EXHIBIT P3

CHADDS FORD TOWNSHIP ACT 537 PLAN

UPDATE TO
CHADDS FORD TOWNSHIP'S SEWAGE FACILITIES MANAGEMENT (ACT 537) PLAN

CHADDS FORD TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA

October 2016
Revised July 2017
Revised November 2017

CHADDS FORD TOWNSHIP
10 Ring Road
Chadds Ford, PA 19317-9101

PENNONI
One South Church Street
Second Floor
West Chester, PA 19382
www.pennoni.com

CFTP0570

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I. Previous Wastewater Planning

A. Introduction

The Pennsylvania Sewage Facilities Act (Act 537) requires that every municipality within the Commonwealth develop and maintain an up-to-date sewage facilities plan. Chadds Ford Township, Delaware County, Pennsylvania authorized the preparation of this report to serve as its Official Sewage Facilities Plan Update (Plan). The Township retained the services of its engineer, Pennoni Associates, Inc., to assist with preparation of the Plan. This Plan was prepared in accordance with Act 537 as described in the Pennsylvania Department of Environmental Protection's (PADEP's) "Guide for Preparing Act 537 Update Revisions," dated January 2003 this includes the "General Plan Contents Checklist". A completed copy of the PADEP checklist indicating where each required item can be found within the Plan is included in Appendix I.

B. Previous Planning

Chadds Ford Township approved and implemented an Act 537 Plan in 1991. At that time, the majority of the Township utilized on-lot sewage disposal systems for collection and treatment.

The Plan proposed the construction of a waste water treatment plant (WWTP) and sewer collection system to serve a portion of the eastern side of the Township (Route 202 – Route 1 corridor). Three years later, 1994, the Ridings WWTP was constructed on Ridge Road. The facility is permitted for an average daily flow of 80,000 gpd.

The 1991 plan recognized that the Chadds Ford Village area was also in need of public sewers and recommended the construction of sewage facilities to serve this area. (The recommended facilities were constructed in 2008).

Thirteen years later, in 2004 last revised 2005, the Township updated the Act 537 plan. The plan included installation of public sewers in the Chadds Ford Village area and Route 1 corridor which included Painters Crossing Condominiums (removal of the PANTOS WWTP), the Estates at Chadds Ford and residential and commercial properties with frontage on Route 1.

Within three years of plan approval, the Turner's Mill WWTP was constructed and was operational. The permitted capacity of the plant is 140,000 gpd.

The PADEP recommended in the 2005 Plan update that additional studies be completed on the private treatment facilities Knight's Bridge WWTP, Springhill Farm WWTP as well as the Ridings WWTP.

II. Physical and Demographic Analysis

A. Planning areas, municipal boundaries, Sewer Authority/Management Agency service area boundaries

1. Planning Area - The planning area for the purposes of this Act 537 Sewage Facilities Plan is the entire Township of Chadds Ford.

2. Municipal Boundaries - Chadds Ford Township is located in Western Delaware County covering an area of approximately 8.8 square miles. Four other municipalities about the Township, namely Concord Township to the east, Thornbury Township to the north east in Delaware County, and Pennsbury Township to the west and Birmingham Township to the north in Chester County.

3. Sewer Authority/Management Agency service area boundaries – the public sewer service area includes the Route 1 and 202 corridors as shown on Appendix II, Map 1.

   The Chadds Ford Township Sewer Authority contracts with Delaware County Regional Water Quality Control Authority to operate and maintain both the Ridings and Turner's Mill Wastewater Treatment Plants.

B. Physical Characteristics within the Study Area

Chadds Ford Township is comprised of many natural and cultural resources. These include; farm fields, meadows, woods, streams and historic sites and structures.

The following physical features are found within Chadds Ford Township:

Streams

1. Brandywine Creek – Flows generally in the southern direction and forms the Township's western boundary. PA Code 25 Chapter 93 Designation - Drainage List G, Warm Water Fishes (WWF) and Migratory Fishes (MF).

2. Harvey Run – Flows generally along the Route 1 corridor and is a tributary to Brandywine Creek. PA Code 25 Chapter 93 Designation - Drainage List G, Warm Water Fishes (WWF) and Migratory Fishes (MF).

3. Wilson Run – is located south west of the Route 1 corridor and is a tributary to Brandywine Creek. PA Code 25 Chapter 93 Designation – Not listed.

4. Brinton Run – the majority of Brinton Run Creek is located in Chester County and is a tributary to Brandywine Creek. However, a small portion of the creek is located along the North West boundary line of the Township. PA Code 25 Chapter 93 Designation – Drainage List G, Warm Water Fishes (WWF) and Migratory Fishes (MF).

