLAIN | DEVELOPMENT LOCATION |
|---|---|---|
| 1-7 | Conodoguinet Creek | Length of corridor |
| 8 | Cedar Run | Shiresmantown and Lower Allen |
| 9-10 | Hogestown Run/Trindle Spring | Mechanicsburg |
| 11-12 | Letort Spring Run | Middlesex Township |
| 13-17 | Yellow Breeches | Monroe and South Middletown Townships |
| 18-19 | Mountain Creek | Mount Holly Springs |
| 20-21 | Middle Spring Creek and Burd Run | Shippensburg |

Conodoguinet Creek contains numerous clusters of floodplain development (1-7), especially along the sharply curved reaches of the waterway. Normally, floodplains along such sharp turns serve to slow the flow of water during heavy rainfalls or snowmelts. However, the presence of numerous structures situated within the floodplain in these sections results in a high potential for structural damage due to flooding.

N

PERRY COUNTY

DAUPHIN COUNTY

YORK COUNTY

FRANKLIN COUNTY

ADAMS COUNTY

EAST PENNSBORO TOWNSHIP
HAMPDEN TOWNSHIP
WORMLEYSBURG BOROUGH
CAMP HILL BOROUGH
LEMOYNE BOROUGH
NEW CUMBERLAND BOROUGH
SHIREMANSTOWN BOROUGH
LOWER ALLEN TOWNSHIP
MECHANICSBURG BOROUGH
UPPER ALLEN TOWNSHIP
SILVER SPRING TOWNSHIP
MIDDLESEX TOWNSHIP
CARLISLE BOROUGH
MONROE TOWNSHIP
SOUTH MIDDLETON TOWNSHIP
NORTH MIDDLETON TOWNSHIP
LOWER FRANKFORD TOWNSHIP
UPPER FRANKFORD TOWNSHIP
LOWER MIFFLIN TOWNSHIP
UPPER MIFFLIN TOWNSHIP
WEST PENNSBORO TOWNSHIP
NEWVILLE BOROUGH
HOPEWELL TOWNSHIP
NEWBURG BOROUGH
NORTH NEWTON TOWNSHIP
DICKINSON TOWNSHIP
PENN TOWNSHIP
MOUNT HOLLY SPRINGS BOROUGH
SOUTH NEWTON TOWNSHIP
SOUTHAMPTON TOWNSHIP
SHIPPENSBURG TOWNSHIP
SHIPPENSBURG BOROUGH
COOKE TOWNSHIP

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Doubling Gap Creek
Blosser Creek
Locust Creek
Opossum Creek
Warts Run
Spring Run
Simmons Creek
Sears Run
Pine Run
Trindle Spring Run
Hogestown Run
Letort Spring Run
Old Town Run
Cold Spring Run
Spruce Run
Hunters Run
Tagg Run
Iron Run
Sage Run
Toms Run
Mountain Creek
Yellow Breeches Creek
Mount Rock Spring Creek
Conodoguinet Creek
Rock Run
Center Creek
Back Creek
Whisky Run
Brandy
Three Square Hollow Run
Trout Run
Peebles Run
Bore Mill Run
Koser Run
Green Spring Creek
Bulls Head Branch
Paxton Run
Gum Run
Maines Run
Thomson Creek
Burd Run
Knob Run
Birch Run

## Legend

- Cumberland County
- Municipal Boundary
- Streams
- Floodplain
- Structures
- Structures within Floodplain

Source: Cumberland County GIS

| SKELLY and LOY, Inc. | August 2009 | Figure 6 |
|---|---|---|

CUMBERLAND COUNTY STORMWATER MANAGEMENT PLAN

# FLOOD PLAINS AND EXISTING DEVELOPMENTS

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 3 miles |
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Development clusters (8-12) within the Cedar Run, Hogestown Run/Trindle Spring, and Letort Spring Run floodplain regions are due to the high demand for location in the nearby urbanized areas. A high density of homes and commercial buildings also leads to a high proportion of impermeable surfaces, which results in increased flooding.

Clusters of development (13-19) along the floodplains of Yellow Breeches Creek and Mountain Creek are most likely due to the lack of set-backs in past regulations.

Development (20-21) along the Middle Spring Creek and Burd Run are jointly due to proximity to an urbanized area and lack of set-back regulations.

## MUNICIPALITIES WITHIN THE WATERSHEDS

Cumberland County is one of four counties comprising the greater Harrisburg metropolitan area. Consisting of 551 square miles within the Cumberland Valley, the County stretches approximately 42 miles from the Susquehanna River in the east to the borough of Shippensburg in the west. The northern boundary of the County is formed primarily by the ridge of North Mountain, separating the Conodoguinet Creek watershed from the Sherman Creek watershed in the north. The southern boundary slopes primarily southwest from east to west along the border of York County and Adams County to the south.

The County's population of approximately 200,000 is distributed throughout 33 municipalities consisting of 22 townships and 11 boroughs (see Figure 7). The County seat is Carlisle Borough.

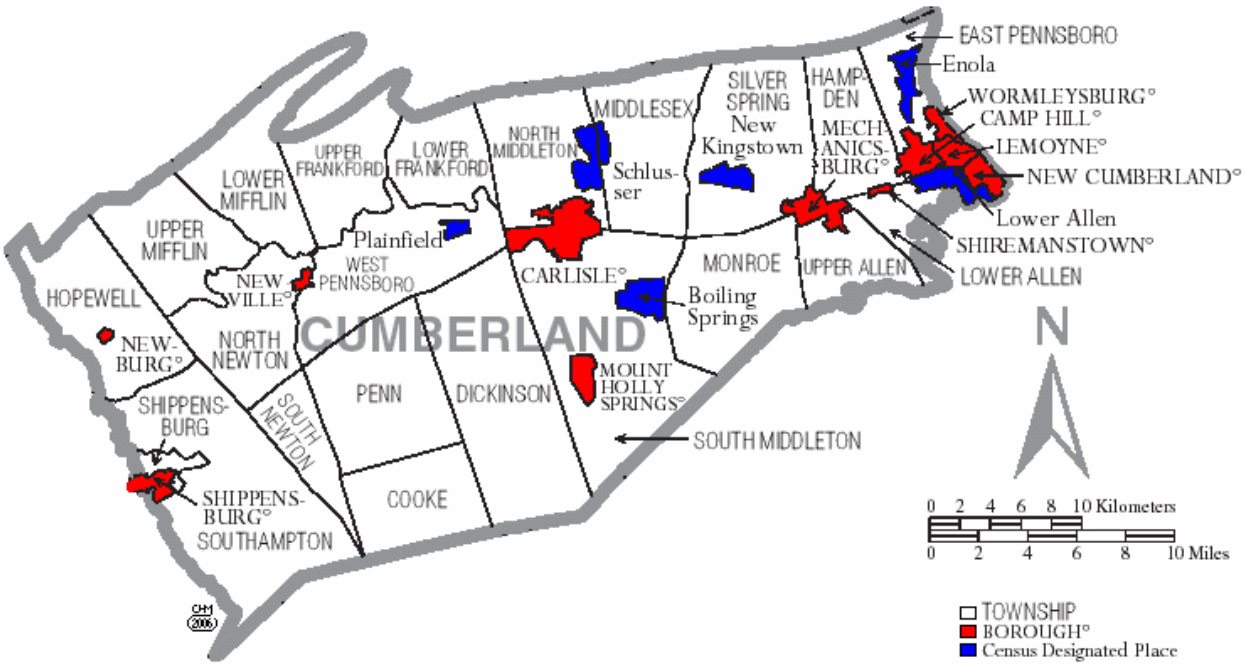



**FIGURE 7 – CUMBERLAND COUNTY MUNICIPALITIES**

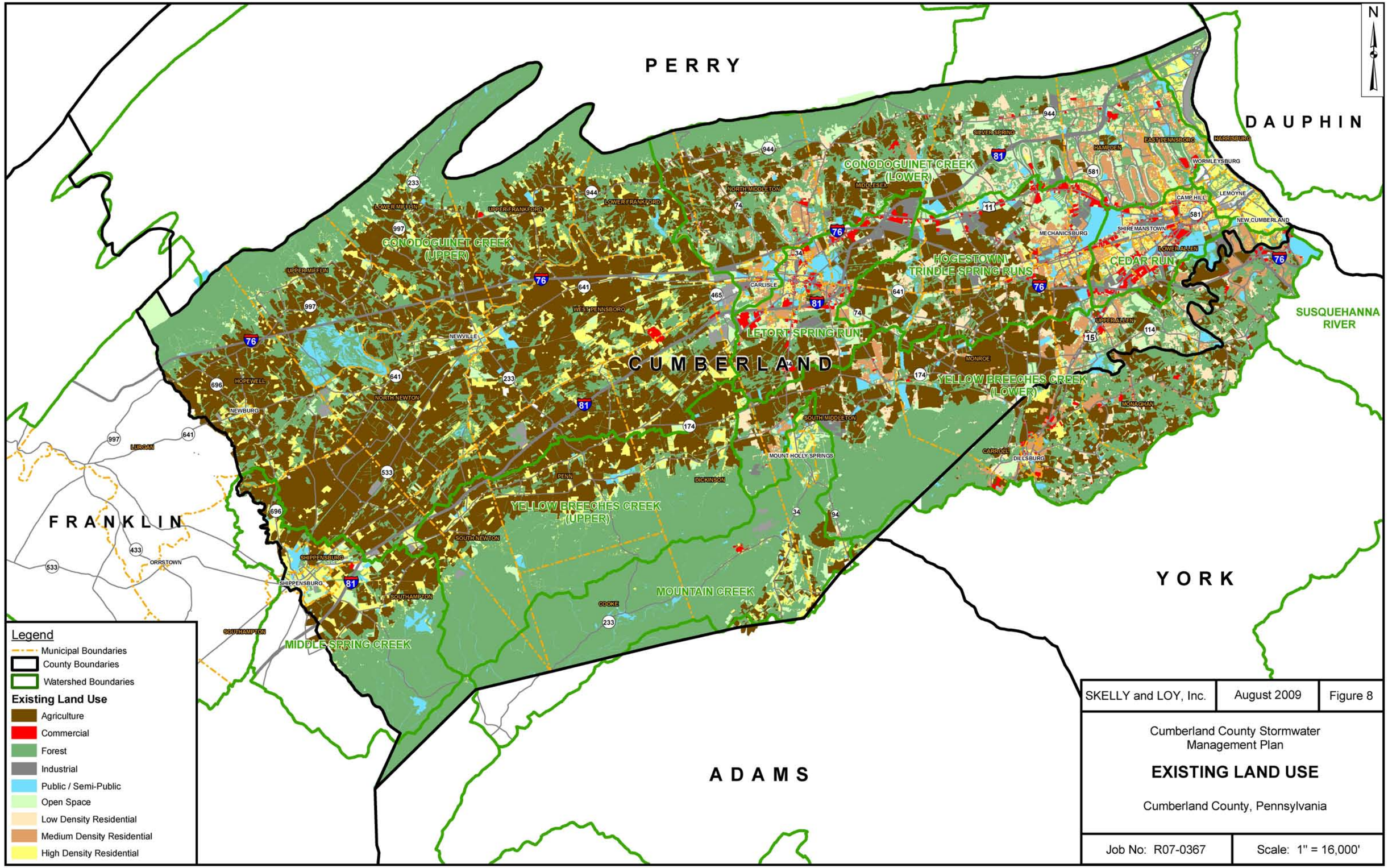
## EXISTING LAND USE

According to the 2003 Cumberland County Comprehensive Plan, the present land uses in the County are characterized by high-density, mixed urban development in the east and rural/ agricultural use in the west (Figure 8). Population densities are concentrated in and near the boroughs of Camp Hill, Mechanicsburg, Carlisle, and Shippensburg. Non-residential strip development is present along U.S. Route 11 between Camp Hill and Carlisle. Cumberland County's proximity to the eastern seaboard and the intersection of I-81 and the Pennsylvania Turnpike near Carlisle has led to a high concentration of warehouse and distribution facilities in the area. Agricultural operations are concentrated in the rural central and western portions of the County, which contain prime agricultural lands or soils of statewide importance. Table 2 summarizes the present land uses within those watersheds that underwent detailed modeling for this Plan.

## FUTURE LAND USE

The 2003 Cumberland County Comprehensive Plan indicates that the majority of new development will be located in or near areas with already existing public services and infrastructure (see Figure 9, Future Land Use). Business park/office development is proposed at three I-81 interchanges – Exits 29, 57, and 61. A combination of mixed land uses and traditional village development has been encouraged to reduce traffic congestion and sprawl. This approach maximizes investment in the infrastructure systems while relieving development pressure on farmland. Stringent development criteria have been recommended for areas containing prime farmland soils in an attempt to preserve these valuable lands. Current methods for protecting farmland include agricultural preservation zoning, transfer development rights, agricultural security areas and easement programs, and the Clean and Green Program (see Table 3, Future Land Use).

Yet, comparison of the data in Table 2 with the projected data in Table 3 shows a consistent increase in the loss of forested area and open space as the projected rise in population increases the amount of land required for residential dwellings and industrial and commercial structures. Only the Cedar Run watershed and the Hogestown Run/Trindle Spring Run watershed show less than a doubling of land use for residential development. Only the Letort Spring watershed and the Hogestown Run/Trindle Spring Run watershed are projected to maintain the existing agricultural land in their area. The loss of natural absorptive qualities of the surrounding landscape reinforces the present need to promote effective stormwater management to prevent future soil erosion and flooding.




Legend

- Municipal Boundaries
- County Boundaries
- Watershed Boundaries

**Existing Land Use**

- Agriculture
- Commercial
- Forest
- Industrial
- Public / Semi-Public
- Open Space
- Low Density Residential
- Medium Density Residential
- High Density Residential

| SKELLY and LOY, Inc. | August 2009 | Figure 8 |
|---|---|---|

Cumberland County Stormwater Management Plan

## EXISTING LAND USE

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 16,000' |
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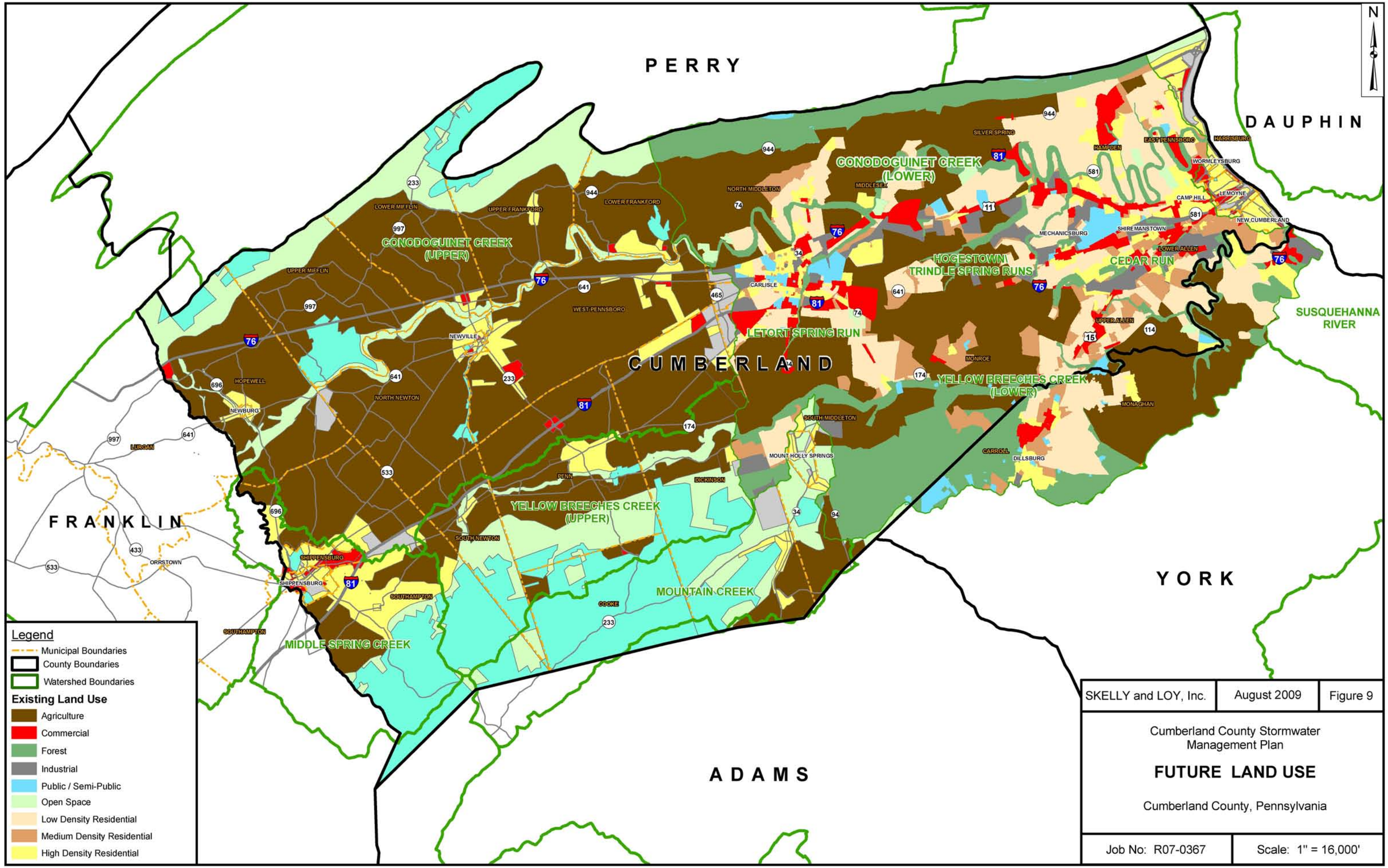
## TABLE 2
## EXISTING LAND USE

| WATERSHED | TOTAL ACRES | LAND USE CATEGORY | PERCENT | LAND USE ACREAGE |
|---|---|---|---|---|
| Cedar Run | 7,956 | Residential – Low Density | 7% | 524 |
| | | Residential – Medium Density | 13% | 1,072 |
| | | Residential – High Density | 10% | 814 |
| | | Commercial | 16% | 1,268 |
| | | Industrial | 11% | 892 |
| | | Public/Semi-Public | 23% | 1,824 |
| | | Forest | 4% | 327 |
| | | Agriculture | 9% | 691 |
| | | Open Space | 7% | 544 |
| Conodoguinet Creek (Lower) | 49,901 | Residential – Low Density | 12% | 6,062 |
| | | Residential – Medium Density | 9% | 4,721 |
| | | Residential – High Density | 1% | 687 |
| | | Commercial | 2% | 954 |
| | | Industrial | 1% | 571 |
| | | Public/Semi-Public | 4% | 1,944 |
| | | Forest | 34% | 17,118 |
| | | Agriculture | 26% | 12,501 |
| | | Open Space | 11% | 5,343 |
| Letort Spring Run | 13,876 | Residential – Low Density | 8% | 1,103 |
| | | Residential – Medium Density | 8% | 1,054 |
| | | Residential – High Density | 3% | 381 |
| | | Commercial | 9% | 1,250 |
| | | Industrial | 7% | 1,043 |
| | | Public/Semi-Public | 8% | 1,069 |
| | | Forest | 11% | 1,460 |
| | | Agriculture | 38% | 5,460 |
| | | Open Space | 8% | 1,056 |
| Hogestown Run/ Trindle Spring Run | 23,682 | Residential – Low Density | 12% | 2,740 |
| | | Residential – Medium Density | 7% | 1,657 |
| | | Residential – High Density | 2% | 495 |
| | | Commercial | 4% | 954 |
| | | Industrial | 6% | 1,325 |
| | | Public/Semi-Public | 8% | 1,869 |
| | | Forest | 7% | 1,681 |
| | | Agriculture | 44% | 10,700 |
| | | Open Space | 10% | 2,261 |
| Yellow Breeches Creek (Lower) | 62,898 | Residential – Low Density | 9% | 5,968 |
| | | Residential – Medium Density | 7% | 4,527 |
| | | Residential – High Density | 1% | 750 |
| | | Commercial | 1% | 792 |
| | | Industrial | 1% | 556 |
| | | Public/Semi-Public | 4% | 2,456 |
| | | Forest | 37% | 23,306 |
| | | Agriculture | 36% | 22,020 |
| | | Open Space | 4% | 2,523 |

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| SKELLY and LOY, Inc. | August 2009 | Figure 9 |

Cumberland County Stormwater Management Plan

# FUTURE LAND USE

Cumberland County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 16,000' |

## TABLE 3
## FUTURE LAND USE

| WATERSHED | TOTAL ACRES | LAND USE CATEGORY | PERCENT | LAND USE ACREAGE |
|---|---|---|---|---|
| Cedar Run | 7,956 | Residential – Low Density | 10% | 796 |
| | | Residential – Medium Density | 19% | 1,512 |
| | | Residential – High Density | 24% | 1,909 |
| | | Commercial | 17% | 1,353 |
| | | Industrial | 20% | 1,581 |
| | | Public/Semi-Public | 4% | 318 |
| | | Forest | 5% | 398 |
| | | Agriculture | 0.07% | 6 |
| | | Open Space | 0 | 0 |
| Conodoguinet Creek (Lower) | 49,901 | Residential – Low Density | 24% | 11,976 |
| | | Residential – Medium Density | 3% | 1,497 |
| | | Residential – High Density | 5% | 2,495 |
| | | Commercial | 4% | 1,996 |
| | | Industrial | 1% | 499 |
| | | Public/Semi-Public | 2% | 998 |
| | | Forest | 25% | 12,475 |
| | | Agriculture | 34% | 16,966 |
| | | Open Space | 2% | 998 |
| Letort Spring Run | 13,876 | Residential – Low Density | 14% | 194,264 |
| | | Residential – Medium Density | 5% | 694 |
| | | Residential – High Density | 11% | 1,526 |
| | | Commercial | 16% | 2,220 |
| | | Industrial | 7% | 971 |
| | | Public/Semi-Public | 5% | 694 |
| | | Forest | 3% | 416 |
| | | Agriculture | 39% | 5,412 |
| | | Open Space | 0.3% | 42 |
| Hogestown Run/ Trindle Spring Run | 23,682 | Residential – Low Density | 19% | 4,599 |
| | | Residential – Medium Density | 7% | 1,642 |
| | | Residential – High Density | 3% | 737 |
| | | Commercial | 8% | 1,792 |
| | | Industrial | 9% | 2153 |
| | | Public/Semi-Public | 3% | 726 |
| | | Forest | 6% | 1,459 |
| | | Agriculture | 44% | 10,449 |
| | | Open Space | 1% | 140 |
| Yellow Breeches Creek (Lower) | 62,898 | Residential – Low Density | 18% | 11,322 |
| | | Residential – Medium Density | 8% | 5,032 |
| | | Residential – High Density | 3% | 1,887 |
| | | Commercial | 2% | 1,258 |
| | | Industrial | 2% | 1,258 |
| | | Public/Semi-Public | 2% | 1,258 |
| | | Forest | 30% | 18,869 |
| | | Agriculture | 34% | 21,385 |
| | | Open Space | 0.2% | 126 |

## STORMWATER PROBLEM AREAS

Municipal officials usually have first-hand knowledge of the frequency and extent of stormwater problem areas due to their direct contact with affected property owners. During the early development of this Stormwater Management Plan, surveys were sent to each of the 33 municipalities in the County, as well as the 5 York County municipalities in the Lower Yellow Breeches Creek watershed, to determine specific areas subject to stormwater drainage problems. (Appendix A contains copies of the returned surveys.) Follow-up requests were made to those municipalities that did not respond initially. Out of the 38 municipalities, 27 returned a survey detailing their specific concerns and problem areas. Figure 10 maps the areas affected by floodplain and drainage problems as identified by the survey respondents. (Appendix B contains a complete listing of problem areas and the causes of the problems as identified by the respondents.)

For the purpose of the survey, Cumberland County was divided into eastern and western sections. The eastern section (with surveys received from 15 municipalities) contains those watersheds that are highly subject to development pressures and, subsequently, underwent detailed modeling for development of this Plan. The western section (with surveys received from 12 municipalities) contains those watersheds that support more extensive agriculture, are subject to limited development pressure, and were not modeled in detail for this Plan. The response choices were ranked from 1 to 5 with 5 signifying "Very Important" and 1 signifying "Relatively Unimportant." The choices were also weighted to provide a final score for comparison purposes. Table 4 shows the scores of the received responses for the Water Quality and Water Quantity problems described in the survey.

## SURVEY RESULTS

- Both the eastern and western sections ranked *Erosion & Sedimentation on Disturbed Lands* and *Erosion & Sedimentation from Streambanks* as "Very Important" in relation to water quality.
- The effect of *Nutrients* on water quality was a greater concern in the eastern section than in the western section, as was the effect of *Flooding* on water quantity.
- Both the eastern and western sections rated *Development Related Increases* on water quantity as "Important." Neither section rated *Inadequate Groundwater Recharge* as a highly important problem.

PERRY

CUMBERLAND

FRANKLIN

YORK

ADAMS

N

Legend

- Problem Areas (UA1)
- Streams
- Municipal Boundaries
- County Boundaries
- Watershed Boundaries

| SKELLY and LOY, Inc. | August 2009 | Figure 10 |
|---|---|---|

Cumberland County
Stormwater Management Plan

**STORMWATER PROBLEM AREAS**

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 19,000' |
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**TABLE 4**
**SUMMARY OF SURVEY RESULTS**

| DESCRIPTION | 5 VERY IMPORTANT | 4 | 3 MODERATELY IMPORTANT | 2 | 1 RELATIVELY UNIMPORTANT | TOTAL POINTS |
|---|---|---|---|---|---|---|
| **Eastern Municipalities** | | | | | | |
| **Water Quality** | | | | | | |
| E&S on Disturbed Lands | 20 | 16 | 3 | 4 | 3 | 46 |
| E&S from Streambanks | 20 | 20 | 6 | 2 | 2 | 50 |
| Nutrients | 25 | 8 | 9 | 2 | 3 | 47 |
| Other | 10 | 0 | 0 | 0 | 1 | 11 |
| Sump Discharges | 0 | 0 | 0 | 2 | 0 | 2 |
| **Water Quantity** | | | | | | |
| Flooding | 60 | 4 | 3 | 0 | 0 | 67 |
| Development Related Increases | 30 | 20 | 6 | 2 | 0 | 58 |
| Inadequate Groundwater Recharge | 10 | 8 | 15 | 8 | 1 | 42 |
| **Western Municipalities** | | | | | | |
| **Water Quality** | | | | | | |
| E&S on Disturbed Lands | 25 | 12 | 6 | 0 | 2 | 45 |
| E&S from Streambanks | 15 | 12 | 9 | 4 | 1 | 41 |
| Nutrients | 10 | 8 | 12 | 4 | 2 | 36 |
| Other | 0 | 0 | 0 | 0 | 0 | 0 |
| Sump Discharges | 0 | 0 | 0 | 0 | 0 | 0 |
| **Water Quantity** | | | | | | |
| Flooding | 20 | 12 | 12 | 0 | 1 | 45 |
| Development Related Increases | 25 | 8 | 6 | 0 | 3 | 42 |
| Inadequate Groundwater Recharge | 10 | 8 | 9 | 0 | 5 | 32 |
| **Entire County** | | | | | | |
| **Water Quality** | | | | | | |
| E&S on Disturbed Lands | 45 | 28 | 9 | 4 | 5 | 91 |
| E&S from Streambanks | 35 | 32 | 15 | 6 | 3 | 91 |
| Nutrients | 35 | 16 | 21 | 6 | 5 | 83 |
| Other | 0 | 0 | 0 | 0 | 1 | 0 |
| Sump Discharges | 0 | 0 | 0 | 2 | 0 | 2 |
| **Water Quantity** | | | | | | |
| Flooding | 80 | 16 | 15 | 0 | 1 | 112 |
| Development Related Increases | 55 | 28 | 12 | 2 | 3 | 100 |
| Inadequate Groundwater Recharge | 20 | 16 | 24 | 8 | 6 | 74 |

## SIGNIFICANT OBSTRUCTIONS

Engineers and environmental specialists conducted extensive field surveys of 409 bridges and culverts to identify all obstructions with the potential to cause substantial upstream flooding. (See Appendix C for a listing of significant obstructions surveyed.) Many of the problem areas identified as occurring during storm events are attributable to the blockage or diversion of water flow by significant obstructions. The majority of the obstructions inventoried were bridges and culverts located along or under roadways and railroads. Field data collected on each obstruction included the type of opening for the bridge/pipe; the building material of the bridge/pipe; and the length, height, and width or diameter of the bridge/pipe. Further review

tabulated hydraulic capacities to determine which obstructions were deemed significant. The final plan analyzed the resultant effects on flooding.

The streams surveyed for the detailed modeling included the following:

- Conodoguinet Creek (Lower)
- Dogwood Run
- Fishers Run
- Hogestown Run
- Holtz Run
- Letort Spring Run
- Little Dogwood Run
- Meetinghouse Run
- Old Town Run
- Pine Run
- Sears Run
- Spring Run
- Stony Run
- Trindle Spring Run
- Trout Run
- Yellow Breeches Creek (Lower)
- Wertz Run

**IMPAIRED STREAM REACHES**

An impaired stream is a stream determined to be receiving a pollutant level that exceeds either the natural level or the level that can be assimilated by the stream without having a detrimental effect on water quality. Under the Total Maximum Daily Load (TMDL) program established under the Clean Water Act Section 303(d), states must develop lists of waters that do not meet water quality standards, even with technology-based or other pollution controls in place. States must then develop TMDLs for those waters ranked high on the priority list.

Stream impairment in the watersheds of Cumberland County can be due to organic enrichment or siltation or the presence of suspended solids and PCBs. Impairment substances can be caused by storm sewers, atmospheric deposition, or land disposal. Soil disturbances (which lead to erosion and excess sedimentation in streams) can be caused by agricultural practices (carelessly plowed fields; overgrazing), construction activities (poor site stabilization; steep slopes), removing ground cover, and soil compaction.

PA DEP has listed parts of the following stream reaches as impaired:

- Cedar Run
- Cold Spring Run
- Conodoguinet Creek

- Dogwood Run
- Fishers Run
- Fishing Creek
- Little Dogwood Run
- Mountain Creek
- Sears Run
- Spruce Run
- Trindle Spring Run
- Yellow Breeches Creek

**HIGH QUALITY/EXCEPTIONAL VALUE (HQ/EV) STREAM REACHES**

Waters classified as High Quality or Exceptional Value are protected under Title 25 of the Pennsylvania Code. A surface water qualifies as High Quality water when it meets the criteria specified by PA DEP Chapter 93 – Water Quality Standards. The water must satisfy specific parameters of chemistry based on data collected long-term (at least one year), and it must satisfy specific parameters of biology by supporting a high-quality aquatic community based on biological assessments. A surface water qualifies as an Exceptional Value water when it meets the criteria for High Quality water and possesses additional attributes such as its location in a protected area, its exceptional recreational significance, or its designation as a "wilderness trout stream"; OR if it has exceptional ecological significance.

The following streams are protected as **High Quality Streams**:

- Trindle Spring Run
- Letort Spring Run
- Mountain Creek
- Yellow Breeches Creek (Upper and Lower)

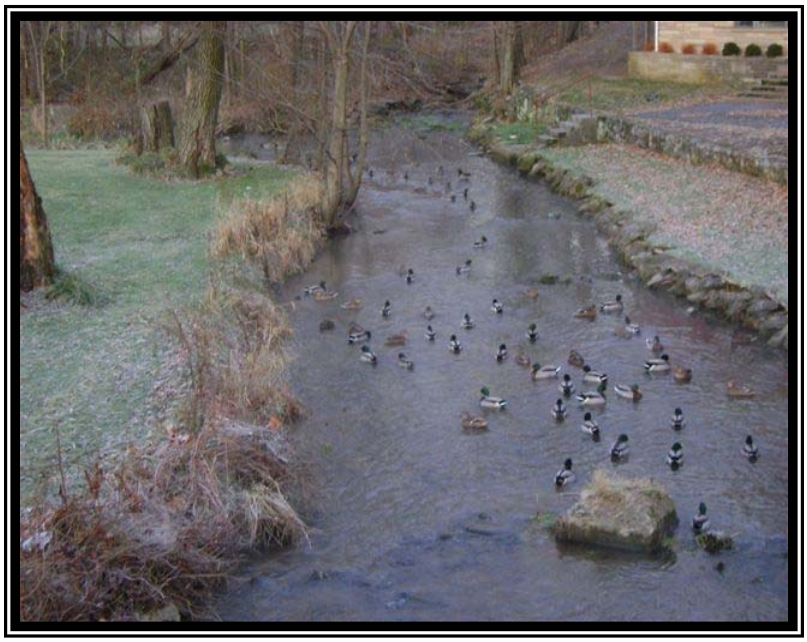
The following streams are also protected as **Exceptional Value Streams**:

- Big Spring Creek (a tributary to the Conodoguinet Creek)
- Letort Spring Run

A goal of the Stormwater Management Plan is to ensure continued protection of these important resources as development increases in Cumberland County.

## WATERSHED DESCRIPTIONS

### Cedar Run Watershed



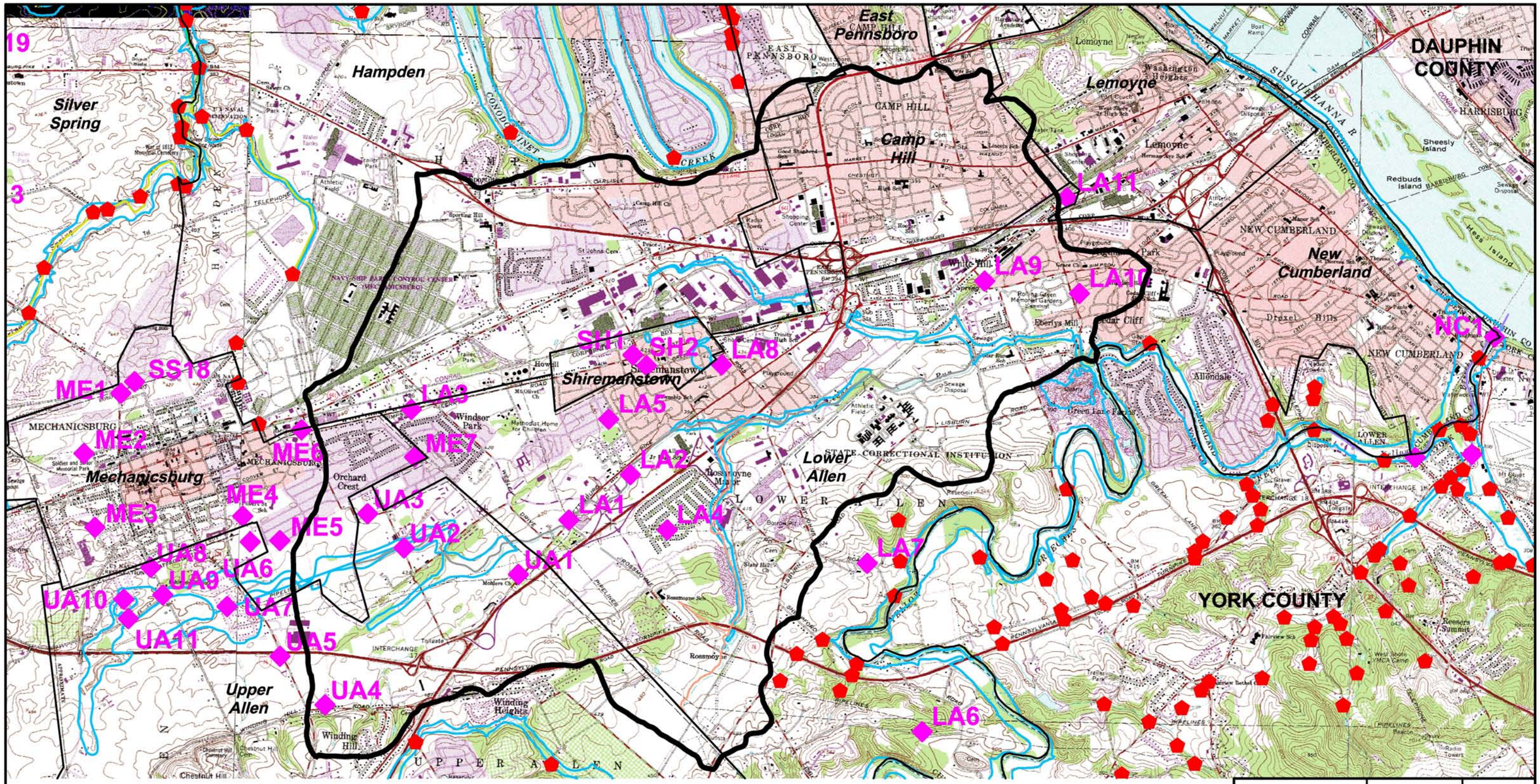
**Photograph No. 1** – Cedar Run

The Cedar Run watershed (Figure 11) is located in the eastern portion of Cumberland County. It encompasses almost 14 square miles (8,870 acres) and includes all or portions of eight municipalities – Camp Hill, Hampden, East Pennsboro, Lower Allen, Mechanicsburg, Monroe, Shiremanstown, and Upper Allen. The main stem of Cedar Run is approximately 7.3 miles long and flows from a southwest to northeast direction, discharging into the Yellow Breeches Creek in Lower Allen Township. The 13.8-square-mile (8,870-acre) drainage area is 70 percent urbanized and contains over 50 percent impervious surface; the land use is primarily high density development.

Much of the watershed is underlain by limestone, which accounts for the presence of numerous depressions and sinkholes. Most of the Main Branch, Rossmoyne Branch, and Shiresmanstown Branch have Federal Emergency Management Agency (FEMA)-designated and -mapped 100-year floodplains. An Act 167 Phase II Stormwater Management Plan was prepared for Cedar Run in 2001. Due to concerns expressed by local municipal officials, the Cedar Run watershed was included as part of the detailed modeling effort completed for the development of this Plan.

*Cedar Run includes the following Special Protection Classification/Designated Use:*

– *Cold Water Fishery (CWF)*




**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 11 |
|---|---|---|

Cumberland County
Stormwater Management Plan

**CEDAR RUN WATERSHED**

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 3,000' |
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## Conodoguinet Creek Watershed

**Photograph No. 2** – Conodoguinet Creek

The 524-square-mile Conodoguinet Creek watershed (Figures 12A and 12B) drains the northern two-thirds of Cumberland County and contains the smaller subwatersheds of Middle Spring Creek, Letort Spring Run, Hogestown Run, and Trindle Spring Run. Conodoguinet Creek originates in the Kittatinny Mountain and flows 101 miles until its confluence with the Susquehanna River near Harrisburg. One of its tributaries, Big Spring Creek, is designated as Exceptional Value due to its classification as a Class A Wild Trout Waters.

Land use in the upland portion of the watershed is primarily forest. Agricultural, residential, and commercial are the predominant land uses as you move downstream towards the Susquehanna River. Over one-quarter of the watershed is forest, with the majority of forested areas on the steep slopes of Blue Mountain in Cumberland County or on the northern flank of South Mountain. Forested areas are mostly state-owned lands. The middle half of the watershed is largely agricultural (approximately 61 percent); the rural lower quarter contains the West Shore suburbs of metropolitan Harrisburg.

The Conodoguinet Creek watershed is divided into Lower (eastern) and Upper (western) sections with the boundary line falling near the North Middleton Township and Lower Frankford Township border. The Lower section of the watershed contains major population centers and continues to experience heavy development pressure. The municipalities in this area (North Middleton, Middlesex, Silver Spring, Hampden, and East Pennsboro) have already identified numerous stormwater management problem areas. Consequently, the Lower section of the Conodoguinet Creek watershed underwent detailed modeling for development of this Plan.

The Upper section of the Conodoguinet Creek basin has significantly less development and greater agricultural presence, thus stormwater problems are generally associated only with low-lying areas. For the Upper section of the watershed, the model ordinance provided in this Plan targets potential development-related impacts with a post-development to pre-development control technique that also addresses water quality. The Upper and Lower sections of the Conodoguinet Creek have FEMA-designated and -mapped 100-year floodplains.

*Conodoguinet Creek includes the following Special Protection Classification/Designated Use:*

- *Pennsylvania Water Trail (the 40-mile stretch from North Middleton Township to the confluence of the Susquehanna River)*
- *Big Spring Creek (tributary to Conodoguinet Creek) is Exceptional Value Waters as well as Class A Wild Trout Waters*

PERRY COUNTY

Lower Mifflin

Upper Frankford

Lower Frankford

North Middleton

Middlesex

Upper Mifflin

Carlisle

West Pennsboro

Hopewell

Newville

South Middleton

Monroe

Newburg

North Newton

Big Spring Creek

Shippensburg

South Newton

Penn

Dickinson

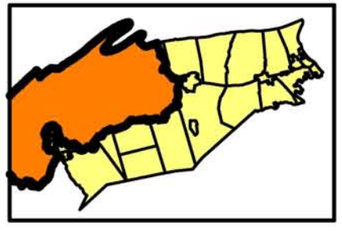
FRANKLIN COUNTY

Shippensburg Boro

Cooke

Southampton

ADAMS COUNTY



**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 12A |
|---|---|---|

Cumberland County
Stormwater Management Plan

**UPPER CONODOGUINET CREEK WATERSHED**

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 15,000' |
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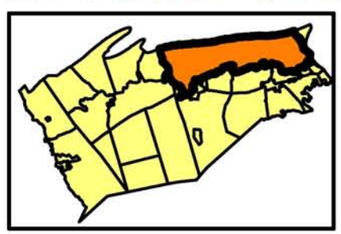
PERRY COUNTY

East Pennsboro
Hampden
Wormleysburg
Lemoyne
Camp Hill
Shiremanstown
Lower Allen
Upper Allen
Mechanicsburg
Silver Spring
Monroe
Middlesex
North Middleton
Carlisle
South Middleton
West Pennsboro
Lower Frankford
Dickinson



**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 12B |
|---|---|---|

Cumberland County
Stormwater Management Plan

**LOWER CONODOGUINET CREEK WATERSHED**

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 6,000' |
|---|---|

**Hogestown Run/Trindle Spring Run Watersheds**

**Photograph No. 3** – Hogestown Run

**Photograph No. 4** – Trindle Spring Run

As subwatersheds of the Conodoguinet Creek watershed, Hogestown Run and Trindle Spring Run (Figure 13) exhibit a number of existing problem areas and extensive development pressures. Based on input from the member municipalities, the Hogestown Run and Trindle Spring Run subwatersheds were remodeled as part of the larger eastern Conodoguinet Creek

effort to update the existing, approved Act 167 plans. Hogestown Run and Trindle Spring Run have FEMA-designated and -mapped 100-year floodplains.