5. Beaver Creek – is located in the southern portion of the Township and is a tributary to Brandywine Creek. PA Code 25 Chapter 93 Designation – Drainage List G, Cold Water Fishes (CWF) and Migratory Fishes (MF).

6. Chester Creek – Flows along the Route 202 corridor. Pa Code Chapter 93 Designation – Drainage List G, Trout Stocking (TSF) and Migratory Fishes (MF).

Lakes and Ponds

There are several unnamed water bodies within Chadds Ford Township as shown on Map 2 of Appendix II.

Watersheds (Drainage Basin)

The majority of Chadds Ford Township is located within the Brandywine Creek Drainage Basin. However, a small portion of the Township (along the Route 202 corridor) is located within the Chester Creek basin. The ridge line delineating the drainage basins is located in close proximity to the Route 202 corridor (see Map 2, Appendix II).

Both the Brandywine Creek and Chester Creek basins discharge into the Delaware River. A named tributary located near Chadds Ford Township to the Chester Creek Basin is West Branch of Chester Creek and Chester Creek. Named tributaries to the Brandywine Creek basin located in Chadds Ford Township are Brandywine Creek, Harvey Run, Wilson Run, Brinton Run and Beaver Creek.

C. Soils within the Study Area

1. Suitability Of Soils For On-Lot Systems

The majority of wastewater disposal systems within Chadds Ford Township is on-lot septic systems. These systems include; conventional, sand mounds and spray irrigation systems. In order to determine if an area will be a good location for an on-lot septic system a soil analysis must be completed. The analysis determines the soils ability to absorb and filter effluent. Soil absorption and filtration removes odors and prevents contamination of ground water.

Measures used to determine if an on lot system will be suitable for a parcel is the permeability rate and a percolation test. Permeability is the rate of water movement through the soil. Slow water movement reduces the capability of soil to absorb and filter sewage. Fast water movement does not allow sufficient time for the soils to absorb and filter the sewage. The rate of water movement is estimated by conducting a percolation test. The recommended percolation rate for underground sewage systems is 1 inch per hour.

Map 3 of Appendix II identifies the types of soils within Chadds Ford Township. The suitability of the soils for underground sewage systems are listed in Tables 1 thru 3 of Appendix II. As shown in the Tables, portions of the soils within the Township show some limitations to underground systems.

In addition to determining the site soils characteristics, the Pennsylvania Code Chapter 73 (PA Code), prohibits the construction of absorption areas and spray fields on fill unless the fill has remained in place for a minimum of four years. The PA Code also recommends that absorption and spray fields be located on undisturbed soils.

2. Prime Agricultural Soils

Prime agricultural soils are defined as those soils that are the most productive for food and feed corps. In general, these soils are deep, not prone to erosion, nearly level, well drained and generally devoid of rocks and stones. In accordance with the Chadds Ford Township Open Space Plan and the Brandywine Conservancy, the township contains approximately 1,780 acres of prime agricultural soils (see Map 4 of Appendix II).

3. Archeological and Historic Resources

Within Chadds Ford Township there are several historic and archeological landmark areas. Per Chadds Ford Township Open Space plan and the Brandywine Conservancy, these areas include; the Act 167 Historic District (Village of Chadds Ford and the Village of Dilworthtown), the Natural Register District, the Brandywine Battlefield Natural Historic Landmark, Gilpin House as well as areas along the Columbia Gas Line, as shown on Map 5 and 6 of Appendix II.

D. Geology Features within the Study Area

The underlying geology of an area can affect the suitability of a site for the successful operation of an underground wastewater disposal system. In accordance with the PA Code, the primary concern with geology and wastewater disposal is restrictive rock areas and areas underlain by limestone.

1. Restrictive Rock Layers:

Chadds Ford Township is located in the Wissahickon Formation of the Piedmont Upland Section of the Piedmont Physiographic Province of Pennsylvania (see Map 7, Appendix II). This area consists of broad, gently rolling hills and valleys. The geology of the area consists of metamorphic and igneous rocks (see Map 8, Appendix II). Table 1, Appendix II indicates limitations of the Township's soils due to the depth of underlying restrictive layers. As shown on Table I, 48% of the Township is very limited for the use of conventional onlot sewer systems due to the location of the restrictive rock layer. (It is recommended that restrictive rock layers be located more

than four feet below the bottom of trenches or beds. Four feet of soil is required to provide adequate soil to provide filtration of the sewage).

2. Limestone and Dolomite Areas:

   Map 9, Appendix II, shows the limestone and dolomite distribution in Pennsylvania. These rock types can present potential hazards due to the presence of cavities and bedrock irregularities (Karst areas). These cavities can collapse or create sinkholes which can cause damage to underground systems. Map 10, Appendix II, shows the location of Karst features in south–central and south-eastern Pennsylvania.

An additional requirement of the Act 537 Plan Checklist for Geologic Features is to include areas where existing nitrate-nitrogen levels are in excess of 5mg/l. Appendix II includes the 2012 Water Data Report for Brandywine Creek at Chadds Ford as well as the west branch of the Chester Creek upstream from the Springhill Farm WWTP. As shown in Appendix II, for Brandywine Creek, the measured nitrate level was 3.59 mg/l, the nitrite measurement was less than 0.040 mg/l. For the west branch of Chester Creek the nitrate level was 2.0 mg/l.

E. Topography within the Study Area

The topography or slope of the land is another important consideration when determining the suitability of a site for a wastewater disposal system. Areas with slopes in excess of 15% are not recommended for soil absorption systems as the downhill flow may reach the soil surface before the sewage has been properly filtered. In addition, the PA Code prohibits the construction of an absorption area or spray fields in areas with slopes greater than 25%. 8% of the Township has slopes exceeding 25% and 19% of the Township has slopes between 15 and 25%. Tables 1 thru 3 of Appendix II indicate limitations of the soils within the Township due to their slope. As shown on Table I-III, 76.3% of the Township is very limited for conventional onlot sewer systems, 33% is very limited for sand mounds and 20% is very limited for spray irrigation systems due to the slope of the land.

Appendix II, map 11, contains the USGS map for Chadds Ford Township. This map indicates the slope and general topography of the area.

F. Potable Water Supplies within the Study Area

The Township's public water service area is shown on Appendix II, Map I. (The public water service area is the same as the public sewer service area). There are no water storage tanks located within the Township.

Chester Water Authority (CWA) operates and maintains the public water system. CWA participates in the Partnership for Safe Water which is a voluntary cooperative effort among the Environmental Protection Agency (EPA), the Pennsylvania Department of Environmental Protection (PA DEP), the American Water Works Association (AWWA),

and other drinking-water organizations and water suppliers across the nation. The goal of the Partnership is to enhance the quality of drinking-water safety by optimizing treatment plant performance. In accordance with the EPA and the PA DEP regulations, CWA completes and posts online an annual water quality report.

The remaining parcels outside of the public water service area are served by private wells. The wells are installed in accordance with PA DEP guidelines. Chapter 73 of the PA Code establishes the minimum separation distances between an individual water supply and a septic system. Prior to construction, the location of the well and septic system are determined based on the recommended separation distance.

G. Wetlands within the Study Area

A wetland is defined as a low lying area such as a marsh or swamp that is saturated with moisture. The soils in these areas are saturated and have no additional space available for the absorption of sewage. According to the National Wetlands Inventory, approximately 2% of the Township is covered by wetlands. Map 12 of Appendix II, shows wetland areas located within Chadds Ford Township.

In addition, the PA Code prohibits the construction of an absorption area or spray field in floodways or within 50 feet of a stream. The primary water bodies associated with floodplains are Brandywine Creek and Harvey Run. Appendix II contains FEMA maps for Chadds Ford Township. The maps indicate floodplain areas within the Township as well as stream locations. Tables 1 thru 3 of Appendix II indicate the soil limitations for septic systems due to high water table and or flooding. As shown on Tables I-III, 21.5% of the Township is very limited for conventional onlot sewer systems, 22% is very limited for sand mounds and 11% is very limited for spray irrigation systems due to the flooding and/or the location of the water table.

III. Existing Wastewater Facilities in the Planning Area

There are two municipally owned sewage treatment plants (WWTP's) in Chadds Ford Township, Delaware County. The Ridings WWTP (NPDES Permit PA0055476) is located at the intersection of Ridge Road and Ridings Boulevard. The Turners Mill WWTP (NPDES Permit PA0244031) is located adjacent to the Township Building at the intersection of Baltimore Pike (Route 1) and Ring Road.

There are currently no tributary municipalities that send sewage to either of the wastewater treatment facilities in the Township. However, there are two private WWTPs in the Township. The Springhill Farm WWTP (NPDES Permit No. PA0052230) serves the Springhill Farm Development and Glen Eagle Shopping Center at Wilmington-West Chester Pike (Route 202) and Ridge Road in the south east corner of the Township (see Flow Chart F-1 located in Appendix III). The Knights Bridge WWTP (NPDES Permit No. PA0052663) serves properties owned by the Henderson Group at the intersection of Routes 202 and Route 1 (see Flow Chart F-3 located in Appendix III).