*Hogestown Run includes the following Special Protection/Designated Use:*

– *Cold Water Fishery (CWF)*

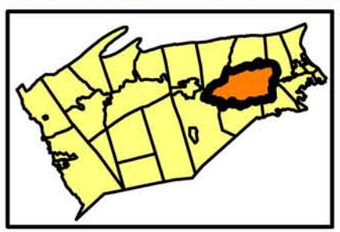
*Trindle Spring Run includes the following Special Protection/Designated Use:*

– *High Quality- Cold Water Fishery (HQ-CWF) from Silver Spring Meeting House to the mouth of the creek*

– *Class A Wild Trout Waters (in the Wertzville/Mechanicsburg area) from Farm Lane Bridge to mouth of the creek*

North Middleton
Middlesex
Silver Spring
Hampden
East Pennsboro
Camp Hill
Shiremanstown
Carlisle
Mechanicsburg
Lower Allen
Upper Allen
South Middleton
Monroe

MI4 MI1 MI2 MI3
SS1 SS8 SS10 SS9 SS11 SS13 SS3 SS2 SS14 SS12
SM3 SM4 SM5 SM6 SM7 SM17 SM18 SM16 SM19
ME1 SS18 ME2 ME6 ME7 ME4 ME5 ME3
UA10 UA8 UA9 UA6 UA11 UA5 UA4 UA3 UA2 UA1
LA8 LA5 LA2 LA1 LA4 LA7 LA6
UA17 UA18 UA22 UA21 UA12 UA16 UA15 UA13 UA19 UA20
MO1



**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 13 |
|---|---|---|

Cumberland County
Stormwater Management Plan

# HOGESTOWN RUN/ TRINDLE SPRING RUN WATERSHED

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 5,000' |
|---|---|

**Letort Spring Run Watershed**

**Photograph No. 5** – Letort Spring Run

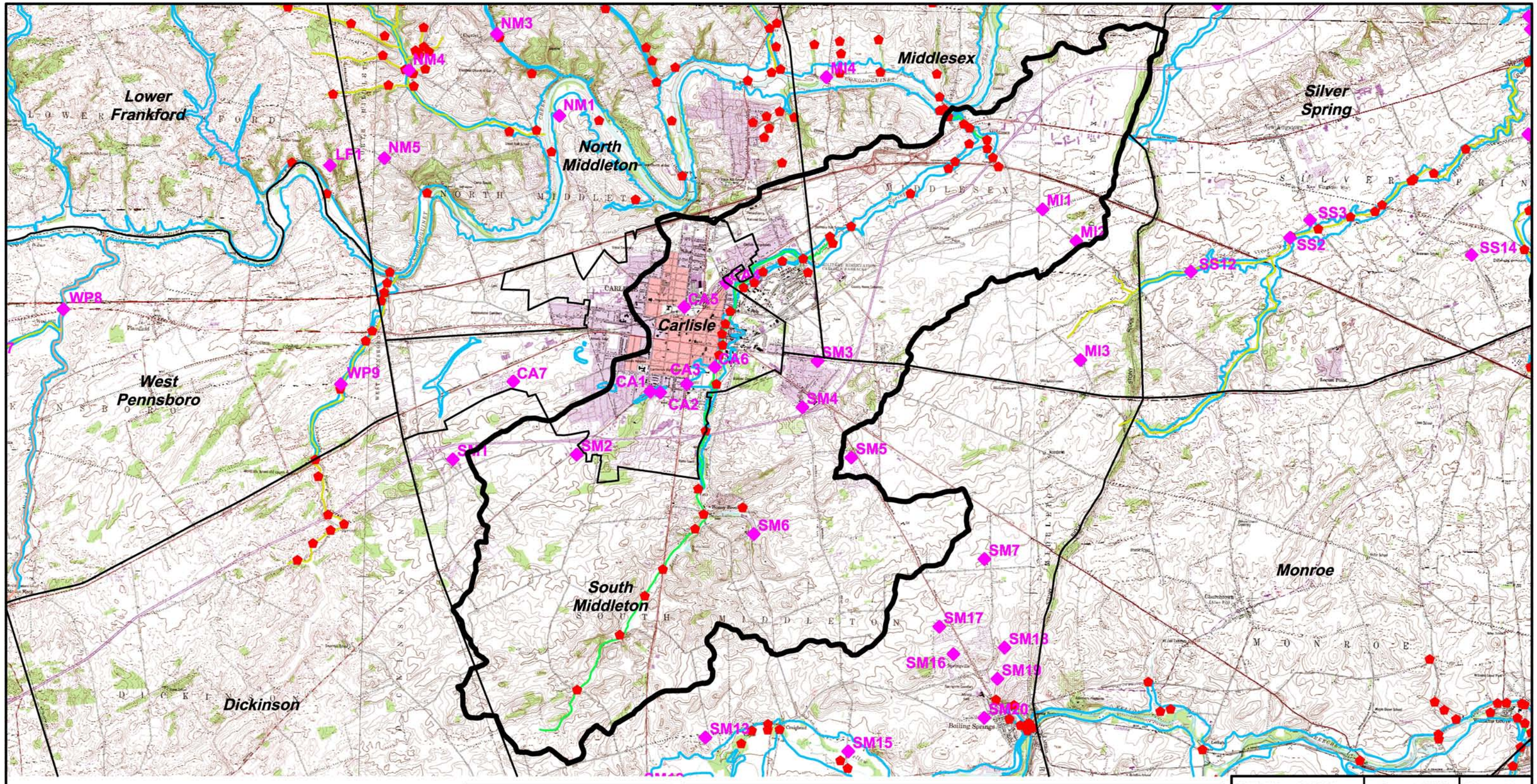
As a subwatershed of the Conodoguinet Creek watershed, Letort Spring Run watershed (Figure 14) lies in a limestone region draining approximately 13,700 acres. Its topography is characterized by rolling hills of low relief. Letort Spring Run begins south of Carlisle and then flows approximately 9.2 miles through Carlisle and enters the Conodoguinet in Middlesex Township. The stream is fed by an estimated 21 natural limestone springs, resulting in high-quality water.

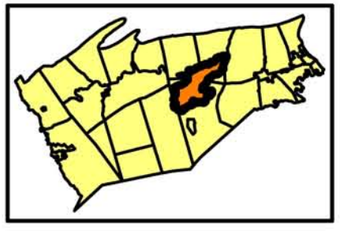
Stormwater runoff from paved development and residential runoff are the primary concerns in this watershed (The Cumberland County Chesapeake Bay Tributary Strategy, February 2005). The Letort Spring Run watershed was modeled for this report with a focus on water quality issues due to its sensitivity as an important trout fishery. Letort Spring Run has FEMA-designated and -mapped 100-year floodplains along its length from Bonny Brook to its confluence with Conodoguinet Creek.

*Letort Spring Run includes the following Special Protection Classification/Designated Use:*

- *High Quality-Cold Water Fishery (HQ-CWF)*
- *Exceptional Value (EV) from the PA 34 bridge to the railroad bridge at Letort Park*

- *Class A Wild Trout Waters from Post Road bridge downstream to the confluence with Conodoguinet Creek*
- *Pennsylvania Scenic River*
- *Catch and Release Fly Fishing*



**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 14 |
|---|---|---|

Cumberland County
Stormwater Management Plan

# LETORT SPRING RUN WATERSHED

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 5,000' |
|---|---|

## Middle Spring Creek Watershed

**Photograph No. 6** – Middle Spring Creek

With a 47.7-square-mile drainage basin, Middle Spring Creek is the largest tributary watershed (Figure 15) to Conodoguinet Creek. Input from two of the five municipalities located in the Middle Spring Creek watershed (Shippensburg and Southampton) indicated only two relatively minor problem areas, and GIS mapping indicated only one impaired tributary in the basin. This Stormwater Management Plan addresses these problem areas and impairment. Development-related impacts will be addressed through the model ordinance with a post-development to pre-development control technique that also addresses water quality. Middle Spring Creek has FEMA-designated and -mapped 100-year floodplains.

*Middle Spring Creek includes the following Special Protection classification/Designated Use:*

- *Cold Water Fishery (CWF)*
- *Class A Wild Trout Waters (a 1.48-mile stretch extending from its source downstream to Avon Road)*

Hopewell

North Newton

NN7

NN7

NN7

NN7

Penn

South Newton

Shippensburg

Shippensburg Boro

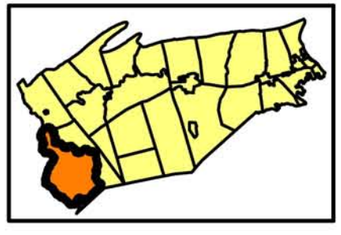
SO1

FRANKLIN COUNTY

Southampton

Cooke

ADAMS COUNTY



**Legend**

Municipality Boundary

Watershed Boundary

100 year Floodplain

Significant Obstructions

Problem Areas

PADEP Impaired Stream Reaches

Agricultural Degradation Sections

Organic Degradation Areas

Industrial Degradation Areas

Construction Degradation Areas

Runoff Degradation Areas

Siltation Degradation Areas

Suspended Solids Areas

Ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 15 |
|---|---|---|

Cumberland County
Stormwater Management Plan

# MIDDLE SPRING CREEK WATERSHED

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 6,000' |
|---|---|

**Mountain Creek Watershed**

**Photograph No. 7** – Mountain Creek

Mountain Creek drains a 46-square-mile area and is the largest tributary to Yellow Breeches Creek. Flowing along for 20.7 miles from its headwaters in Adams County, it converges with the Upper Yellow Breeches Creek to flow eastward and empty into the Susquehanna River near Harrisburg. The Mountain Creek watershed (Figure 16) is composed primarily of Pine Grove Furnace State Park and Michaux State Forest and is, therefore, mostly under public ownership with little potential for development.

Mountain Creek is designated as a High Quality-Cold Water Fishery from its source to Toland. From Toland to Mount Holly Springs, it is designated as a Cold Water Fishery. From Mount Holly Springs to the mouth, it is a Trout-Stocked Fishery.

Acid rain is a major problem for the creek as it has little buffering capacity. Increased acidity of the water affects the emerging brook trout fry during the spring. In addition, the large upper portion of Mountain Creek and many of its tributaries are designated as impaired, which is highly significant due to the stream's role as the primary water source for the lakes at Pine Grove Furnace State Park. Therefore, while stormwater management through a model ordinance is seen as sufficient to control the very limited development anticipated for this area, a significant field effort was undertaken to determine the primary sources of impairment and identify appropriate courses of action to eliminate the impairment. Mountain Creek has FEMA-designated and -mapped 100-year floodplains from its source in Adams County to its confluence with Yellow Breeches Creek.

*Mountain Creek includes the following Special Protection Classification/Designated Use:*

- *High Quality-Cold Water Fishery (HQ-CWF) from the source to Toland*
- *Cold Water Fishery from Toland to Mount Holly Springs*
- *Trout-Stocked Fishery from Mount Holly Springs to the mouth*
- *Toms Run (a tributary to Mountain Creek) is a Class A Wild Trout Waters*

West Pennsboro

North Newton

Penn

South Newton

Dickinson

Cooke

Southampton

Monroe

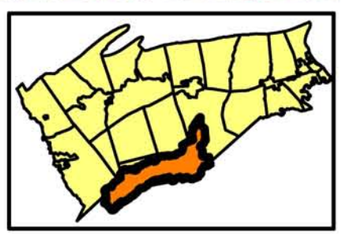
South Middleton

Mt. Holly Springs

YORK COUNTY

ADAMS COUNTY

SM12 SM15 SM14 SM19 SM11 SM8 DT6 DT4 DT3 DT5 PT1 PT2 PT4 PT6 PT5 PT7 PT3 DT1 DT9 DT8 DT7 CT1



**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 16 |
|---|---|---|

Cumberland County
Stormwater Management Plan

# MOUNTAIN CREEK WATERSHED

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 6,000' |
|---|---|

## Yellow Breeches Creek Watershed

The Yellow Breeches Creek drains the southern half of Cumberland County as it flows east through York and Cumberland Counties before emptying into the Susquehanna River at New Cumberland. Along the 49-mile long mainstem, it drains 219 square miles, approximately 79 percent of which is located in Cumberland County. The watershed is divided into Upper Yellow Breeches Creek (Figure 17A) and Lower Yellow Breeches Creek (Figure 17B); the creek's junction with Mountain Creek serves as the boundary between the two reaches. Only the Lower Yellow Breeches Creek watershed underwent detailed modeling for this Stormwater Management Plan.

The geology of the Yellow Breeches Creek watershed consists of 38 percent carbonate, 49 percent metamorphic/igneous, 10 percent shale, and 3 percent sedimentary and conglomerate rock. The limestone geology portion of the watershed produces a high groundwater yield, such as Boiling Springs in South Middleton Township. The remaining shale portion of the watershed provides ample groundwater for domestic needs. Land use throughout the watershed is mixed with over one-half as forest, over one-third as agricultural, and the remainder as urban. Yellow Breeches Creek has FEMA-designated and -mapped 100-year floodplains.

*Yellow Breeches Creek includes the following Special Protection Classification/ Designated Use:*

- *High Quality-Cold Water Fishery (HQ-CWF) (from the main stem to S.R. 1007)*
- *Pennsylvania Scenic River*
- *Pennsylvania Water Trail – includes three sections of the creek totaling approximately 13 miles*

### Upper Yellow Breeches Creek Watershed

Class I (Prime) soils are distributed in the northern portion of the Upper Yellow Breeches Creek watershed. It is classified as High Quality-Cold Water Fishery from its source to S.R. 1007.

The Upper Yellow Breeches Creek watershed was the subject of Act 167 planning process within the last five years. The present planning effort included a review of municipal ordinances ensure that adopted regulations were consistent with the Act 167 Plans.

**Lower Yellow Breeches Creek Watershed**

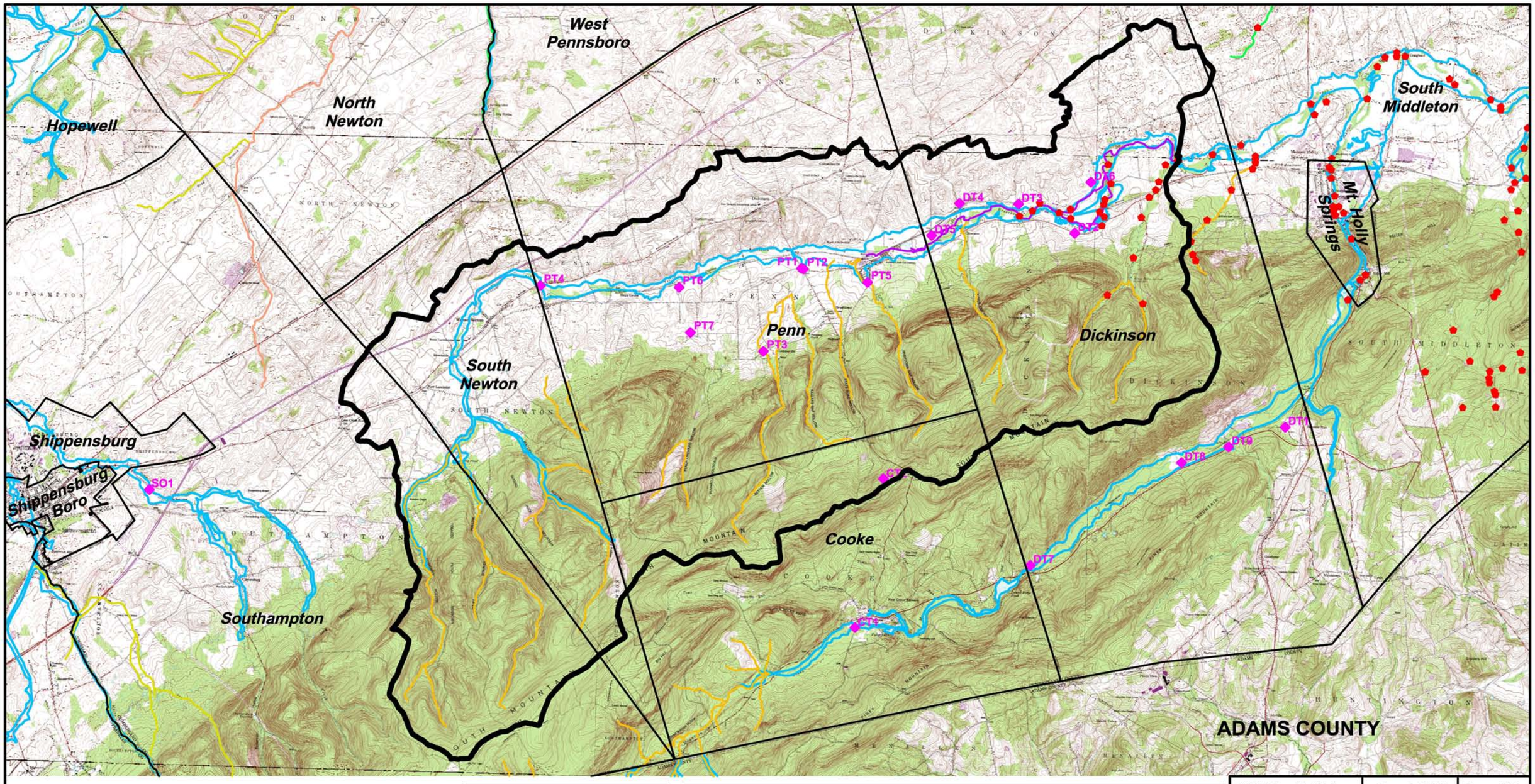
**Photograph No. 8** – Lower Yellow Breeches Creek

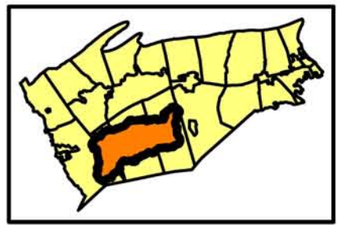
The northern border of the Lower Yellow Breeches Creek watershed consists primarily of carbonate rock. Shale, sandstone, and sedimentary rock dominate along the southern border along the York and Cumberland County border. Class I (Prime) soils are distributed across most of the watershed. South Middleton Township, as the primary municipality in the headwaters of the Lower Yellow Breeches Creek watershed, has identified numerous stormwater problem areas as the township undergoes extensive development pressure.

In addition, two of the primary tributaries in the township are designated as impaired. Monroe Township, just downstream of South Middleton Township, has also identified three problem areas in the watershed. Thus, this watershed underwent detailed modeling to establish the optimal stormwater management criteria in anticipation of significant future development occurring in the watershed. Coordination with York County was critical as approximately 18 percent of the watershed is in York County.

*Lower Yellow Breeches Creek includes the following Special Protection classification/ Designated Use:*

– *High Quality-Cold Water Fishery (HQ-CWF) along its section located in Michaux State Forest*



**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 17A |
|---|---|---|

Cumberland County
Stormwater Management Plan

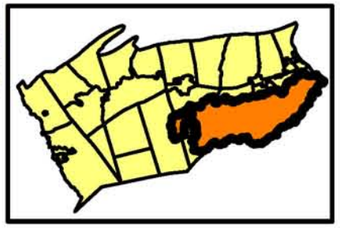
**UPPER YELLOW BREECHES WATERSHED**

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 6,000' |
|---|---|

North Middleton
Carlisle
Middlesex
Silver Spring
Hampden
Shiremanstown
Camp Hill
New Cumberland
Lower Allen
Mechanicsburg
Upper Allen
South Middleton
Dickinson
Mt. Holly Springs
YORK COUNTY

SM1 SM2 SM3 SM4 SM5 SM6 SM7 SM8 SM9 SM10 SM11 SM12 SM13 SM14 SM15 SM16 SM17 SM18 SM19 SM20
MO1 MO2 MO3
UA1 UA2 UA3 UA4 UA5 UA6 UA7 UA8 UA9 UA10 UA11 UA12 UA13 UA15 UA16 UA17 UA18 UA19 UA21 UA22
LA1 LA2 LA3 LA4 LA5 LA6 LA7 LA8 LA9 LA11



**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 17B |
|---|---|---|

Cumberland County
Stormwater Management Plan

# LOWER YELLOW BREECHES WATERSHED

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 7,000' |
|---|---|

## Susquehanna River Watershed

**Photograph No. 9** – Susquehanna River

A small portion of the 27,500-square-mile drainage basin that comprises the Susquehanna River watershed is located along the eastern edge of Cumberland County. Sitting on the western side of the Susquehanna River, the Cumberland County section of the watershed lies directly across the river from the City of Harrisburg. The river in this location is shallow and nearly a mile wide.