Operation and maintenance responsibilities for the Ridings and Turners Mill WWTPs as well as the municipally owned sewage pump stations are provided on a contract basis by the Delaware County Regional Water Quality Control Authority (DELCORA). Management and administrative duties are carried out by the Board of Directors of the Chadds Ford Township Sewer Authority ("Authority"), the Authority Manager, and an administrative manager.

A. Existing Municipally Owned Wastewater Treatment Plants

1. Ridings WWTP

The Ridings WWTP started operation in October 1994 in accordance with National Pollution Discharge Elimination System (NPDES) Permit No. PA0055476. The current permit has an expiration date of September 30, 2017. The facility discharges treated wastewater to an unnamed tributary of Harvey Run in the Brandywine Creek watershed.

The Ridings WWTP is permitted for an average daily flow of 80,000 gpd. The treatment plant consists of an influent lift station, a fine screen, an influent equalization tank, a dual basin sequencing batch reactor, post treatment equalization basin, tertiary filtration of the effluent, chlorination, and then de-chlorination prior to release to the receiving stream. Removed bio-solids are aerobically digested and periodically hauled offsite to an approved disposal facility.

The Ridings WWTP is regularly maintained by DELCORA. The pumps, tanks, and other mechanical equipment are functioning properly. In an effort to reduce the effluent Total Suspended Solids (TSS), the Authority installed a Siemens Forty-X disc filter in February 2008 to replace an existing sand filter. The disc filter is intended to improve the effluent quality of the WWTP through the use of removable filter panels that can be replaced with minimal filter down time. While the unit initially suffered start-up issues, the Authority worked with the filter manufacturer until the unit performed in accordance with the required discharge parameters. The Authority has installed a polymer injection system to aid the disc filter operation on an as needed basis to ensure optimal performance. Other improvements to the treatment plant were completed in early 2011 which included influent wastewater screening and flow equalization through the installation of a Lakeside Fine Screen and concrete equalization tank, respectively. The Authority has found solutions that are providing reliable tertiary treatment that have maintained the Authority's compliance with the NPDES Permit.

Since 2011, peak influent flows have been substantially mitigated. The treatment facility was designed such that during high flows the treatment process accelerates by allowing the tanks to fill from the bottom while partially treated effluent is decanted from the surface. Once decanted, the effluent is screened and chlorinated/dechlorinated to ensure partial treatment and disinfection prior to

discharge (Storm Mode). The treatment plant did not experience a Storm Mode condition in 2015.

As per the Water Quality Management Permit No. 2393404 Amendment 2, the Ridings Treatment Plant has a Hydraulic Design (Annual Average) Capacity of 0.080 MGD. The Annual Average Flow in 2015 at the Ridings Plant was 0.0399 MGD. These flows are within the permitted Annual Average Capacity of the treatment facility. The treatment plant did not experience a hydraulic overload condition in 2015.

Although the Ridings WWTP is currently working within current permit effluent parameters, due to the age of the technology and limitations of the treatment process and inability to expand, the Township believes that potential future effluent requirements and the commitments to the capacity of the plant make continued operations of the plant unsustainable.

a. Ridings Collection System

The Ridings Collection System is generally in good condition. System flows are monitored and have been operating within the design and permitted capacity.

The Ridings Collection System is a relatively small collection system and consists of 8-inch PVC gravity collection sewers and a low pressure sewer system.

There are approximately 241 connections to the Ridings Collection System yielding an annual average flow of 0.0399 MGD.

1) Low Pressure Sewers

There is a low pressure sewer system serving the Raven Crest Development and certain properties along Heyburn Road south of Ridge Road. The low pressure force main discharges into a gravity sewer along Ridge Road to the west of the Ridings WWTP. This gravity sewer enters the treatment plant lift station independent of the gravity collection system from the Ridings Development described above.

b. Ridings Conveyance Systems

The Ridings Conveyance System includes three (3) sewage pumping stations and a small low pressure sewer system (see Flow Chart F-2 located in Appendix III). The pump stations are continuously monitored and regularly inspected and maintained by DELCORA. The following table summarizes the permitted, present and projected flows for each station.

Pump Stations							
		Permitted Capacities		Present Flows			Projected Flows
Pump Station Name	Numer of Pumps	AA Permitted Capacity (gpd)	Hydraulic Design Capacity (gpm)	Annual Average Flows (gpd)	Peak Day Flow (gpd)	Peak Hourly Flow* (gpm)	2-Year Projected Max Flow (gpd)
Remote PS	2	1,400	38	1,282	2,280	7	2,280
Intermediate PS	2	5,950	35	4,356	9,660	28	9,660
Woodland PS	2	27,500	120	6,790	16,200	45	16,200

*Peak hourly flows are estimated based on a peaking factor applied to the Peak Day Flow. For Smith Bridge and Eckmen, a factor of 4.2 was used and a factor of 4.0 was used for Woodland PS. Additional capacity and attenuation of the peak flows is provided in the storage volume of the wetwells of both the Smith Bridge and Eckman pump stations. Both pump stations were designed to hold a minimum of 24 hours of flow providing adequate attenuation of the peak instantaneous flows.

1) Remote (Smith Bridge) Pump Station

The Remote Pump Station is located at the southern end of the Ridings System off of Smith Bridge Road. The station services 6 single family residences. It has 2 submersible pumps rated at 38 gpm each. The force main from the pump station discharges to the Intermediate Pump Station.

The Smith Bridge pump station is in good condition. The Remote Pump Station does not have an emergency generator for back-up power, however it does have added storage capacity intended to provide emergency wastewater storage for a minimum of 24 hours. The extra storage capacity in the wetwell provides adequate attenuation of any peak flows and ensures that the pump station has adequate capacity with only one pump in operation.

2) Intermediate (Eckman) Pump Station

The Intermediate Pump Station is located at the southern end of the Ridings neighborhood in an easement on the south side of Ridings Way. The pump station receives flow via gravity from 17 single family homes in the Ridings Development in addition to the flow from the Remote Pump Station. The Intermediate Pump Station is equipped with 2 submersible pumps rated at 35 gpm each. The force main from the pump station discharges into a manhole (MH 11) in Ridings Way and then flows by gravity to the Ridings WWTP.

The Intermediate Pump Station is in good condition. The Intermediate Pump Station does not have an emergency generator for back-up power, however it does have added storage capacity intended to provide emergency wastewater storage for a minimum of 24 hours. The extra storage capacity in the wetwell provides adequate attenuation of any peak flows and ensures that the pump station has adequate capacity with only one pump in operation.

3) Woodland Pump Station

The Woodland Pump Station is located on Woodland Drive on the east side of Route 202. The Woodland Pump Station services approximately 82 EDU's, including approximately 35 single family homes on Woodland Drive, Summit Drive, and Longview Road as well as a number of commercial facilities on Route 202. The pump station consists of two aboveground Smith & Loveless pumps rated at 120 gpm each. The force main from the pump station discharges into a terminal gravity manhole in Longview Road and then flows via gravity to the Ridings WWTP.

The Woodland Pump Station is in good condition with only routine maintenance required. It has an emergency generator for back-up power which is regularly inspected and exercised.

2. Turners Mill WWTP

The Turners Mill WWTP started treatment operations in 2008 in accordance with NPDES Permit PA0244031. The current permit has an expiration date of December 31, 2017. The facility discharges treated wastewater to an unnamed tributary of Harvey Run in the Brandywine Creek watershed.

The Turners Mill WWTP is permitted for an average daily flow of 0.140 MGD with a design hydraulic capacity of 0.150 MGD with a peak design flow of 0.403 MGD

The treatment process utilized at the Turners Mill WWTP is extended aeration. The plant incorporates a mechanical screen with manual bar screen by-pass, concrete tanks with package treatment units, and ultraviolet disinfection.

The Turners Mill WWTP is in relatively new condition. Regular maintenance is provided by DELCORA to ensure that the pumps, tanks, and other mechanical equipment are functioning properly.

As per the Water Quality Management Permit No. 2305404 T1, the Turners Mill Treatment Plant has a permitted Annual Average Flow Capacity of 0.140 MGD and a Design Hydraulic Capacity of 0.403 MGD (Peak Flow). The Annual Average Flow in 2015 at the Turners Mill Plant was 0.0713 MGD. These flows are within the permitted Annual Average Capacity of the treatment facility. The treatment plant did not experience a hydraulic overload condition in 2015.

a. Turners Mill Collection System

The Turners Mill Collection System is generally in excellent condition, currently operating within its design and permitted capacity. There are no hydraulic

overloads projected or known areas with surcharging within the Turners Mill Collection System.

Because the Turners Mill Collection System is relatively new and primarily consists of low pressure sewers, the plant experiences little increases in flow during wet weather.

The Turners Mill Collection System is relatively small and is substantially comprised of low pressure sewers. There are two privately owned gravity collection systems that contribute flow to Turners Mill. The gravity collection system that serves the Estates at Chadds Ford dedicated to Chadds Ford Township Sewer Authority (CFTSA) and a gravity collection that serves the Painters Crossing Condominiums owned by the condominiums association. Two pump stations individually owned and maintained by the CFTSA and Painters Crossing HOA convey flow from the gravity systems to Turners Mill sewage treatment plant.