This portion of the Susquehanna River watershed (Figure 18) located in Cumberland County is fairly well urbanized with limited open areas, but it has some redevelopment potential. The primary problems identified by Wormleysburg Borough, one of the primary municipalities in the watershed, are streambank erosion and flooding. This watershed did not undergo detailed modeling; instead, the Stormwater Management Plan focused on streambank stability and floodplain management, with model ordinance provisions addressing future development.

PERRY COUNTY

DAUPHIN COUNTY

YORK COUNTY

East Pennsboro

Hampden

Silver Spring

Wormleysburg

Camp Hill

Lemoyne

New Cumberland

Shiremanstown

Lower Allen

Mechanicsburg

Upper Allen

EP1 EP2 EP3 EP4 EP5 EP6 EP7

WO1 WO2 WO3 WO4

**Legend**

- Municipality Boundary
- Watershed Boundary
- 100 year Floodplain
- Significant Obstructions
- Problem Areas

PADEP Impaired Stream Reaches

- Agricultural Degradation Sections
- Organic Degradation Areas
- Industrial Degradation Areas
- Construction Degradation Areas
- Runoff Degradation Areas
- Siltation Degradation Areas
- Suspended Solids Areas
- ph Degradation Areas

| SKELLY and LOY, Inc. | August, 2009 | Figure 18 |
|---|---|---|

Cumberland County
Stormwater Management Plan

**SUSQUEHANNA RIVER WATERSHED**

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 6,000' |
|---|---|

## SUMMARY

In summary, the Eastern Conodoguinet Creek watershed (which includes the Letort Spring Run, Hogestown Run, and Trindle Spring Run subwatersheds) as well as the lower Yellow Breeches Creek and the Cedar Run watersheds were the focal points of detailed modeling for the Cumberland County Stormwater Management Plan.

The recent Act 167 Plans for Conococheague Creek, Upper Yellow Breeches Creek, and Cedar Run were also reviewed to verify implementation of ordinances. The focus of the planning effort in the remainder of Cumberland County, which is the more rural, western portion of the County, involved field investigations on the impaired stream reaches as identified by PA DEP. The primary sources of the impairments were identified, and strategies were developed to eliminate the impairments. This multidisciplinary approach was proposed in order to provide the most comprehensive and targeted approach possible for stormwater management throughout Cumberland County.

# SECTION III TECHNICAL ANALYSIS

## PRESENT/ULTIMATE IMPACTS ON STORM RUNOFF

Detailed hydrologic modeling determined that the projected changes in land use within Cumberland County will result in increases in the rate and volume of runoff from the land. For the most part, the projected development of existing forested land, open space, and agricultural land within the county will increase the percentage of impervious area (resulting in higher runoff curve numbers) and reduce the potential for infiltration and groundwater recharge. An increase in impervious area directly equates to increases in storm runoff volume and peak rate. To mitigate for the expected increases in runoff volume and rate, the model ordinance exhibits two distinct control features: **volume control** and **rate control**.

Implementation of the volume control standards will ensure that the projected future land development within the watershed will not shunt additional amounts of stormwater into the downstream channels and conveyance systems. As stated within the purpose section of the model ordinance, stormwater is becoming viewed more as a resource rather than a nuisance. The protection of the resource of stormwater is vital to maintaining the process of groundwater recharge. Infiltration of stormwater directly recharges groundwater, while reuse of stormwater elsewhere on a property reduces the demand on public water supply systems and decreases the volume of water extracted from wells. Similarly, using the volume control portion of storm-water runoff for transpiration purposes (i.e., watering vegetation) will reduce the demand on water supply sources.

Release rates have been established within the County to determine the rate controls for future development. (See Table 5 at end of Section III for the Release Rates Table.) Refer to the Release Rates Map (Figure 19) for the delineation of the various subwatersheds within the County and the proposed release rates. These release rates have been established to prevent any increases in the amount of discharge (or rate of flow) within the modeled stream reaches in the study area. Detailed hydrologic modeling was undertaken to establish the release rates and to avoid hydrograph interference in downstream reaches due to release of stormwater over extended periods of time.

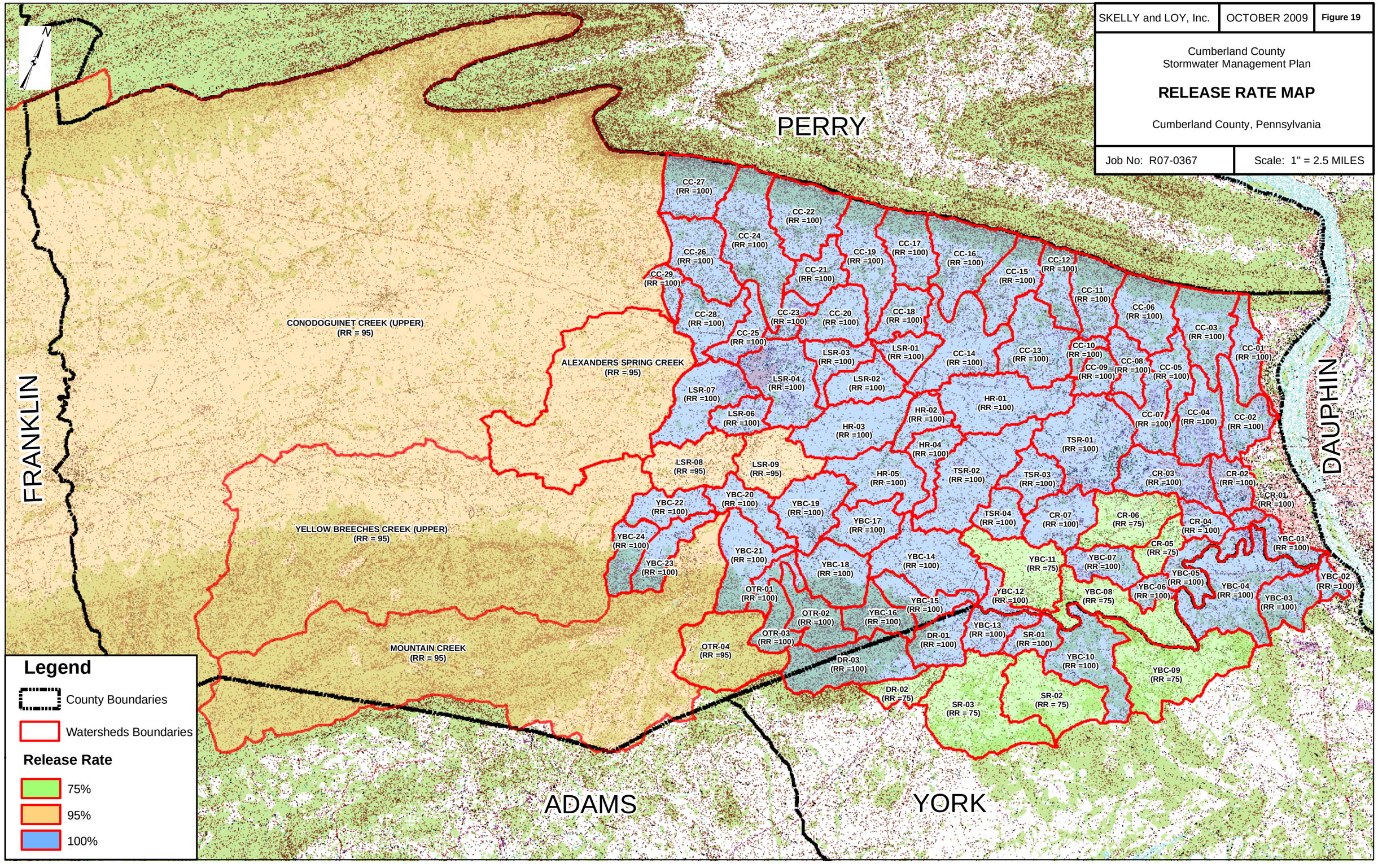
| SKELLY and LOY, Inc. | OCTOBER 2009 | Figure 19 |
|---|---|---|

Cumberland County
Stormwater Management Plan

# RELEASE RATE MAP

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 2.5 MILES |
|---|---|



As seen on the Release Rates Map, the entire western portion of the County will be required to use release rates of 95 percent. The detailed hydrologic modeling effort revealed that the use of a release rate of 100 percent in the western portion of the County forced subwatershed areas near the middle of the County to be over-controlled (extremely low release rates) to avoid increases within the downstream reaches and junctions, resulting in an unfair burden on a few subwatersheds to overcompensate for any increases in runoff in the western portion of the County.

Also noted on the Release Rates Map, the majority of the subwatersheds in the eastern portion of the County are prescribed with release rates of 100 percent. This is attributed to two factors. First, the implementation of volume control has secondary benefits in terms of reducing the rate of runoff. In a few subwatersheds, the removal of the volume control portion at the onset of the runoff hydrograph actually resulted in a reduction in the future two-year peak discharge. The removal of the volume control portion of the hydrograph can also only serve to reduce peak discharges in the downstream reaches and junctions. Removal of a specified volume of runoff will logically not contribute to any increases. The second factor relates to the shape of the watersheds. Both the Conodoguinet Creek and Yellow Breeches Creek are oriented in a narrow, linear arrangement, with streams flowing in an easterly direction. This arrangement means that subwatersheds sequentially contribute to flow in each of the two major stream systems. Conversely, in a more fan-shaped watershed, the subwatersheds concurrently contribute to the flow in the main stem of the stream providing greater chances for increases in peak discharge due to hydrograph addition.

The effects of Karst topography are evident in the calibration of the hydrological model. The Yellow Breeches Creek (which is underlain by a higher percentage of carbonate bedrock) required a greater reduction in the curve numbers (reduction of ten as opposed to a reduction of seven in the Conodoguinet Creek watershed) to replicate the historical gage data. Reductions in curve numbers result in reductions in the volume of runoff, as would be expected in a carbonate geology region.

The results of the hydrologic modeling were evaluated at key points within the watershed. These points are referred to as “Hydrological Points of Interest.” These points consist of the outlet from each subwatershed and the junctions (or confluence) between stream reaches or the junctions between subwatershed outlets and stream reaches. The HEC-HMS software package allows for easy tabulation of discharge results at these points. From these tabulations, comparisons can be made between the existing conditions, projected future conditions without stormwater management controls, and projected future conditions managed by the proposed

stormwater management ordinance. A detailed discussion of the hydrologic model used to verify the proposed control standards is included in Appendix D of this report. Appendix E provides a map of hydrological points of interest and calibrated model results for the Conodoguinet Creek and Yellow Breeches Creek study areas.

## ASSESSMENT OF ALTERNATIVE RUNOFF CONTROL TECHNIQUES

As an alternative to the implementation of the model stormwater ordinance and its proposed volume and rate control standards, the establishment of a Regional Stormwater Authority was investigated. The Regional Stormwater Authority could be established either by the County or as a multi-municipal agency. Similar to a municipal water or wastewater authority (both of which are formed by a municipality or multiple local governments to deal directly with the supply of fresh water and treatment of wastewater in accordance with local, county, state, and federal regulations), the Regional Stormwater Authority's functions would focus on the management of water resources in the County, such as groundwater, stormwater, and surface waters. The Regional Stormwater Authority would have the ability to levy and collect fees, implement water resource initiatives, and make recommendations for improvements in the regulations to the County and/or the municipalities. The actual structure of the Regional Stormwater Authority could be highly variable, depending on the bylaws upon which it is established. Two examples of such Regional Stormwater Authorities (each with varying purposes and bylaws) are the Philadelphia Water Department and the Chester County Water Resources Authority.

The Regional Stormwater Authority would work towards the creation of regional control facilities, such as on-line detention basins and flood prevention/reduction projects. On-line detention basins could consist of a variety of BMPs that serve to detain runoff, attenuating and reducing the peak discharge within the stream system. Flood-prevention/reduction projects could include the following:

- Stream restoration
- Floodplain reconnection (i.e., excavation of streambank to reestablish floodplain functions)
- Reforestation initiatives
- Daylighting undersized culverts
- Stormwater infiltration systems

The municipalities and the County may wish to consider the creation of a Regional Stormwater Authority at some time in the future.

# TABLE 5
# CUMBERLAND COUNTY ACT 167 PLAN
# ESTABLISHED RELEASE RATES (PERCENT)

| YELLOW BREECHES CREEK | |
|---|---|
| **SUBWATERSHEDS** | **RELEASE RATES** |
| **Cedar Run** | |
| CR-01 | 100% |
| CR-02 | 100% |
| CR-03 | 100% |
| CR-04 | 100% |
| CR-05 | 75% |
| CR-06 | 75% |
| CR-07 | 100% |
| **Dogwood Run** | |
| DR-01 | 100% |
| DR-02 | 75% |
| DR-03 | 100% |
| **Old Town Run** | |
| OTR-01 | 100% |
| OTR-02 | 100% |
| OTR-03 | 100% |
| OTR-04 | 95% |
| **Spring Run** | |
| SR-01 | 100% |
| SR-02 | 75% |
| SR-03 | 75% |
| **Yellow Breeches Creek** | |
| YBC-01 | 100% |
| YBC-02 | 100% |
| YBC-03 | 100% |
| YBC-04 | 100% |
| YBC-05 | 100% |
| YBC-06 | 100% |
| YBC-07 | 100% |
| YBC-08 | 75% |
| YBC-09 | 75% |
| YBC-10 | 100% |
| YBC-11 | 75% |
| YBC-12 | 100% |
| YBC-13 | 100% |
| YBC-14 | 100% |
| YBC-15 | 100% |
| YBC-16 | 100% |
| YBC-17 | 100% |
| YBC-18 | 100% |
| YBC-19 | 100% |
| YBC-20 | 100% |
| YBC-21 | 100% |
| YBC-22 | 100% |
| YBC-23 | 100% |
| YBC-24 | 100% |
| Mountain Creek | 95% |
| **Upper Yellow Breeches Creek** | |
| Upper YB | 95% |

| CONODOGUINET CREEK | |
|---|---|
| **SUBWATERSHEDS** | **RELEASE RATES** |
| CC-01 | 100% |
| CC-02 | 100% |
| CC-03 | 100% |
| CC-04 | 100% |
| CC-05 | 100% |
| CC-06 | 100% |
| CC-07 | 100% |
| CC-08 | 100% |
| CC-09 | 100% |
| CC-10 | 100% |
| CC-11 | 100% |
| CC-12 | 100% |
| CC-13 | 100% |
| CC-14 | 100% |
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| CC-21 | 100% |
| CC-22 | 100% |
| CC-23 | 100% |
| CC-24 | 100% |
| CC-25 | 100% |
| CC-26 | 100% |
| CC-27 | 100% |
| CC-28 | 100% |
| CC-29 | 100% |
| **Hogestown Run** | |
| HR-01 | 100% |
| HR-02 | 100% |
| HR-03 | 100% |
| HR-04 | 100% |
| HR-05 | 100% |
| **Letort Spring Run** | |
| LSR-01 | 100% |
| LSR-02 | 100% |
| LSR-03 | 100% |
| LSR-04 | 100% |
| LSR-06 | 100% |
| LSR-07 | 100% |
| LSR-08 | 95% |
| LSR-09 | 95% |
| **Trindle Spring Run** | |
| TSR-01 | 100% |
| TSR-02 | 100% |
| TSR-03 | 100% |
| TSR-04 | 100% |
| Upper CC | 95% |
| Alexanders Spring Creek | 95% |

## SECTION IV EXISTING MUNICIPAL ORDINANCE INFORMATION

Similar to many other local government issues, municipalities within Pennsylvania have flexibility in the extent to which they regulate stormwater runoff and in the method in which they incorporate those regulations into the local ordinance structure. For all intents and purposes, municipalities are independent government entities that have the authority to regulate (or conversely, not regulate) stormwater runoff to the extent that they so choose, in so much as they are in compliance with the fundamental requirements of the Pennsylvania Municipalities Planning Code and other applicable state and federal regulations. Municipalities also have the authority to implement those stormwater management regulations into their existing local ordinance structure in whatever manner they so choose. This local flexibility has resulted in tremendous variety in stormwater management regulation and implementation across Pennsylvania.

Within Cumberland County, a diverse variety of stormwater management regulations, ordinances, and requirements exists. To date, three watershed-level Act 167 Stormwater Management Plans have been completed in Cumberland County. These Act 167 Plans were completed for the Hogestown Run/Trindle Spring Run watersheds (1994), Cedar Run watershed (2001), and Upper Yellow Breeches watershed (2002). As such, a number of Cumberland County's municipalities have implemented stormwater management regulations consistent with approved Act 167 Plans. In some instances, these same municipalities have incorporated different stormwater management regulations into their Subdivision and Land Development Ordinance (SALDO) to cover those land areas located outside of the designated Act 167 watersheds.

The municipalities that are not part of an existing Act 167 Plan have adopted stormwater management regulations through their SALDO or by adopting a separate/stand-alone ordinance. In most cases, the primary stormwater management control requirement in those municipalities not covered as part of an existing Act 167 Plan is the typical "post-to-pre" peak rate control (i.e., the peak rate of stormwater discharge after development must be reduced to the peak rate of stormwater discharge that existed prior to development). In a few select instances, certain municipalities not covered by an existing Act 167 Plan have implemented stormwater management regulations more restrictive than the typical "post-to-pre" peak rate control requirement.

Finally, one municipality within Cumberland County appears to have implemented no stormwater management regulations of any capacity. The following text summarizes the

structure and magnitude of stormwater management regulations as currently exists within Cumberland County.

## NO STORMWATER MANAGEMENT REGULATIONS

As previously mentioned, it appears that one municipality within Cumberland County have implemented no stormwater management regulations of any capacity. This municipality is Lower Mifflin Township. Lower Mifflin Township is fairly rural with a significant portion of potentially developable land. Therefore, Lower Mifflin Township will be encouraged to adopt and enforce the model stormwater management ordinance developed as part of this Act 167 Plan.

## SEPARATE/STAND-ALONE STORMWATER MANAGEMENT ORDINANCE

Thirteen (13) municipalities in Cumberland County have adopted a stand-alone ordinance with the express purpose of managing stormwater runoff. Of these 13 municipalities, 9 have adopted stand-alone ordinances which include standards in accordance with a completed watershed-level Act 167 Stormwater Management Plan. These nine municipalities are listed below.

- Upper Yellow Breeches Watershed:
  - Cooke Township
  - Dickinson Township
  - South Middleton Township
- Cedar Run Watershed:
  - Lower Allen Township
  - Upper Allen Township
  - Mechanicsburg Borough
  - Shiremanstown Borough
  - Camp Hill Borough
- Hogestown Run/Trindle Spring Run Watersheds:
  - Silver Spring Township
  - South Middleton Township

The remaining four municipalities with stand-alone stormwater management ordinances are Carlisle Borough, Wormleysburg Borough, Lemoyne Borough, and Monroe Township. The primary stormwater management requirement dictated in these non-Act 167 stand-alone ordinances is the typical “post-to-pre” peak rate control.

## STORMWATER MANAGEMENT REGULATIONS INCORPORATED INTO SALDO

A total of 22 municipalities in Cumberland County have chosen to incorporate stormwater management regulations into their SALDO. One municipality (Hampden Township) chose to incorporate its Act 167 stormwater management regulations directly into its SALDO instead of adopting a separate stormwater management ordinance. As previously mentioned, a few municipalities covered under an existing Act 167 Plan have a separate stormwater management ordinance consistent with that Act 167 Plan but have chosen to incorporate additional stormwater management regulations into their SALDO to cover those land areas located outside of the designated Act 167 watersheds. These municipalities include Cooke Township, Dickinson Township, and South Middleton Township. The remaining 18 municipalities that have incorporated stormwater management regulations into a SALDO are listed below.

- East Pennsboro Township (*)
- Hopewell Township
- Lower Frankford Township
- Middlesex Township (*)
- Mt. Holly Springs Borough (*)
- Newburg Borough
- New Cumberland Borough
- Newville Borough
- North Middleton Township (*)
- North Newton Township
- Penn Township
- Shippensburg Borough
- Shippensburg Township
- Southampton Township
- South Newton Township
- Upper Frankford Township
- Upper Mifflin Township
- West Pennsboro Township (*)

Of these 18 municipalities, only 5 (*) have chosen to include stormwater runoff control requirements more restrictive than the typical “post-to-pre” peak rate control.

It is important to note that all of these municipalities, including those already covered by an existing Act 167 Plan, will be required to adopt the model stormwater management ordinance developed as part of this Act 167 Plan. However, it is equally important to note that watershed-specific stormwater runoff control requirements developed as part of the previous Act 167 Plans have been incorporated into this new model ordinance. As such, this new model

ordinance effectively replaces the existing standalone ordinances developed as part of previous Act 167 Plans without losing the stormwater control strategies developed specifically for those watersheds. Therefore, this new model stormwater management ordinance eliminates the need for multiple ordinances in any one municipality.

**INSTRUCTIONS FOR MUNICIPALITIES IMPLEMENTING STORMWATER PLANS PURSUANT TO 1978 ACT 167**

When the Model Stormwater Management Ordinance is enacted as part of the implementation of an approved Act 167 Stormwater Management Plan, the following suggestions apply:

A. When a municipality either elects to create a single purposed stormwater ordinance or amends an existing ordinance, the following provisions must be retained in a manner consistent with the criteria provided.