The municipally owned portions of the Turners Mill Collection System are relatively new with the oldest portions being constructed in 2008. There are no known portions of the system that are in need of repair, replacement, or rehabilitation. The existing low pressure sewer lines are designed and sized properly for the current and projected connections within the system.

The Turners Mill Wastewater Treatment Plant currently has a permitted hydraulic capacity of 0.140 MGD. There were approximately 460 connections to the Turners Mill Collection System through 2015 yielding an annual average flow of 0.0713 MGD.

b. Turner's Mill Conveyance System

The Turner's Mill Conveyance System is comprised of the Estates at Chadds Ford (EACF) Pump Station and the Painters Crossing Pump Station (PANTOS) (see Flow Chart F-4 located in Appendix III). The Authority owns and maintains the Estates at Chadds Ford (EACF) Pump Station and the Painters Crossing Pump Station is owned and maintained by a Home Owners Association. There have been no issues or problems reported by or to the Authority regarding these pump stations.

The EACF Pump Station has an influent flow meter; the PANTOS Pump Station does not; however, it is equipped with effluent flow meters that record the total flow.

1) Painters Crossing Pump Station (PANTOS)

The Painters Crossing pump station is located adjacent to the Painters Crossing Condominiums at 1300 Baltimore Pike. The Station serves 242

Condominium units (170 equivalent EDUs). There are no future connections proposed for this pump station. The pump station consists of two aboveground Smith & Loveless pumps rated at 220 gpm each, resulting in a peak design flow of 316,800 gpd. The force main from the pump station discharges into a combined forcemain that conveys the sewage directly to the Turners Mill WWTP.

The Painters Crossing Pump Station is in relatively good condition. No upgrades to the station are currently planned. The Painters Crossing Pump Station has an emergency generator for back-up power which is reportedly inspected and exercised on a regular basis.

2) Estates at Chadds Ford Pump Station

The Estates at Chadds Ford pump station is located at 3 Evergreen Place and serves the 120 single family detached residences in the Estates at Chadds Ford subdivision. There are no future connections proposed for this pump station as the subdivision is built out. The pump station consists of two aboveground Smith & Loveless pumps rated at 100 gpm each, resulting in a peak design flow of 144,000 gpd. The force main from the pump station discharges into a combined forcemain that conveys the sewage directly to the Turners Mill WWTP.

The EACF Pump Station is in relatively good condition. The pump station has an emergency generator for back-up power which is reportedly inspected and exercised on a regular basis.

B. Existing Privately Owned Wastewater Treatment System

a. Springhill Farm Wastewater Treatment Plant

Springhill Farm WWTP is located in eastern portion of Township near the intersection of Springhill Road and Springhill Drive. The treatment plant serves a 276 townhome community, a commercial shopping center, a restaurant and several residential properties. The Plant was constructed in 1985 (WQM Permit #2387434 and NPDES Permit # PA0052230). The Plant has a permitted hydraulic design capacity of 100,000 gallons/day and discharges to an unnamed tributary to Harvey Run in the Brandywine Creek watershed. The Table below summarizes the results of Springhill Farm's 2013 Discharge Monitoring Reports (DMRs).

At this time, the Springhill Farm Wastewater Treatment Facility Association (SHWTFA) is negotiating with Concord Township to connect to their sewage system. If SHWTFA obtains all necessary approvals to connect to Concord's system, they would be required to submit a special study/planning module to the PA DEP for review and approval.

SPRINGHILL FARM WWTP																
MONTH	DISSOLVED OXYGEN (mg/L)		pH (Instantaneous Maximum) (S.U.)		pH (Instantaneous Minimum) (S.U.)		Total Suspended Solids Average Monthly (lbs/day)		Total Suspended Solids Average Monthly (mg/L)		Ammonia-Nitrogen (Average Monthly) (lbs/day)		Ammonia-Nitrogen (Average Monthly) (mg/L)		Total Phosphorus (Average Monthly) (mg/L)	
	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT
JANUARY	6	5	7.5	9	6.6	6	7	25	15	30	0.2	5	0.5	6	3.5	---
FEBRUARY	6.3	5	7.6	9	6.6	6	9.2	25	20	30	0.1	5	0.1	6	3.2	---
MARCH	6.2	5	7.6	9	6.7	6	4	25	10	30	0.05	5	0.1	6	3.5	---
APRIL	5.7	5	7.2	9	6.7	6	4	25	10	30	0.1	5	0.1	6	3.8	---
MAY	6	5	7.6	9	6.7	6	3	25	7	30	0.04	5	0.1	6	3.6	---
JUNE	5.6	5	7.5	9	6.6	6	3	25	6	30	0.2	5	0.5	6	3.8	---
JULY	5.5	5	7.7	9	6.8	6	1	25	4	30	0.2	5	0.5	6	2.9	---
AUGUST	5	5	7.7	9	7	6	2	25	5	30	0.2	5	0.5	6	4.7	---
SEPTEMBER	5.8	5	7.6	9	7	6	3	25	8	30	0.2	5	0.5	6	3.7	---
OCTOBER	6.5	5	7.6	9	6.8	6	5	25	13	30	0.2	5	0.5	6	4.1	---
NOVEMBER	6.3	5	7.9	9	6.6	6	4	25	13	30	0.3	5	0.9	6	4.6	---
DECEMBER	6.5	5	7.5	9	6.5	6	7	25	18	30	0.2	5	0.5	6	4	---