- Article I – General Provisions
- Article II – Definitions
- Article III – Stormwater Management Procedures

All other provisions are provided as guidance, but recommended to be addressed, and may be modified to be consistent with other municipal ordinances.

B. The municipal solicitor should review Article VIII - Enforcement and Penalties, and make any additions as necessary to ensure that effective enforcement can be provided commensurate with the applicable municipal code.

C. The Municipality is to provide information or make selections where indicated to do so by italicized text.

# STORMWATER MANAGEMENT ORDINANCE

ORDINANCE NO. _____

MUNICIPALITY OF

_____

CUMBERLAND COUNTY, PENNSYLVANIA

Adopted at a Public Meeting Held on

_____, 2010

## ARTICLE I - GENERAL PROVISIONS

### Section 101. Short Title

This Ordinance shall be known and may be cited as the "(name of municipality) Stormwater Management Ordinance."

### Section 102. Statement of Findings

The governing body of the Municipality finds that:

A. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases non-point source pollution of water resources.

B. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety and welfare and the protection of people of the Commonwealth, their resources and the environment.

C. Stormwater is an important water resource, which provides groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.

D. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES).

### Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the Municipality and its watershed by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance, through provisions designed to:

A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code Chapter 93 to protect, maintain, reclaim and restore the existing and designated uses of the waters of this Commonwealth.

B. Preserve the natural drainage systems as much as possible.

C. Manage stormwater runoff close to the source.

D. Provide procedures and performance standards for stormwater planning and management.

E. Maintain groundwater recharge, to prevent degradation of surface and groundwater quality and to otherwise protect water resources.

F. Prevent scour and erosion of stream banks and streambeds.

G. Provide proper operation and maintenance of all permanent Stormwater Management (SWM) Best Management Practices (BMPs) that are implemented within the Municipality.

H. Provide standards to meet NPDES permit requirements.

I. Meet general water quality and soil disturbance goals by implementing measures to:

1. Minimize disturbance to floodplains, wetlands, natural slopes over 15%, and existing native vegetation.

2. Preserve and maintain trees and woodlands. Maintain or extend riparian buffers and protect existing forested buffer. Provide trees and woodlands adjacent to impervious areas whenever feasible.

3. Establish and maintain non-erosive flow conditions in natural flow pathways.

4. Minimize soil disturbance and soil compaction. Over disturbed areas, replace topsoil to a minimum depth equal to the original depth or 4 inches, whichever is greater. Use tracked equipment for grading when feasible.

5. Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.

6. Incorporate the techniques for Low Impact Development Practices described in the most current version of "The Pennsylvania Stormwater Best Management Practices Manual" (SWM Manual)[1].

7. Minimize thermal impacts to Waters of the Commonwealth.

**Section 104. Statutory Authority**

A. Primary Authority:

The municipality is empowered to regulate these activities by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, the "Storm Water Management Act" and the (*insert appropriate municipal code - First Class Township, Second Class Township, or Borough*).

Hereafter, all earthmoving activities and land development within this Borough/Township, including without limitation, the location, design and construction within the watershed of storm water management systems, obstructions, flood control projects, subdivisions and major land developments, highways and transportation facilities, facilities for the provision of public utility services and facilities owned or financed in whole or in part by funds from the Commonwealth, shall be in full compliance with the requirements of the Cumberland County Storm Water Management Plan and shall be conducted in a manner consistent therewith. Any violation of the Cumberland County Storm Water Management Plan shall be considered a violation of this ordinance.

B. Secondary Authority:

The Municipality also is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

**Section 105. Applicability**

All regulated activities and all activities that may affect stormwater runoff, including land development and earth disturbance activity, are subject to regulation by this Ordinance as is reasonably necessary to prevent injury to health, safety or other property. The following activities are defined as "regulated activities" and shall be subject to the provisions of this Ordinance (unless otherwise exempted by Section 302):

(1) Land development and/or redevelopment
(2) Subdivision
(3) Construction of new or additional impervious or semipervious surfaces (driveways, parking lots, etc.)
(4) Construction of structures or additions to existing structures, as determined by the municipality
(5) Diversion or piping of any natural or man-made stream channel
(6) Installation of stormwater management facilities or appurtenances thereto
(7) Forest management/timber operations that include logging road construction and timber harvesting

**Section 106. Repealer**

Any other ordinance provision(s) or regulation of the Municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

**Section 107. Severability**

In the event that a court of competent jurisdiction declares any section or provision of this Ordinance invalid, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

**Section 108. Compatibility with Other Requirements**

Approvals issued and actions taken under this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation or ordinance.

**Section 109. Waiver Procedure**

The provisions of this ordinance are intended as minimum standards for the protection of the public health, safety and welfare. The elected officials may waive any mandatory provision of these regulations to the benefit of the applicant provided the waiver:

1. Is consistent with the purpose of the Ordinance as described in Section 103;

2. Will remove or reduce an unreasonable standard or undue hardship as it applies to the particular property, which is grossly disproportionate to any benefit derived from the standard, or when an alternative standard provides equal or better results.

3. Is consistent with Section 301.C when involving water quality requirements.

It shall be the burden of the applicant to demonstrate compliance with the above conditions.

## ARTICLE II - DEFINITIONS

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.

C. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

**Agricultural Activity** - The work of producing crops, including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops, pasturing and raising of livestock, and installation of conservation measures. Construction of new buildings or impervious area is not considered an Agricultural Activity.

**Applicant** - A landowner, developer or other person who has filed an application to the Municipality for approval to engage in any Regulated Activity at a project site in the Municipality.

**Best Management Practice (BMP)** - Activities, facilities, designs, measures or procedures used to manage stormwater impacts from Regulated Activities, to meet State Water Quality Requirements, to promote groundwater recharge and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "non-structural". In this ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural Stormwater BMPs are permanent appurtenances to the project site.

**Conservation District** - A conservation district, as defined in section 3(c) of the Conservation District Law (3 P. S. § 851(c)), which has the authority under a delegation agreement executed with the Department to administer and enforce all or a portion of the erosion and sediment control program in this Commonwealth.

**Design Storm** - The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g. a 5-year-storm) and duration (e.g. 24 hours), used in the design and evaluation of stormwater management systems. Also see Return Period.

**Detention Volume** - The volume of runoff that is captured and then infiltrated, evaporated, reused, or released into the waters of this Commonwealth at a controlled rate.

**DEP** - The Pennsylvania Department of Environmental Protection.

**Development Site (Site)** - See Project Site.

**Disconnected Impervious Area (DIA)** - An impervious or impermeable surface which has its stormwater runoff disconnected from any stormwater drainage or conveyance system and is redirected or directed to a pervious area which allows for infiltration, filtration, and increased time of concentration as specified in Appendix B, Disconnected Impervious Area.

**Disturbed Area** - An unstabilized land area where an Earth Disturbance Activity is occurring or has occurred.

**Earth Disturbance Activity** - A construction or other human activity which disturbs or exposes the underlying soil, including, but not limited to, clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

**Erosion** - The natural process by which the surface of the land is worn away by water, wind or chemical action.

**Existing Condition** - The initial condition of a project site prior to the proposed construction.

**FEMA** - Federal Emergency Management Agency.

**Floodplain** - The lowland and relatively flat areas adjoining inland and coastal waters including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

**Floodway** - The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year floodway, it is assumed -- absent evidence to the contrary -- that the floodway extends from the stream to 50 feet from the top of the bank of the stream.

**Forest Management/Timber Operations** - Planning and activities necessary for the management of forestland. These include conducting a timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation and reforestation.

**Hydrologic Soil Group (HSG)** – Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSG's (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less pervious as the HSG varies from A to D (NRCS [3,4]).

**Impervious Surface (Impervious Area)** - A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to, roofs used to cover indoor living spaces, patios, garages, storage sheds and similar structures, and any new streets or sidewalks.

Decks, parking areas, and driveway areas are not counted as impervious areas if they allow for infiltration.

**Karst** - A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

**Land Development (Development)** - Inclusive of any of the following activities: (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure, or (b) the division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (ii) any subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

**Municipality** - (municipality name), Cumberland County, Pennsylvania.

**NRCS** - USDA Natural Resources Conservation Service (previously SCS).

**Peak Discharge** - The maximum rate of stormwater runoff from a specific storm event.

**Pervious Area** - Any area not defined as impervious.

**Project Site** - The specific area of land where any Regulated Activities in the Municipality are planned, conducted or maintained.

**Qualified Professional** - Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by the Ordinance.

**Regulated Activities** – Shall include, but not be limited to any Earth Disturbance Activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff as specified in Section 105.

**Regulated Earth Disturbance Activity** - Activity involving Earth Disturbance subject to regulation under 25 Pa. Code Chapters 92, Chapter 102, or the Clean Streams Law.

**Retention Volume/Removed Runoff** - The volume of runoff that is captured and not released directly into the surface waters of this Commonwealth during or after a storm event.

**Return Period** - The average interval, in years, within which a storm event of a given magnitude can be expected to occur one time. For example, the 25-year return period rainfall would be expected to occur on average once every 25 years; or stated in another way, the probability of a 25-year storm occurring in any one year is 0.04 (i.e. a 4% chance).

**Runoff** - Any part of precipitation that flows over the land.

**Sediment** - Soils or other materials transported by surface water as a product of erosion.

**State Water Quality Requirements** - The regulatory requirements to protect, maintain, reclaim, and restore water quality under Pennsylvania Code Title 25 and the Clean Streams Law.

**Stormwater** - Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

**Stormwater Management Facility** - Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff. Typical stormwater management facilities include, but are not limited to, detention and retention basins, open channels, storm sewers, pipes, and infiltration facilities.

**Stormwater Management Plan** - The Cumberland County Stormwater Management Plan for managing stormwater runoff adopted by the County of Cumberland as required by the Act of October 4, 1978, P.L. 864, (Act 167), as amended, and known as the "Storm Water Management Act".

**Stormwater Management Best Management Practices** - Is abbreviated as **BMPs** or **SWM BMPs** throughout this Ordinance.

**Stormwater Management Site Plan** - The plan prepared by the developer, municipality, or other entity indicating how storm water runoff will be managed at the development site in accordance with this Ordinance. **Stormwater Management Site Plan** will be designated as **SWM Site Plan** throughout this Ordinance.

**Subdivision** - As defined in The Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247.

**USDA** - United States Department of Agriculture.

**Waters of this Commonwealth** - Rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs and other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

**Watershed** - Region or area drained by a river, watercourse or other surface water of the Commonwealth.

**Wetland** - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, fens, and similar areas.

## ARTICLE III - STORMWATER MANAGEMENT STANDARDS

### Section 301. General Requirements

A. For all Regulated Activities, unless preparation of a SWM Site Plan is specifically exempted in Section 302:

1. Preparation and implementation of an approved SWM Site Plan is required.

2. No Regulated Activities shall commence until the municipality issues written approval of an SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.

B. SWM Site Plans approved by the Municipality, in accordance with Section 406, shall be on site throughout the duration of the Regulated Activity.

C. The Municipality, after consultation with DEP, may approve measures for meeting the State Water Quality Requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, State law including but not limited to the Clean Streams Law.

D. For all Regulated Earth Disturbance Activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the Regulated Earth Disturbance Activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under the Pennsylvania Code Title 25 and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual* (E&S Manual)[2], Commonwealth of Pennsylvania, Department of Environmental Protection, No. 363-2134-008 (2000), as amended and updated.

E. For all Regulated Activities not exempted by Section 302, implementation of the Volume Controls in Section 303 is required.

F. For all new development projects, the measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages. Similarly, for new development projects taking place in stages, the entire proposed new development plan must be used in determining conformance with this Ordinance.

G. Stormwater flows/direct discharges onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification to the adjacent property owner(s). Such stormwater flows shall be subject to the requirements of this Ordinance.

H. The design of all facilities over Karst shall include an evaluation of measures to minimize adverse effects in accordance with the procedures outlined in Section 7.4 (Special Management Areas – Karst Areas) of the most current version of the SWM Manual[1].

I. Storage facilities should completely drain both the volume control and rate control capacities within 72 hours from the end of the design storm subject to site conditions.

J. The design storm precipitation depth estimates to be used in the analysis of peak rates of discharge should be obtained from the Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland, 20910. NOAA's Atlas 14[5] can be accessed at Internet address: http://hdsc.nws.noaa.gov/hdsc/pfds/.

K. For all Regulated Activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.

**Section 302. Exemptions**

A. Regulated Activities resulting in less than or equal to 1,000 square feet of new impervious surface are exempt from Article IV SWM Site Plan preparation requirements including Sections 303 and 304 of this Ordinance. Regulated Activities greater than 1,000 square feet and less than or equal to 5,000 square feet of new impervious area may be exempt from the SWM Site Plan preparation requirements including Sections 303 and 304 of this Ordinance when justification is provided that stormwater impact is minimal.*

B. Regulated Activities that create new Disconnected Impervious Areas greater than 1,000 square feet and less than or equal to 5,000 square feet that are proven to meet the 75-foot minimum pervious flow path requirement outlined in Appendix B are exempt from the SWM Site Plan preparation requirements including Sections 303 and 304 of this Ordinance.*

C. Regulated Activities meeting the following parcel size and square footage requirements are exempt from the peak rate control requirements, but not the volume control or SWM Site Plan preparation requirements of this Ordinance. These criteria shall apply to the total proposed development even if development is to take place in phases. The date of the municipal ordinance adoption shall be the starting point from which to consider tracts as "parent tracts" in which future subdivisions and respective impervious area computations shall be cumulatively considered.*

**New Impervious Area Exemption Criteria for Peak Rate Control**

| Total Parcel Size (acres) | Total Parcel Size (square feet) | New Impervious Area Exemption (square feet) |
|---|---|---|
| **<0.25** | **<10,890** | **1,500** |
| **0.25 – 0.5** | **10,890 - 21,780** | **2,500** |
| **>0.5** | **>21,780** | **5,000** |

D. Agricultural plowing and tilling are exempt from the SWM Site Plan requirements including Sections 303 and 304 of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

E. Forest management and timber operations are exempt from the rate control and SWM Site Plan preparation requirements of this ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

***The Municipality has, at its discretion, the ability to deny exemption from any requirements of this ordinance. Exemption from any requirements of this ordinance does not convey exemption from any requirements of any other applicable local codes or ordinances (i.e., local building permit requirements).**

## Section 303. Volume Controls

Water volume controls shall be implemented using the *Design Storm Method* in Subsection 1 or the *Simplified Method* in Subsection 2 below for all Regulated Activities not otherwise exempted by Section 302. For Regulated Activity areas equal or less than one (1) acre that do not require hydrologic routing to design the stormwater facilities, this Ordinance establishes no preference for either methodology; therefore, the applicant may select either methodology on the basis of economic considerations, the intrinsic limitations on applicability of the analytical procedures associated with each methodology, and other factors.

1. *The Design Storm Method* (see Section 8.7 of the most current version of the SWM Manual[1]) is applicable to any size of Regulated Activity. This method requires detailed modeling based on site conditions.

    a. Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year 24-hour duration precipitation.

    ***[The municipality may choose the item b they prefer below]***

    *b. For modeling purposes:*

        *i. Existing (pre-development) non-forested pervious areas must be considered meadow or its equivalent.*

        *ii. Twenty (20) percent of existing impervious area, when present, shall be considered meadow in the model for existing conditions.*

    ***[or]***

    *b. For modeling purposes:*

        *i. Calculate existing (pre-development) stormwater runoff and infiltration volumes based on existing site conditions, as verified through design phase soil infiltration testing.*

2. *The Simplified Method* (see Section 8.7 of the most current version of the SWM Manual[1]) provided below is independent of site conditions and should be used if the Design Storm Method is not followed. This method is not applicable to Regulated Activities greater than one (1) acre or for projects that require design of stormwater detention or rate control facilities. For new impervious surfaces:

a. Stormwater facilities shall be sized to capture at least the first two inches (2") of runoff from all new impervious surfaces.

b. At least the first one inch (1.0") of runoff from new impervious surfaces shall be permanently removed from the runoff flow -- i.e. it shall not be released into the surface waters of this Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration.

c. Infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first one-half inch (0.5") of the permanently removed runoff should be infiltrated.

d. The second one inch (1.0") of runoff from new impervious surfaces should be detained using structural and non-structural BMPs (as outlined in the most current version of the SWM Manual) and released at a controlled rate.

e. Regulated Activities eligible under this method are exempt from the requirements of Section 304, Rate Controls.

**Section 304. Rate Controls (see Section 8.3 of the most current version of the SWM Manual[1])**

A. Areas not covered by a Release Rate Map from an approved Act 167 Stormwater Management Plan:

Post-development discharge rates shall not exceed the predevelopment discharge rates for the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year storms. If it is shown that the peak rates of discharge indicated by the post-development analysis are less than or equal to the peak rates of discharge indicated by the pre-development analysis for 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.

B. Areas covered by a Release Rate Map from an approved Act 167 Stormwater Management Plan (see Appendix C):

For the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year storms, the post-development peak discharge rates will follow the applicable approved release rate maps (see Appendix C). For any areas not shown on the release rate maps, the post-development discharge rates shall not exceed the predevelopment discharge rates.

**Section 305. Additional SWM and Drainage Requirements**

***[insert additional municipal-specific requirements here]***

## ARTICLE IV - STORMWATER MANAGEMENT (SWM) SITE PLAN REQUIREMENTS

### Section 401. Plan Requirements

The following items shall be included in the SWM Site Plan:

A. Appropriate sections from the Municipal Subdivision and Land Development Ordinance, and other applicable local ordinances, shall be followed in preparing the SWM Site Plans.

B. The Municipality shall not approve any SWM Site Plan that is deficient in meeting the requirements of this Ordinance. At its sole discretion and in accordance with this Article, when a SWM Site Plan is found to be deficient, the Municipality may either disapprove the submission and require a resubmission, or in the case of minor deficiencies the Municipality may accept submission of modifications.

C. Provisions for permanent access or maintenance easements as determined necessary by the municipality for all physical SWM BMPs, such as ponds and infiltration structures, to implement the operation and maintenance plan discussed in item E.9 below.

D. ***The following signature block for the Municipality is optional****:*

*"(Municipal Official or designee), on this date (date of signature), has reviewed and hereby certifies that the SWM Site Plan meets all design standards and criteria of the Municipal Ordinance No. (Number assigned to the Ordinance)."*

E. The SWM Site Plan shall provide the following information:

1. The overall stormwater management concept for the project.

2. A determination of Site Conditions in accordance with the Site Assessment procedures outlined in Chapter 4 of the most current version of the SWM Manual[1]. A site assessment shall be completed for projects proposed in areas of carbonate geology or karst topography.

3. Stormwater runoff design computations and documentation as specified in this Ordinance, or as otherwise necessary to demonstrate that measures have been taken to meet the requirements of this Ordinance, including the recommendations and general requirements in Section 301.

4. Expected project time schedule.

5. A soil erosion and sediment control plan, where applicable, as prepared for and submitted to the approval authority.

6. The effect of the project (in terms of runoff volumes, water quality, and peak flows) on surrounding properties and adjacent aquatic features and on any existing stormwater conveyance system that may be affected by the project.

7. Plan and profile drawings of all SWM BMPs including drainage structures, pipes, open channels, and swales.

8. SWM Site Plan shall show the locations of existing and proposed on-lot wastewater facilities and water supply wells.

9. The SWM Site Plan shall include an operation and maintenance (O&M) plan for all proposed physical stormwater management facilities (see Appendix A). This plan shall address long-term ownership and responsibilities for operation and maintenance as well as schedules for O&M activities.

**Section 402. Plan Submission**

A. ____ (Typically Four (4)) copies of the SWM Site Plan shall be submitted as follows:

1. ____ (Typically Two (2)) copies to the Municipality.

2. ____ (Typically One (1)) copy to the Municipal Engineer (when applicable).

3. ____ (Typically One (1)) final copy to the County Conservation District.

B. Additional copies shall be submitted as requested by the Municipality.

**Section 403. Plan Review**

A. The SWM Site Plan shall be reviewed by a Qualified Professional for the Municipality for consistency with the provisions of this ordinance. After review, the Qualified Professional shall provide a written recommendation for the municipality to approve or disapprove the SWM Site Plan. If it is recommended to disapprove the SWM Site Plan, the Qualified Professional shall state the reasons for the disapproval in writing. The Qualified Professional also may recommend approval of the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing. The SWM Site Plan review and recommendations shall be completed within the time allowed by the Municipalities Planning Code for reviewing subdivision plans.

B. For SWM Site Plans that do not require subdivision and land development approval, the Municipality shall notify the applicant in writing within ___ calendar days whether the SWM Site Plan is approved or disapproved. If the SWM Plan involves a Subdivision and Land Development Plan, the notification period is 90 days. If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by the Municipality. If the Municipality disapproves the SWM Plan, the Municipality shall cite the reasons for disapproval in writing.