SPRINGHILL FARM WWTP																
MONTH	Flow (Average Monthly) (mgd)		Flow (Daily Maximum) (mgd)		Total Residual Chlorine (TRC) (Average Monthly) (mg/L)		Total Residual Chlorine (TRC) (Instantaneous Maximum) (mg/L)		Fecal Coliform (Average Monthly) (CFU/100mL)		Fecal Coliform (Instantaneous Maximum) (CFU/100mL)		CBOD5 (Average Monthly) (lbs/day)		CBOD5 (Average Monthly) (mg/L)	
	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT
JANUARY	0.05452	---	0.06571	---	0.04	0.06	0.08	0.14	25	200	640	1000	7	21	16	25
FEBRUARY	0.05746	---	0.06555	---	0.04	0.06	0.12	0.14	32	200	87	1000	8	21	18	25
MARCH	0.05594	---	0.06554	---	0.02	0.06	0.08	0.14	10	200	17	1000	9	21	21	25
APRIL	0.05575	---	0.06826	---	0.03	0.06	0.09	0.14	29	200	63	1000	7	21	16	25
MAY	0.05527	---	0.09435	---	0.03	0.06	0.07	0.14	12	200	52	1000	7	21	17	25
JUNE	0.05894	---	0.09174	---	0.03	0.06	0.08	0.14	11	200	19	1000	6	21	13	25
JULY	0.05082	---	0.07134	---	0.03	0.06	0.08	0.14	8	200	25	1000	2	21	6	25
AUGUST	0.04862	---	0.05581	---	0.03	0.06	0.09	0.14	26	200	55	1000	1	21	4	25
SEPTEMBER	0.04695	---	0.06126	---	0.03	0.06	0.06	0.14	87	200	580	1000	1	21	4	25
OCTOBER	0.04903	---	0.07719	---	0.04	0.06	0.13	0.14	35	200	61	1000	2	21	5	25
NOVEMBER	0.04793	---	0.07724	---	0.03	0.06	0.07	0.14	88	200	188	1000	2	21	6	25
DECEMBER	0.04716	---	0.06796	---	0.04	0.06	0.11	0.14	7	200	12	1000	2	21	6	25

b. Knight's Bridge Wastewater Treatment Plant

Knight's Bridge WWTP is located in the eastern portion of the Township north of Baltimore Pike (Route 1) near the intersection of Brandywine Drive and Endo Boulevard. The WWTP serves the Henderson Business Park as well as adjacent commercial buildings. Sewage from the Henderson Business Park is collected by a gravity sewer system which flows to a pump station. Flows collected at the pump station are pumped by a force main to a gravity system located on the northwest side of Route 1 which conveys the flows to the WWTP.

The WWTP is permitted for 90,000 gpd (NPDES PA0052663 and WQM 2307401) and discharges to an unnamed tributary to Harvey Run in the Brandywine Creek watershed. However, the permitted capacity is based on a plant expansion which to date has not been constructed. As shown in the Table below, the weekly average daily flow to the plant is 31,500 gpd.