**Section 404. Modification of Plans**

A modification to a submitted SWM Site Plan that involves a change in SWM BMPs or techniques, or that involves the relocation or redesign of SWM BMPs, or that is necessary because soil or other conditions are not as stated on the SWM Site Plan as determined by the Municipality, shall require a resubmission of the modified SWM Site Plan in accordance with this Article.

**Section 405. Resubmission of Disapproved Storm Water Management Site Plans**

A disapproved SWM Site Plan may be resubmitted, with the revisions addressing the Municipality's concerns, to the Municipality in accordance with this Article. The applicable review fee must accompany a resubmission of a disapproved SWM Site Plan.

**Section 406. Authorization to Construct and Term of Validity**

The Municipality's approval of an SWM Site Plan authorizes the Regulated Activities contained in the SWM Site Plan for a maximum term of validity of five years following the date of approval. Terms of validity shall commence on the date the Municipality signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to Section 407 within the term of validity, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits issued by the Municipality. SWM Site Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with Section 405 of this Ordinance.

**Section 407. As-Built Plans, Completion Certificate and Final Inspection**

A. The Applicant shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to the Municipality.

***[If desired, the municipality may choose to delete item B below]***

*B. The as-built submission shall include a certification of completion signed by a Qualified Professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. If any licensed Qualified Professionals contributed to the construction plans, then a licensed Qualified Professional must sign the completion certificate.*

C. After receipt of the as-built plan, the Municipality may conduct a final inspection.

## ARTICLE V - OPERATION AND MAINTENANCE

### Section 501. Responsibilities of Developers and Landowners

A. The Municipality shall make the final determination on the continuing maintenance and inspection responsibilities prior to final approval of the SWM Site Plan. The Municipality may require a dedication of such facilities as part of the requirements for approval of the SWM Site Plan. Such a requirement is not an indication that the Municipality will accept the facilities. The Municipality reserves the right to accept or reject the ownership and operating responsibility for any portion of the stormwater management controls.

B. Facilities, areas, or structures used as Stormwater Management BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.

C. The Operation and Maintenance Plan shall be recorded as a restrictive deed covenant that runs with the land.

D. The Municipality may take enforcement actions against an owner for any failure to satisfy the provisions of this Article.

### Section 502. Operation and Maintenance Agreements

The owner is responsible for Operation and Maintenance of the SWM BMPs. If the owner fails to adhere to the Operation and Maintenance Agreement (see the sample Operations and Maintenance Agreement in Appendix A), the Municipality may perform the services required and charge the owner appropriate fees. Non-payment of fees may result in a lien against the property or other judicial action.

## ARTICLE VI - FEES AND EXPENSES

### Section 601. General

The Municipality may include all costs incurred in the review fee charged to an applicant.

The review fee may include but not be limited to costs for the following:

A. Administrative/clerical processing.

B. Review of the SWM Site Plan.

C. Attendance at meetings.

D. Inspections.

## ARTICLE VII - PROHIBITIONS

### Section 701. Prohibited Discharges and Connections

A. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including, but not limited to, sewage, process wastewater, wash water, ammonia, chlorine, petroleum products (gasoline, fuel oil, etc.) pesticides, pollutants and other hazardous materials to enter the waters of the Commonwealth is prohibited.

Handling and disposal of all materials and wastes shall comply with all Federal and State requirements. Structural and non-structural BMPs, in accordance with Chapters 5 and 6 of the most current version of the SWM Manual, shall be implemented where necessary to preserve the quality of stormwater runoff.

B. Discharges to Waters of the Commonwealth which are not composed entirely of stormwater shall be prohibited, except (1) as provided in subsection C below, and (2) discharges allowed under a state or federal permit.

C. The following discharges are authorized unless they are determined to be significant contributors to pollution to the waters of this Commonwealth:

| | |
|---|---|
| - Discharges from fire fighting activities | - Flows from riparian habitats and wetlands |
| - Potable water sources including water line flushing | - Uncontaminated water from foundations or from footing drains |
| - Irrigation drainage | - Lawn watering |
| - Air conditioning condensate | - Dechlorinated swimming pool discharges |
| - Springs | - Uncontaminated groundwater |
| - Water from crawl space pumps | - Water from individual residential car washing |
| - Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used | - Routine external building wash down (which does not use detergents or other compounds) |

D. In the event that the Municipality or DEP determines that any of the discharges identified in Subsection C, significantly contribute to pollution of the waters of this Commonwealth, the Municipality or DEP will notify the responsible person(s) to cease the discharge.

### Section 702. Roof Drains and Sump Pumps

Roof drains and sump pumps shall not discharge to any impervious area, if site conditions permit.

### Section 703. Alteration of SWM BMPs

No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures, without the written approval of the Municipality.

## ARTICLE VIII - ENFORCEMENT AND PENALTIES

### Section 801. Right-of-Entry

Upon presentation of proper credentials, the Municipality may enter at reasonable times upon any property within the Municipality to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

### Section 802. Inspection

SWM BMPs must be inspected by the landowner, or the owner's designee (including the Municipality for dedicated and owned facilities) according to the following list of minimum frequencies or as otherwise specified by the municipality. All inspection reports shall be submitted to the municipality.

1. Annually for the first 5 years.

2. Once every 3 years thereafter.

### Section 803. Enforcement

A. It shall be unlawful for a person to undertake any Regulated Activity except as provided in an approved SWM Site Plan, unless specifically exempted in Section 302.

B. Inspections regarding compliance with the SWM Site Plan during project construction are a responsibility of the Municipality.

### Section 804. Suspension and Revocation

A. Any approval or permit issued by the Municipality may be suspended or revoked for:

1. Non-compliance with or failure to implement any provision of the approved SWM Site Plan or Operation and Maintenance Agreement.

2. A violation of any provision of this Ordinance or any other applicable law, Ordinance, rule or regulation relating to the Regulated Activity.

3. The creation of any condition or the commission of any act during the Regulated Activity which constitutes or creates a hazard or nuisance, pollution, or which endangers the life or property of others.

B. A suspended approval may be reinstated by the Municipality when:

1. The Municipality has inspected and approved the corrections to the violations that caused the suspension.

2. The Municipality is satisfied that the violation has been corrected.

C. An approval that has been revoked by the Municipality cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.

D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the Municipality may provide a limited time period for the owner to correct the violation. In these cases, the Municipality will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the Municipality may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

**Section 805. Penalties**

***[Municipalities should ask their solicitors to provide appropriate wording for this section.]***

A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction shall be subject to a fine of not more than $_____ for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.

B. In addition, the Municipality, may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

**Section 806. Appeals**

A. Any person aggrieved by any action of the Municipality or its designee, relevant to the provisions of this Ordinance, may appeal to the Municipality within thirty (30) days of that action.

B. Any person aggrieved by any decision of the Municipality, relevant to the above appeal of this Ordinance, may appeal to the Cumberland County Court Of Common Pleas within thirty (30) days of the Municipality's decision.

## ARTICLE IX - REFERENCES


1. Pennsylvania Department of Environmental Protection (DEP). No. 363-0300-002 (2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual.* Harrisburg, PA.

2. The Pennsylvania Department of Environmental Protection (DEP). 363-2134-008 (2000), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.

3. United States Department of Agriculture (USDA), National Resources Conservation Service (NRCS). *National Engineering Handbook.* Part 630: Hydrology, 1969-2001. Originally published as the *National Engineering Handbook*, Section 4: Hydrology. Available online at: http://www.wcc.nrcs.usda.gov/hydro/hydro-techref-neh-630.html.

4. United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.

5. US Department of Commerce (USDC), National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), Hydrometeorological Design Studies Center. 2004-2006. *Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2*, Silver Spring, Maryland, 20910. Internet address: http://hdsc.nws.noaa.gov/hdsc/pfds/.

(Ordinance Name)

(Ordinance Number)

**ENACTED and ORDAINED** at a regular meeting of the

_____

on this _____ day of _____, 20_____.

This Ordinance shall take effect immediately.

_____

(Name) (Title)

_____

(Name) (Title)

_____

(Name) (Title)

ATTEST:

_____

Secretary

## APPENDIX A

### SAMPLE OPERATION AND MAINTENANCE AGREEMENT
### STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM BMPs)

**THIS AGREEMENT**, made and entered into this _____ day of _____, 20___, by and between _____, (hereinafter the "Landowner"), and _____, Cumberland County, Pennsylvania, (hereinafter "Municipality");

**WITNESSETH**

**WHEREAS**, the Landowner is the owner of certain real property as recorded by deed in the land records of Cumberland County, Pennsylvania, Deed Book _____ at Page _____, (hereinafter "Property").

**WHEREAS**, the Landowner is proceeding to build and develop the Property; and

**WHEREAS,** the SWM BMP Operation and Maintenance Plan approved by the Municipality (hereinafter referred to as the "Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of BMPs; and

**WHEREAS**, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

**WHEREAS**, the Municipality requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors and assigns.

**NOW, THEREFORE**, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.

2. The Landowner shall operate and maintain the BMPs as shown on the Plan in good working order in accordance with the specific maintenance requirements noted on the approved SWM Site Plan.

3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the

Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality.

8. The Municipality shall inspect the BMPs at a minimum of once every *(_____)* years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of Cumberland County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

_____

For the Landowner:

_____

ATTEST:

_____ (City, Borough, Township)

County of Cumberland, Pennsylvania

I, _____, a Notary Public in and for the County and State aforesaid, whose commission expires on the _____ day of _____, 20_____, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day of _____, 20_____, has acknowledged the same before me in my said County and State.

**GIVEN UNDER MY HAND THIS** _____ day of _____, 20_____.

_____ _____

**NOTARY PUBLIC** **(SEAL)**

# APPENDIX B

## DISCONNECTED IMPERVIOUS AREA (DIA)

B.1. Rooftop Disconnection

When rooftop downspouts are directed to a pervious area that allows for infiltration, filtration, and increased time of concentration, the rooftop may qualify as completely or partially Disconnected Impervious Area (DIA) and a portion of the impervious rooftop area may be excluded from the calculation of total impervious area.

A rooftop is considered to be completely or partially disconnected if it meets the requirements listed below:

- The contributing area of rooftop to each disconnected discharge is 500 square feet or less, and
- The soil, in proximity of the roof water discharge area, is not designated as hydrologic soil group "D" or equivalent, and
- The overland flow path from roof water discharge area has a positive slope of 5% or less.

For designs that meet these requirements, the portion of the roof that may be considered disconnected depends on the length of the overland path as designated in Table B.1.

**Table B.1: Partial Rooftop Disconnection**

| **Length of Pervious Flow Path *** | **Roof Area Treated as Disconnected** |
|---|---|
| (ft) | (% of contributing area) |
| 0 – 14 | 0 |
| 15 – 29 | 20 |
| 30 – 44 | 40 |
| 45 – 59 | 60 |
| 60 – 74 | 80 |
| 75 or more | 100 |
| * Flow path cannot include impervious surfaces and must be at least 15 feet from any impervious surfaces. | |

B.2. Pavement Disconnection

When pavement runoff is directed to a pervious area that allows for infiltration, filtration, and increased time of concentration, the contributing pavement area may qualify as a DIA that may be excluded from the calculation of total impervious area. This applies generally only to small or narrow pavement structures such as driveways and narrow pathways through otherwise pervious areas (e.g. a walkway or bike path through a park).

Pavement is disconnected if the pavement, or area adjacent to the pavement, meets the requirements below:

- The contributing flow path over impervious area is not more than 75 feet, and
- The length of overland flow is greater than or equal to the contributing length, and
- The soil is not designated as hydrologic soil group "D" or equivalent, and

- The slope of the contributing impervious area is 5% or less, and
- The slope of the overland flow path is 5% or less.

If the discharge is concentrated at one or more discrete points, no more than 1,000 square feet may discharge to any one point. In addition, a gravel strip or other spreading device is required for concentrated discharges. For non-concentrated discharges along the edge of the pavement, this requirement is waived; however, there must be a provision for the establishment of vegetation along the pavement edge and temporary stabilization of the area until vegetation becomes stabilized.

## REFERENCE

Philadelphia Water Department. 2006. *Stormwater Management Guidance Manual.* Section 4.2.2: ***Integrated Site Design.*** Philadelphia, PA.

# APPENDIX C

## CUMBERLAND COUNTY RELEASE RATE MAPS

| SKELLY and LOY, Inc. | DECEMBER 2009 |
|---|---|

Cumberland County
Stormwater Management Plan

# RELEASE RATE MAP

Cumberland County, Pennsylvania

| Job No: R07-0367 | Scale: 1" = 2.5 MILES |
|---|---|

PERRY

FRANKLIN

DAUPHIN

ADAMS

YORK

CONODOGUINET CREEK (UPPER)
(RR = 95)

ALEXANDERS SPRING CREEK
(RR = 95)

YELLOW BREECHES CREEK (UPPER)
(RR = 95)

MOUNTAIN CREEK
(RR = 95)

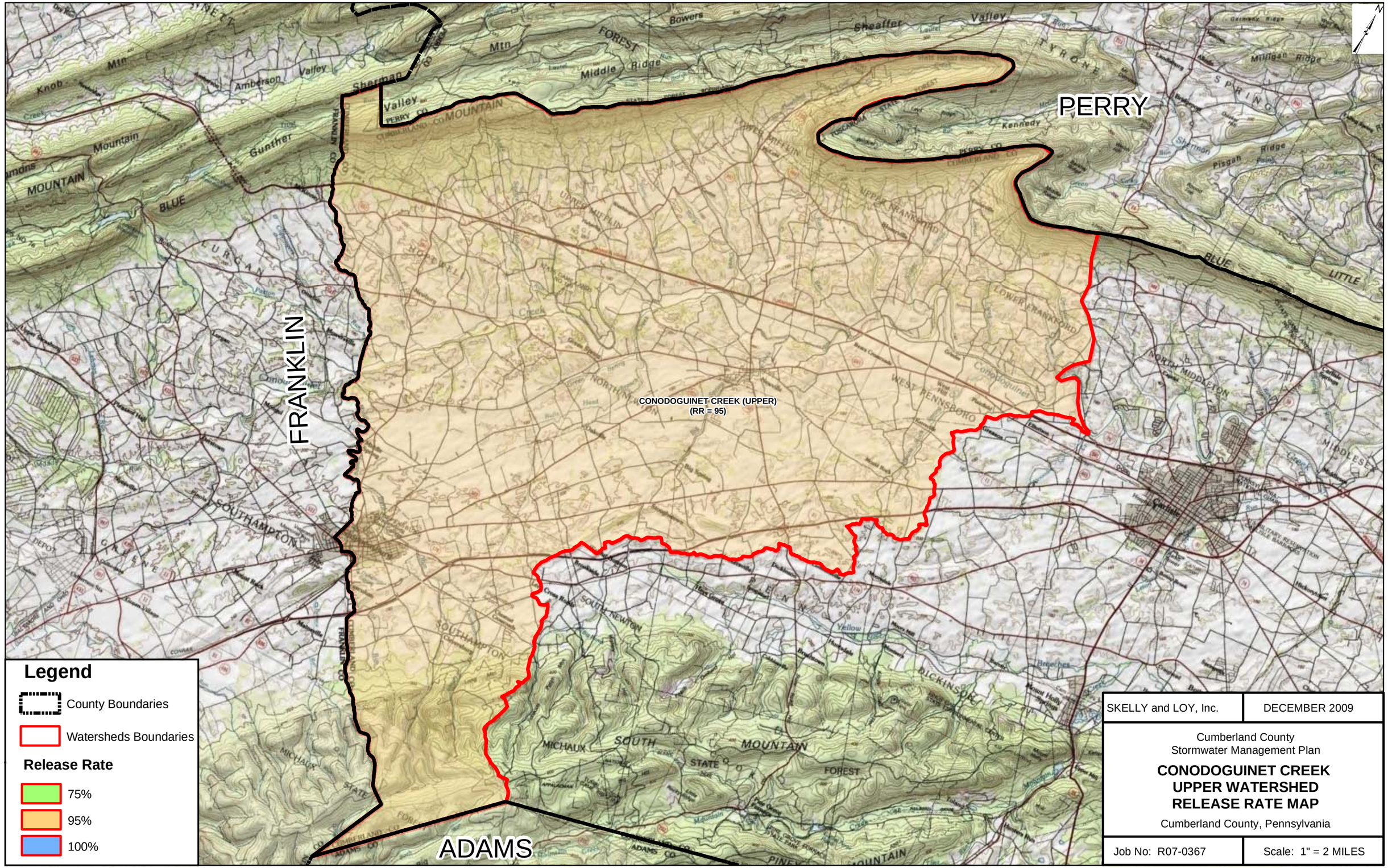
CC-27 (RR =100)
CC-22 (RR =100)
CC-24 (RR =100)
CC-26 (RR =100)
CC-29 (RR =100)
CC-21 (RR =100)
CC-19 (RR =100)
CC-17 (RR =100)
CC-16 (RR =100)
CC-15 (RR =100)
CC-12 (RR =100)
CC-11 (RR =100)
CC-28 (RR =100)
CC-23 (RR =100)
CC-20 (RR =100)
CC-18 (RR =100)
CC-25 (RR =100)
CC-06 (RR =100)
CC-03 (RR =100)
LSR-01 (RR =100)
CC-14 (RR =100)
CC-13 (RR =100)
CC-10 (RR =100)
CC-01 (RR =100)
LSR-03 (RR =100)
CC-09 (RR =100)
CC-08 (RR =100)
CC-05 (RR =100)
LSR-04 (RR =100)
LSR-02 (RR =100)
LSR-07 (RR =100)
HR-01 (RR =100)
LSR-06 (RR =100)
HR-02 (RR =100)
CC-07 (RR =100)
CC-04 (RR =100)
CC-02 (RR =100)
HR-03 (RR =100)
HR-04 (RR =100)
TSR-01 (RR =100)
LSR-08 (RR =95)
LSR-09 (RR =95)
HR-05 (RR =100)
TSR-02 (RR =100)
TSR-03 (RR =100)
CR-03 (RR =100)
CR-02 (RR =100)
YBC-22 (RR =100)
YBC-20 (RR =100)
YBC-19 (RR =100)
CR-01 (RR =100)
TSR-04 (RR =100)
CR-07 (RR =100)
CR-06 (RR =75)
CR-04 (RR =100)
YBC-24 (RR =100)
YBC-17 (RR =100)
CR-05 (RR =75)
YBC-01 (RR =100)
YBC-21 (RR =100)
YBC-23 (RR =100)
YBC-18 (RR =100)
YBC-14 (RR =100)
YBC-11 (RR =75)
YBC-07 (RR =100)
YBC-05 (RR =100)
YBC-02 (RR =100)
OTR-01 (RR =100)
YBC-06 (RR =100)
YBC-04 (RR =100)
YBC-15 (RR =100)
YBC-12 (RR =100)
YBC-08 (RR =75)
YBC-03 (RR =100)
OTR-02 (RR =100)
YBC-16 (RR =100)
OTR-03 (RR =100)
YBC-13 (RR =100)
DR-01 (RR =100)
SR-01 (RR =100)
OTR-04 (RR =95)
DR-03 (RR =100)
YBC-10 (RR =100)
YBC-09 (RR =75)
DR-02 (RR =75)
SR-03 (RR = 75)
SR-02 (RR = 75)

## Legend

- County Boundaries
- Watersheds Boundaries

**Release Rate**

- 75%
- 95%
- 100%



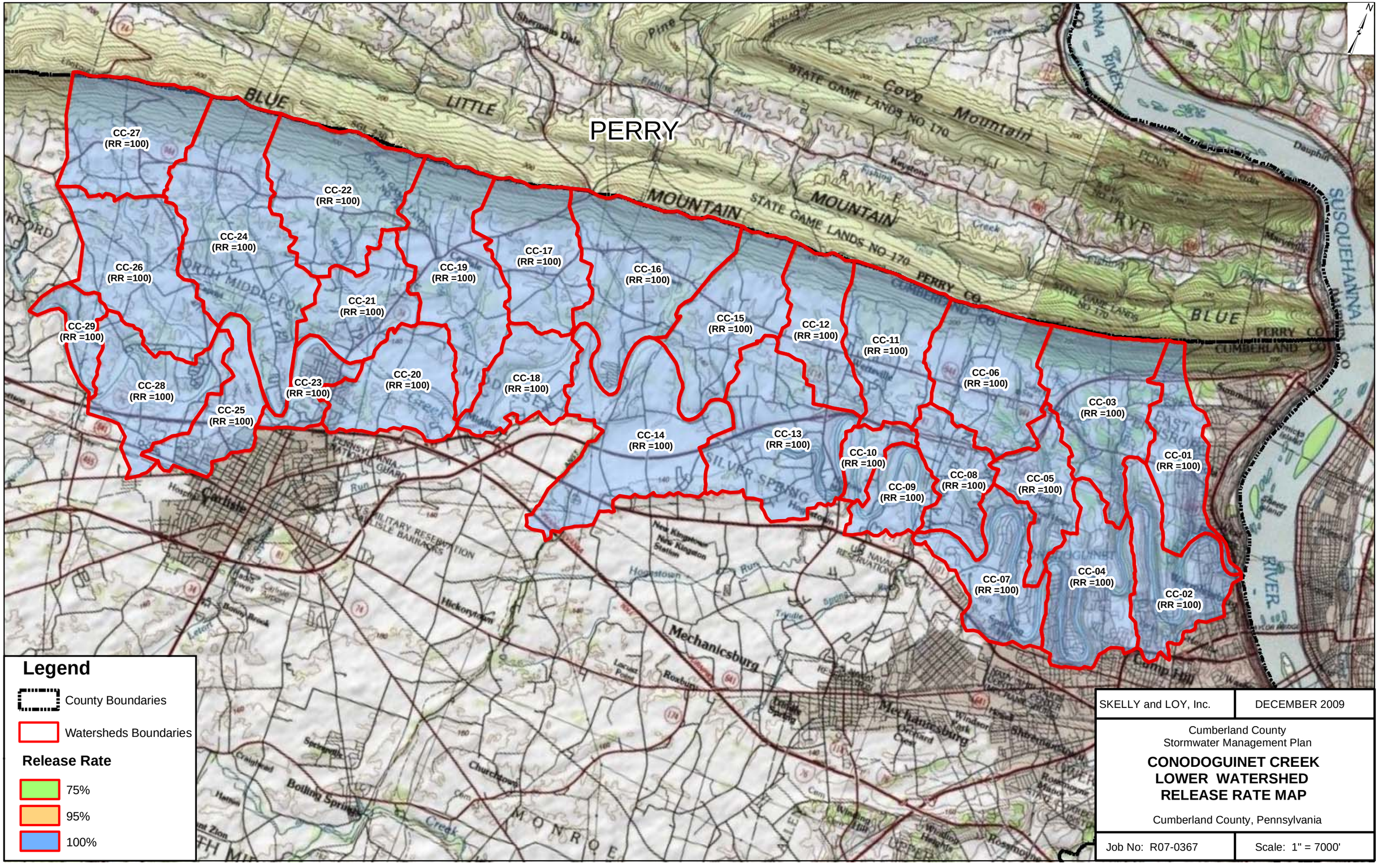

| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**CONODOGUINET CREEK**
**UPPER WATERSHED**
**RELEASE RATE MAP**

Cumberland County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 2 MILES |



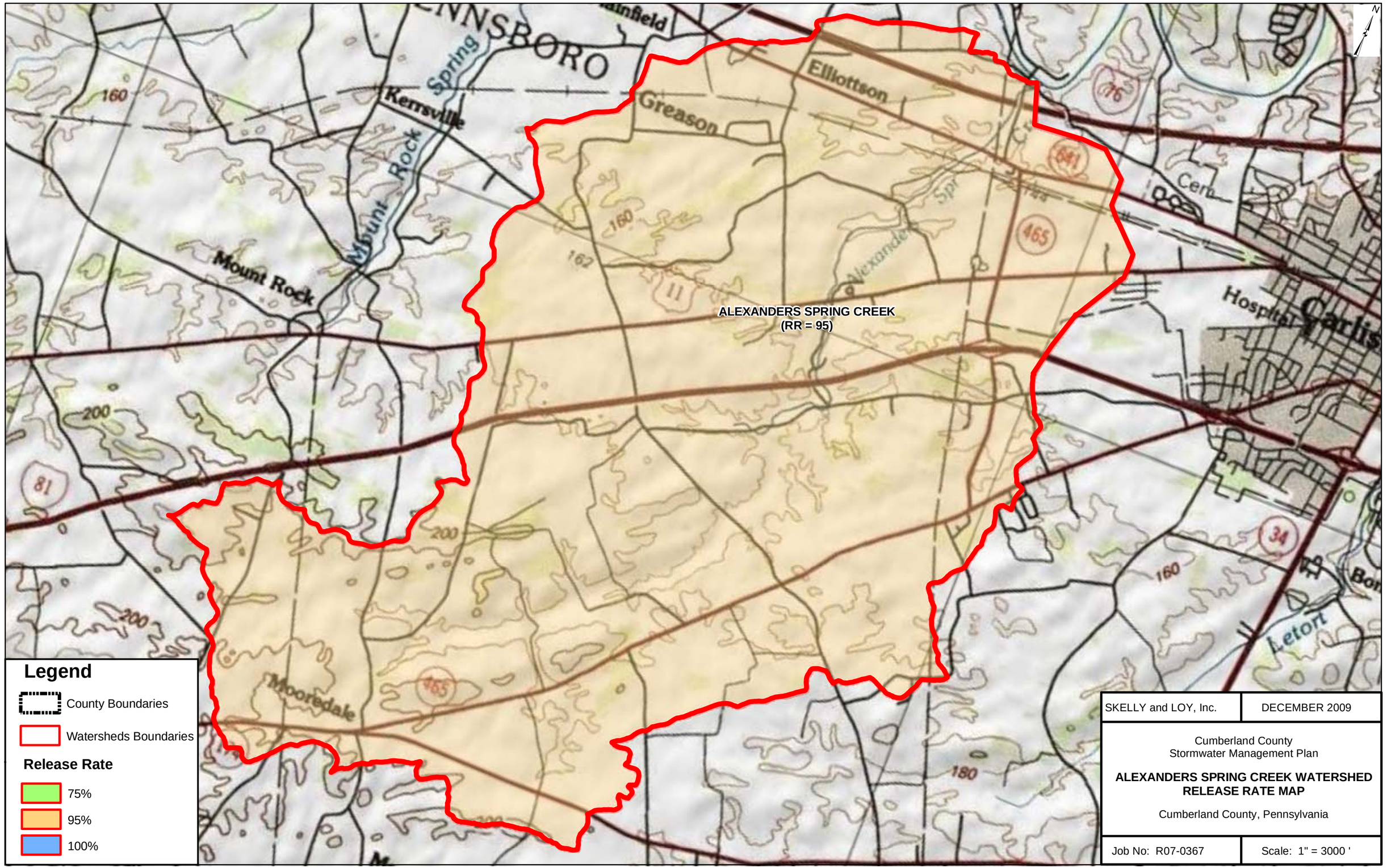

SKELLY and LOY, Inc. | DECEMBER 2009

Cumberland County
Stormwater Management Plan

**CONODOGUINET CREEK**
**LOWER WATERSHED**
**RELEASE RATE MAP**

Cumberland County, Pennsylvania

Job No: R07-0367 | Scale: 1" = 7000'




| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**ALEXANDERS SPRING CREEK WATERSHED RELEASE RATE MAP**

Cumberland County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 3000 ' |

YELLOW BREECHES CREEK (UPPER)
(RR = 95)

## Legend

- County Boundaries
- Watersheds Boundaries

**Release Rate**

- 75%
- 95%
- 100%

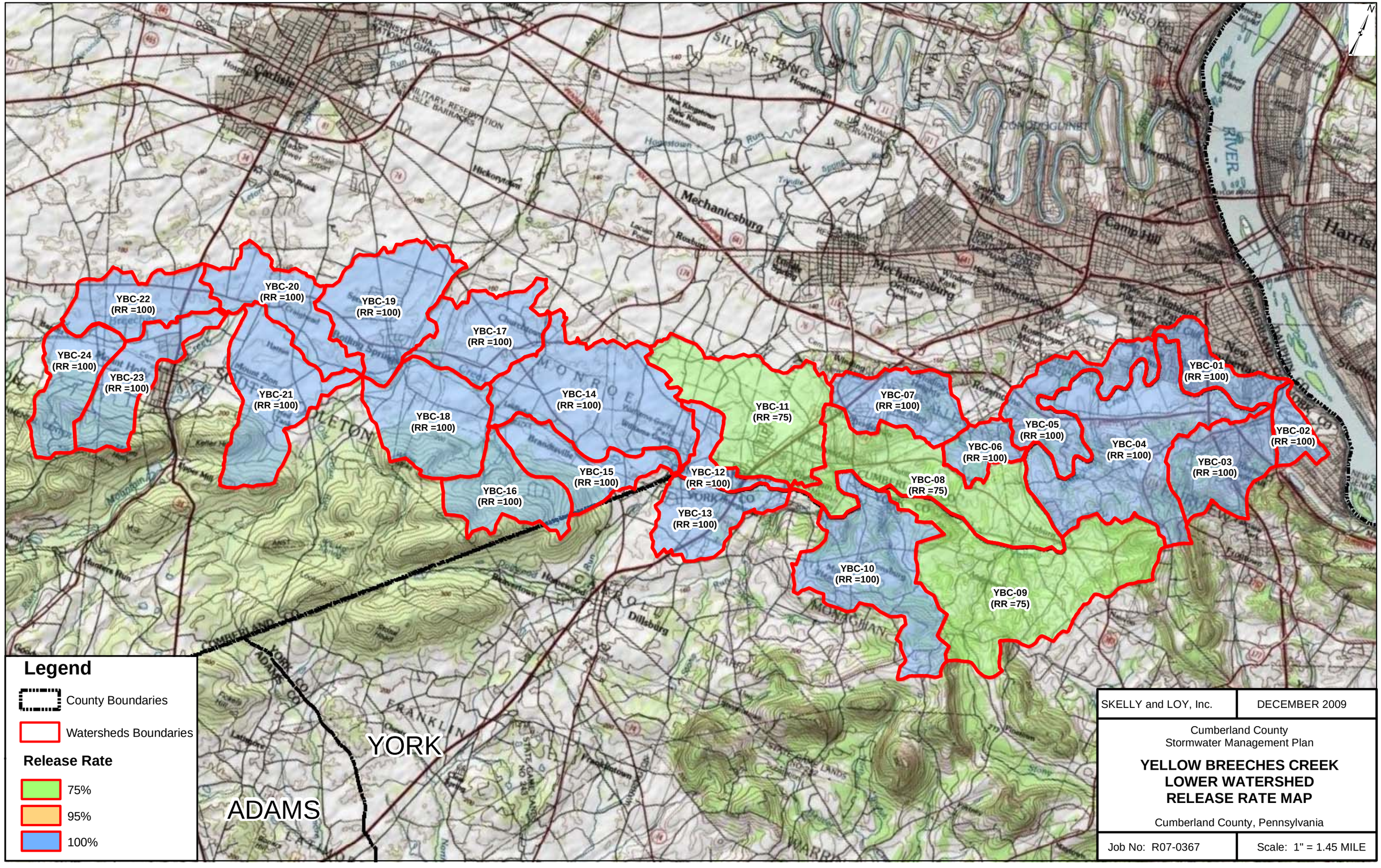
| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**YELLOW BREECHES CREEK**
**UPPER WATERSHED**
**RELEASE RATE MAP**

Cumberland County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 1 MILE |




SKELLY and LOY, Inc. | DECEMBER 2009

Cumberland County
Stormwater Management Plan

# YELLOW BREECHES CREEK LOWER WATERSHED RELEASE RATE MAP

Cumberland County, Pennsylvania

Job No: R07-0367 | Scale: 1" = 1.45 MILE

CUMBERLAND

YORK

DR-01
(RR =100)

DR-02
(RR =75)

DR-03
(RR =100)

## Legend

- County Boundaries
- Watersheds Boundaries

**Release Rate**

- 75%
- 95%
- 100%

| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**DOGWOOD RUN WATERSHED RELEASE RATE MAP**

Cumberland & York Counties, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 2,400' |

HR-01
(RR =100)

HR-02
(RR =100)

HR-03
(RR =100)

HR-04
(RR =100)

HR-05
(RR =100)

## Legend

- County Boundaries
- Watersheds Boundaries

**Release Rate**

- 75%
- 95%
- 100%

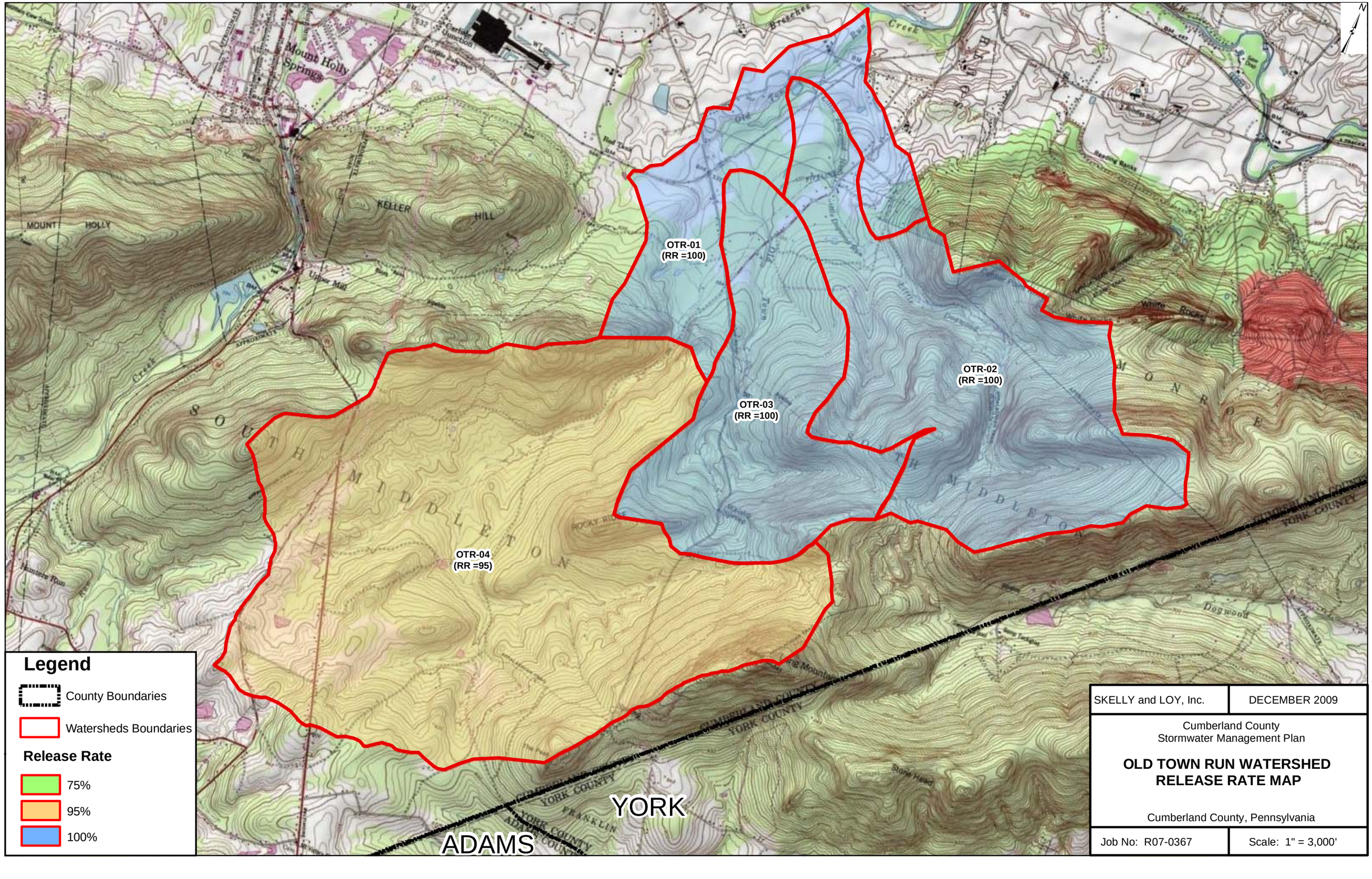
| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**HOGESTOWN RUN WATERSHED RELEASE RATE MAP**

Cumberland County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 3,000' |



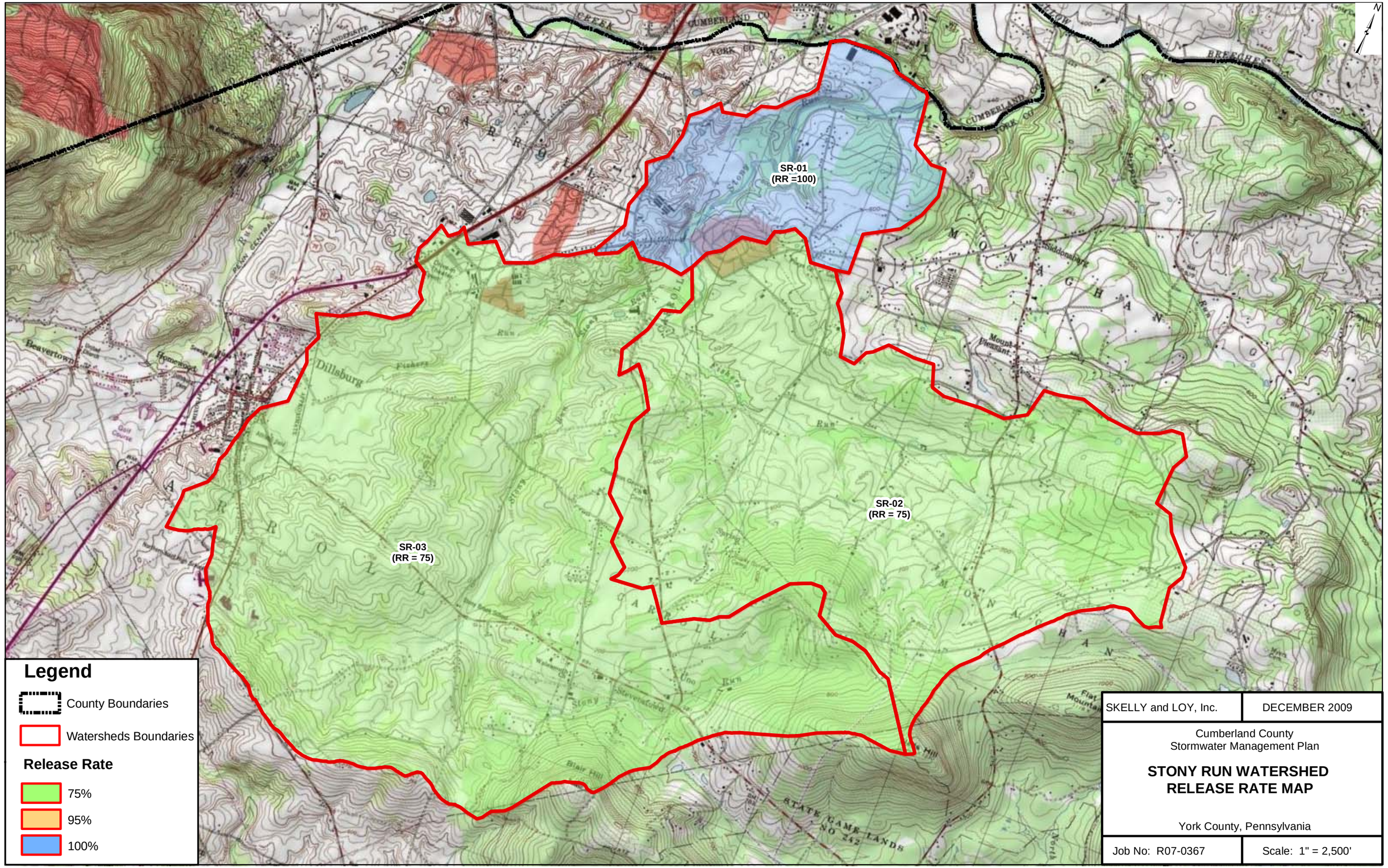

| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**OLD TOWN RUN WATERSHED RELEASE RATE MAP**

Cumberland County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 3,000' |



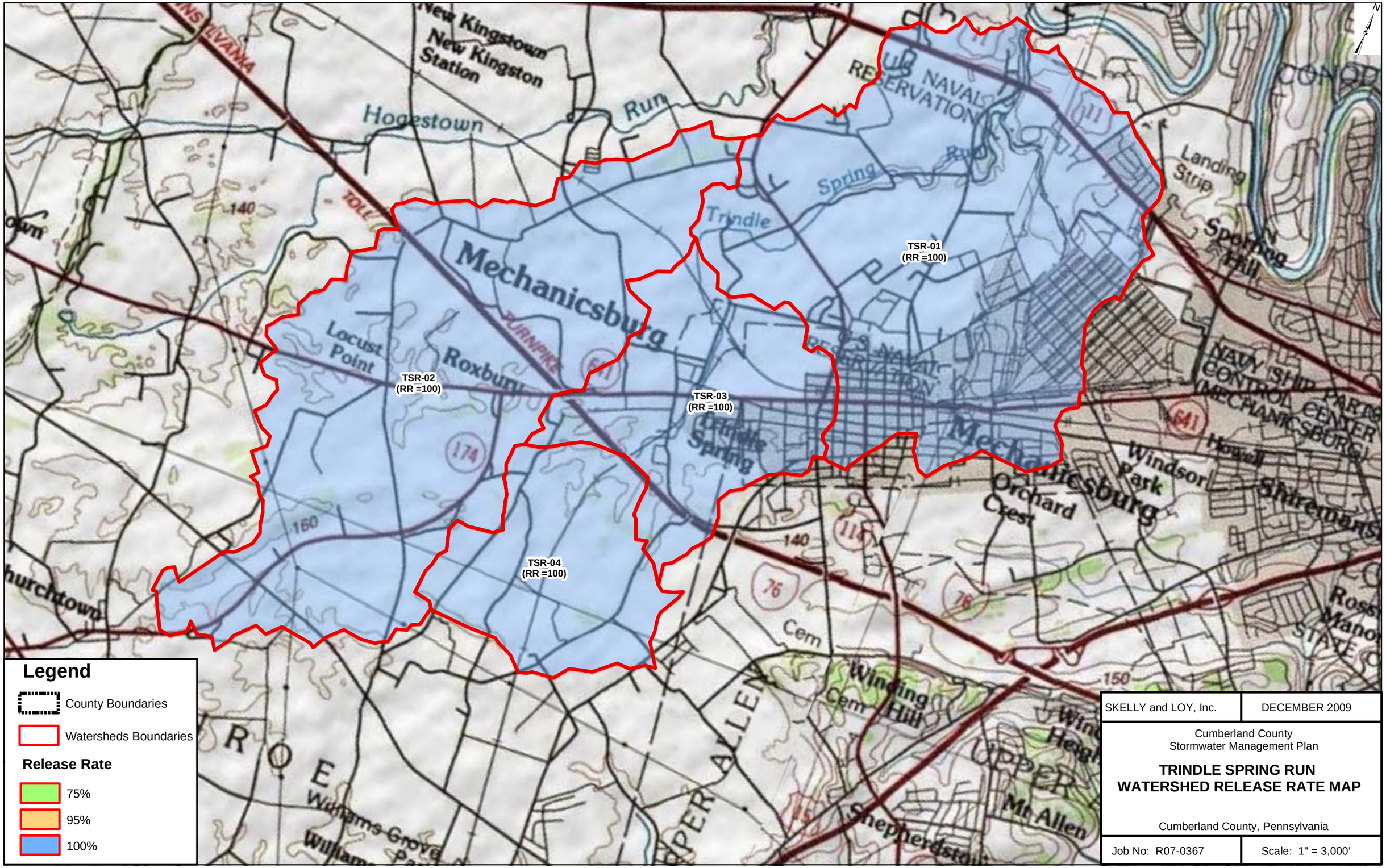

| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**STONY RUN WATERSHED**
**RELEASE RATE MAP**

York County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 2,500' |



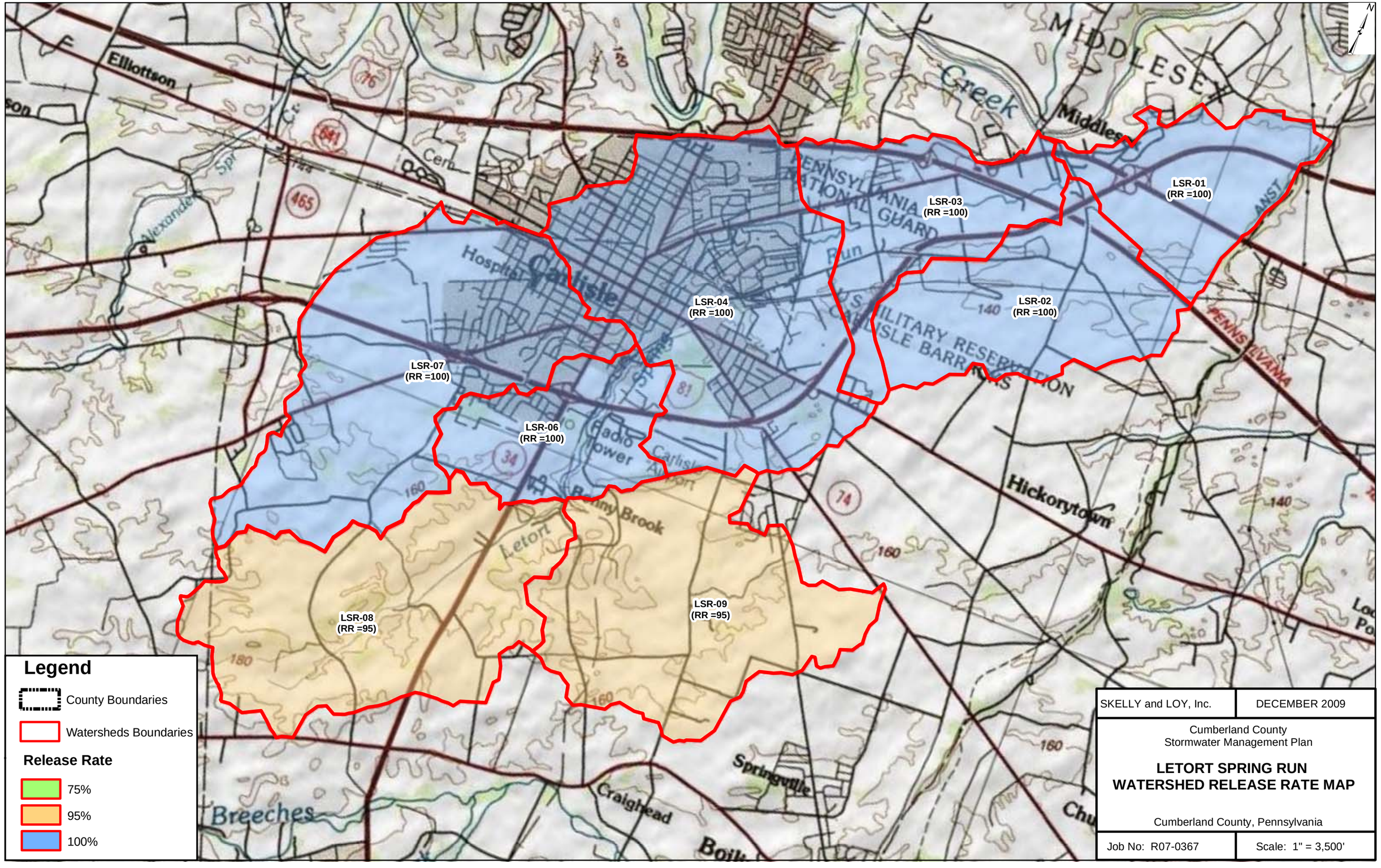

| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**TRINDLE SPRING RUN**
**WATERSHED RELEASE RATE MAP**

Cumberland County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 3,000' |



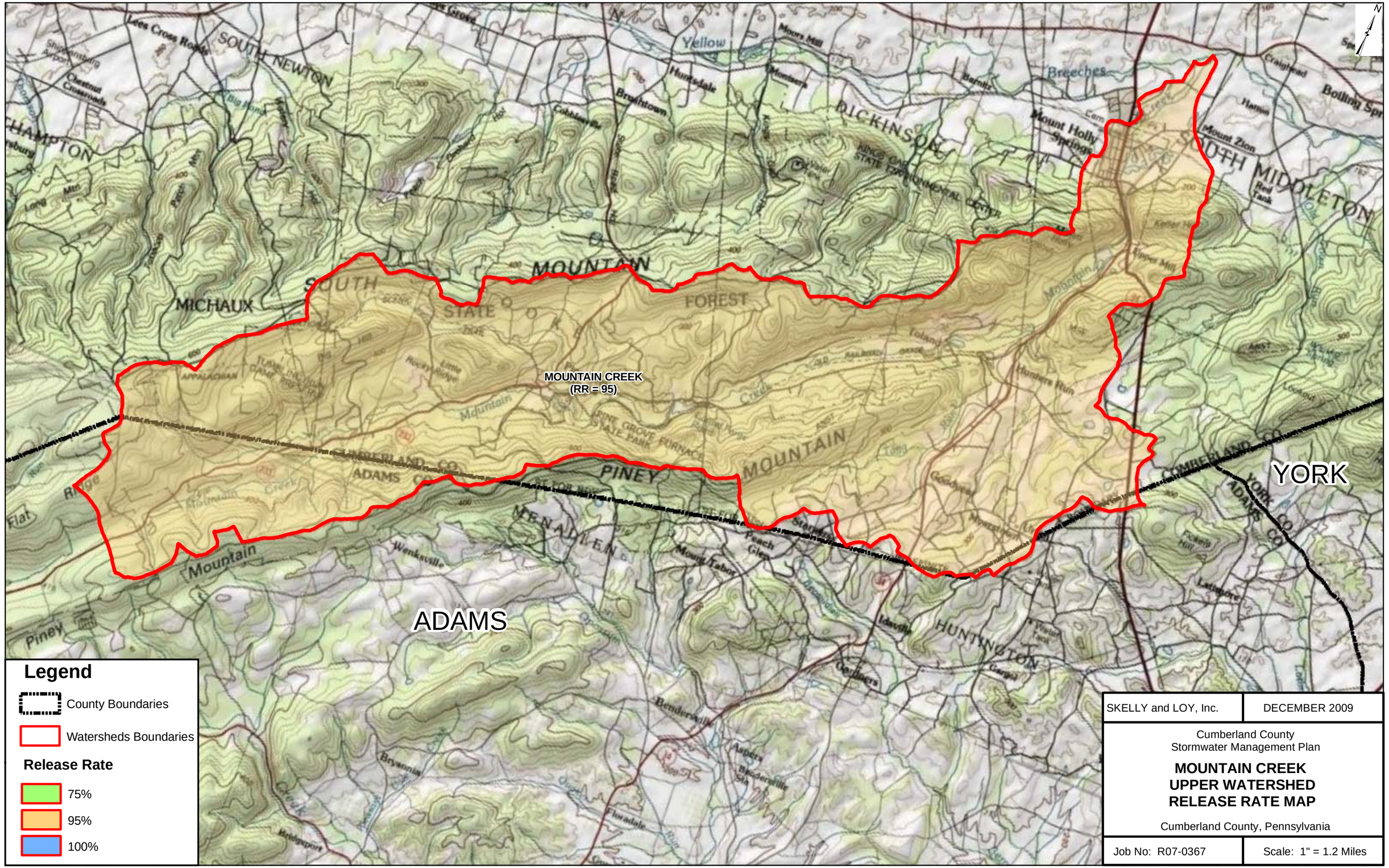

SKELLY and LOY, Inc. | DECEMBER 2009

Cumberland County
Stormwater Management Plan

**LETORT SPRING RUN**
**WATERSHED RELEASE RATE MAP**

Cumberland County, Pennsylvania

Job No: R07-0367 | Scale: 1" = 3,500'



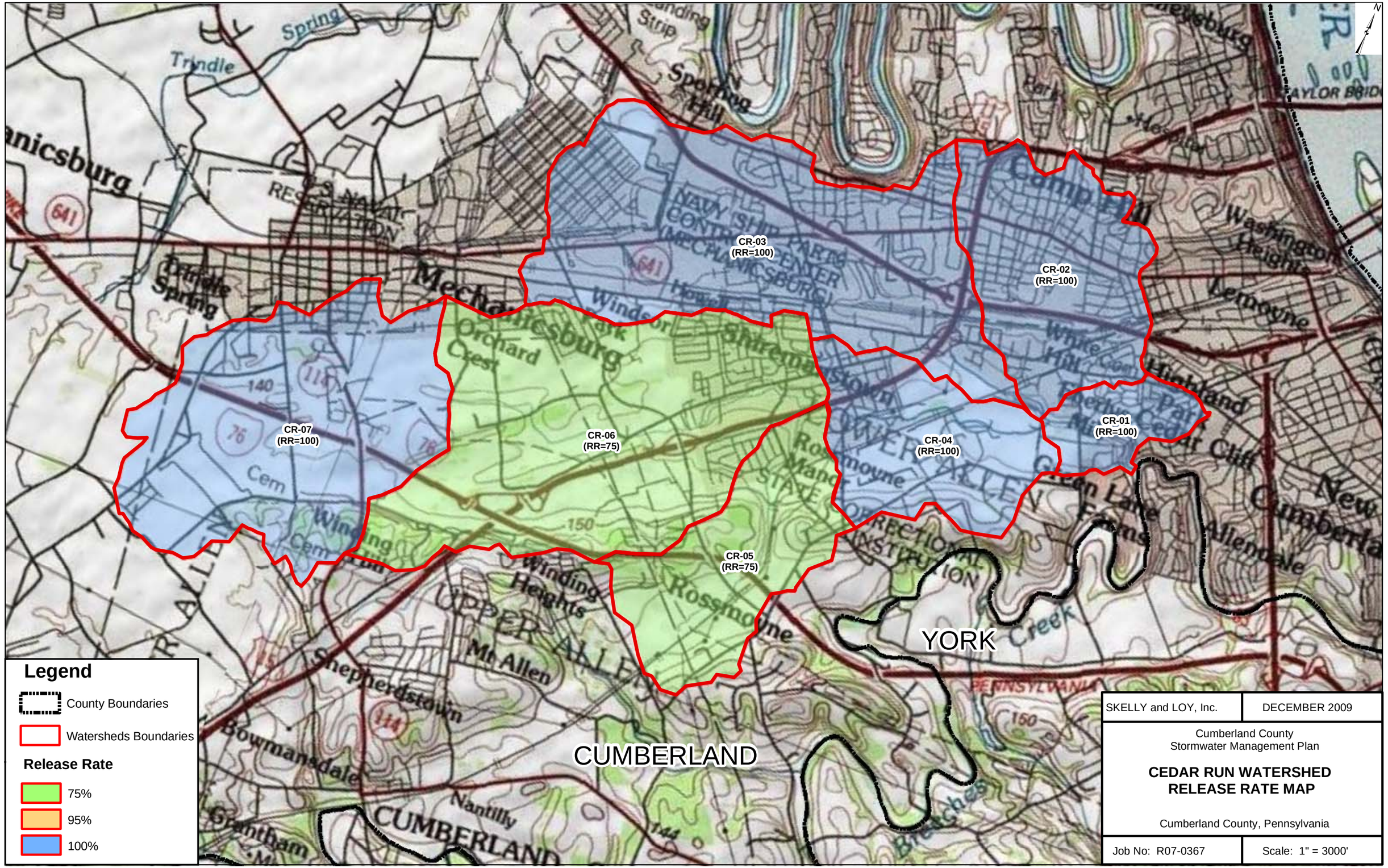

| | |
|---|---|
| SKELLY and LOY, Inc. | DECEMBER 2009 |

Cumberland County
Stormwater Management Plan

**MOUNTAIN CREEK**
**UPPER WATERSHED**
**RELEASE RATE MAP**

Cumberland County, Pennsylvania

| | |
|---|---|
| Job No: R07-0367 | Scale: 1" = 1.2 Miles |


CR-03
(RR=100)
CR-02
(RR=100)
CR-01
(RR=100)
CR-04
(RR=100)
CR-05
(RR=75)
CR-06
(RR=75)
CR-07
(RR=100)
YORK
CUMBERLAND
Legend
County Boundaries
Watersheds Boundaries
Release Rate
75%
95%
100%
SKELLY and LOY, Inc.
DECEMBER 2009
Cumberland County
Stormwater Management Plan
CEDAR RUN WATERSHED
RELEASE RATE MAP
Cumberland County, Pennsylvania
Job No: R07-0367
Scale: 1" = 3000'

## SECTION VI SUMMARY OF OUTREACH AND EDUCATIONAL EFFORTS

A Watershed Plan Advisory Committee (WPAC) was established in both the eastern and western regions of the County. The purpose of each committee was to periodically meet to provide input and advise on the development of the Plan and the County-wide stormwater regulations that would eventually be proposed. Five committee meetings were held separately in both regions of the County, yielding a total of ten WPAC meetings over a span of three years.

The committees were composed of representatives from the Cumberland County Conservation District, various county and regional agencies, Home Builders Association, municipalities located within the targeted watersheds, Franklin and York Counties, and various watershed associations and foundations.

WPAC Members included the following:

- Eastern Cumberland County Committee

| | |
|---|---|
| Keith Ashley | Home Builders Association of Metropolitan Harrisburg |
| Randy Beck | York County Planning Commission |
| Gary Berresford | Wormleysburg Borough |
| Joe Bonarrigo | East Pennsboro Township |
| Dave Buell | Camp Hill Borough |
| Larry Claycomb | Middlesex Township |
| Janna Colechio | Shiremanstown Borough |
| Bony Dawood | Silver Spring Township |
| Patrick Dennis | Mechanicsburg Borough |
| Deb Ealer | North Middleton Township |
| Daniel Flint | Lower Allen Township |
| Ronald Frank | Lemoyne Borough |
| Gil Freedman | Conodoguinet Creek Watershed Association |
| Chris Houston | Letort Regional Authority |
| Brian Jaymes | Cumberland County Conservation District |
| Bruce Koziar | Carlisle Borough |
| Glenn Magatz | Hampden Township |
| Margorie Metzger | Monroe Township |
| Greg Moll | Upper Allen Township |
| Donna Morelli | Alliance for the Chesapeake Bay |
| Brian O'Neill | South Middleton Township |
| John Owen | East Pennsboro Township |
| John Pietropaoli | East Pennsboro Township |
| Rich Pugh | Yellow Breeches Watershed Association |
| Cheryl Smith | Mount Holly Springs Borough |
| Stephen Sultzaberger | New Cumberland Borough |

- Western Cumberland County Committee

| | |
|---|---|
| Greg Alleman | Hopewell Township |
| Larry Barrick | Dickinson Township |
| Walter Beaston | Upper Mifflin Township |

| | |
|---|---|
| Sherri Clayton | Franklin County Planning Commission |
| Keith Clinton | Big Spring Watershed Association |
| Jim Crum | Newburg Borough |
| John Epley | West Pennsboro Township |
| Paul Fegley | North Middleton/Lower Frankford Townships |
| Raelane Gabriel | Penn Township |
| Bruce Gilmore | Chesapeake Bay Foundation |
| Thomas Ginnick | Southampton Township |
| Louis Gruver | South Newton Township |
| Karen Heishman | Lower Frankford Township |
| Sherry Hershey | Newville Borough |
| Vonda Kelso | Upper Frankford Township |
| Gary Martin | Penn Township |
| Stephen Oldt | Shippensburg Township |
| David Parthemore | North Newton Township |
| John Shambaugh | Penn Township |
| Andre Weltman | Cooke Township |
| Shelby Winter | Lower Mifflin Township |
| William Wolfe | Shippensburg Borough |

- *WPAC Meeting No. 1* – January 9/10, 2007

  – Review of PA DEP designation of nine major watersheds in Cumberland County

  – Discussion of purpose and time frames for Phase I and Phase II for the Plan

  – Review of locations of existing stormwater problems and obstructions as identified in municipal surveys

- *WPAC Meeting No. 2* – March 6/7, 2008

  – Review of maps presenting significant obstruction/problem areas, impaired streams, existing land use, hydrologic soils, and geology

  – Discussion of concerns about land use data mapping, water quality, use of Best Management Practices (BMPs) and runoff, and enforcement of ordinance provisions

- *WPAC Meeting No. 3* – October 22/30, 2008

  – Review of field data collection and measurement of significant obstructions in all the watersheds in the eastern part of the County and portions of York County

  – Review of subwatershed composite runoff curve numbers

  – Discussion of how to adjust model to address stormwater flows and revision of the Future Land Use map

- *WPAC Meeting No. 4* – April 2/23, 2009
  - Review of the PA DEP model stormwater ordinance to serve as a framework for the Cumberland County Plan
  - Discussion on the difficulty of tracking the amount of impervious areas over time and per lot, the need for clearly defined standards for exemption criteria, and whether infiltration BMPs should be used in certain situations
- *WPAC Meeting No. 5* – October 2/8, 2009
  - Review of Model Ordinance Revisions (including definition of a regulated activity and revised exemption criteria)
  - Discussion on the model results/stormwater control provisions for eastern Cumberland County and incorporation of the Upper Yellow Breeches Creek

# SECTION VII PLAN IMPLEMENTATION AND UPDATE PROCEDURES

## PLAN IMPLEMENTATION

The regulatory approach for implementing this Watershed Plan utilizes the powers granted by Act 247, the Municipalities Planning Code (MPC). The MPC enables counties and municipalities to adopt zoning, subdivision and land development, and planned residential development ordinances and to address storm drainage concerns in these ordinances. Implementation of this Plan requires that it first be reviewed by the municipalities, WPAC members, and County Planning Commission. Comments received from these entities will be incorporated into the Plan, and then it will be presented to the County Board of Commissioners for adoption. The adoption process includes conducting a public hearing at which time the Plan will be presented, comments will be received and reviewed, and appropriate changes will be made. The County will then enact an Adoption Resolution.

Once this Plan has been adopted by the Cumberland County Board of Commissioners, it will be submitted to PA DEP for approval. Once approved, the municipalities within the watershed are required to adopt regulations consistent with the Model Ordinance as a stand-alone ordinance or incorporate it into their existing subdivision and land development ordinances. The ordinance provisions adopted by the municipalities must be <u>at least</u> as restrictive as the provisions stated in the Model Ordinance. In addition to adopting the stormwater provisions, the municipalities must amend existing zoning and building codes to provide correct references.

## PLAN UPDATE

Section 5(b) of the Stormwater Management Act requires that approved plans incorporate provisions for periodically reviewing, revising, and updating the plan. Section 5(a) requires that Plan updates be conducted at least every five years to account for changes in land use, development pressures, and water quantity and quality provisions. The Cumberland County Planning Commission will compile and maintain information as necessary to facilitate the subsequent updating of the Plan and will initiate the process whenever it is deemed appropriate. Information to be compiled includes updates and revisions to municipal ordinances, new development plans, and documentation of any stormwater or flood management facilities that are constructed. If a Plan update is initiated, the County will reconvene the Watershed Plan Advisory Committee to provide local input into the process.