KNIGHTSBRIDGE WWTP																		
MONTH	DISSOLVED OXYGEN (mg/L)		pH (Instantaneous Maximum) (S.U.)		pH (Instantaneous Minimum) (S.U.)		Total Suspended Solids Average Monthly (lbs/day)		Total Suspended Solids Average Monthly (mg/L)		Total Suspended Solids Instantaneous Maximum (mg/L)		Ammonia Nitrogen (Average Monthly) (lbs/day)(5-1 to 10-31)		Ammonia Nitrogen (Average Monthly) (mg/L) (5-1 to 10-31)		Ammonia Nitrogen (Instantaneous Maximum) (mg/L) (5-1 to 5-31)	
	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT
JANUARY	8	5	8.6	9	7	6	0.5	7.5	6.4	10	7.6	20	----	0.8	----	1	----	2
FEBRUARY	6.2	5	8.8	9	6.8	6	0.2	7.5	3.6	10	3.6	20	----	0.8	----	1	----	2
MARCH	6.1	5	8.6	9	6	6	0.2	7.5	1.8	10	2.8	20	----	0.8	----	1	----	2
APRIL	6.1	5	7.9	9	6.2	6	0.1	7.5	0.6	10	0.8	20	----	0.8	----	1	----	2
MAY	6.1	5	7.8	9	6.3	6	0.2	7.5	1.2	10	1.2	20	0	0.8	0.1	1	0.2	2
JUNE	5.2	5	8	9	6.3	6	1.1	7.5	7.2	10	9.6	20	0.1	0.8	0.3	1	0.8	2
JULY	6.1	5	8.1	9	6.6	6	1.4	7.5	7.6	10	24	20	0.1	0.8	0.3	1	0.4	2
AUGUST	6	5	8.8	9	6.5	6	1.1	7.5	6.3	10	15	20	0.1	0.8	0.4	1	0.6	2
SEPTEMBER	6.1	5	8.8	9	6.1	6	0.5	7.5	3.3	10	15	20	0.1	0.8	0.6	1	1.5	2

KNIGHTSBRIDGE WWTP																		
MONTH	Ammonia-Nitrogen (Average Monthly) (lbs/day) (11-1 to 4-30)		Ammonia-Nitrogen (Average Monthly) (mg/L) (11-1 to 4-30)		Ammonia-Nitrogen (Instantaneous Maximum) (mg/L) (11-1 to 4-30)		Nitrite + Nitrate (Monthly Average) (lbs/day)		Nitrite + Nitrate (Monthly Average) (mg/l)		Nitrite + Nitrate (Instantaneous Maximum) (mg/l)		Total Phosphorus (Average Monthly) (lbs/day)		Total Phosphorus (Average Monthly) (mg/L)		Total Phosphorus (Instantaneous Maximum) (mg/L)	
	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT
JANUARY	0	2.3	0.2	3	0.3	6	0.5	7.5	4.9	10	19.1	20	0.1	1.5	0.8	2	1.1	4
FEBRUARY	0.1	2.3	0.7	3	1	6	0.6	7.5	7.7	10	13.1	20	0	1.5	0.4	2	0.5	4
MARCH	0.1	2.3	1.2	3	3.2	6	0.9	7.5	8.3	10	12.1	20	0	1.5	0.2	2	0.3	4
APRIL	0	2.3	0.3	3	0.5	6	0.5	7.5	4.6	10	10.1	20	0	1.5	0.2	2	0.3	4
MAY	----	2.3	----	3	----	6	0.9	7.5	5.3	10	8	20	0.1	1.5	0.3	2	0.4	4
JUNE	----	2.3	----	3	----	6	1.2	7.5	7.4	10	10.1	20	0.1	1.5	0.4	2	0.6	4
JULY	----	2.3	----	3	----	6	1.6	7.5	7.5	10	8.3	20	0.1	1.5	0.7	2	1.1	4
AUGUST	----	2.3	----	3	----	6	1.6	7.5	8.9	10	15.2	20	0	1.5	0.3	2	0.3	4
SEPTEMBER	----	2.3	----	3	----	6	1.1	7.5	7.1	10	15.1	20	0.2	1.5	1.8	2	4.7	4

KNIGHTSBRIDGE WWTP (CONTINUED)																				
MONTH	Flow (Average Monthly) (mgd)		Flow (Weekly Average) (mgd)		Total Residual Chlorine (TRC) (Average Monthly) (mg/L)		Total Residual Chlorine (TRC) (Instantaneous Maximum) (mg/L)		Fecal Coliform (Average Monthly) (CFU/100mL)		Fecal Coliform (Instantaneous Maximum) (CFU/100mL)		CBOD5 (Average Monthly) (lbs/day) (11-1 to 4-30))		CBOD5 (Average Monthly) (mg/L) (11-1 to 4-30)		CBOD5 (Average Monthly) (lbs/day) (5-1 to 10-31)		CBOD5 (Average Monthly) (mg/L) (5-1 to 5-31)	
	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT	DMR VALUE	PERMIT LIMIT
JANUARY	0.0121	---	0.0348	---	0.42	0.6	0.58	1.5	6	200	2310	1000	0.2	15	2.1	20	----	7.5	----	10
FEBRUARY	0.0104	---	0.0153	---	0.34	0.6	0.49	1.5	15	200	218	1000	0.1	15	2.5	20	----	7.5	----	10
MARCH	0.014	---	0.0244	---	0.35	0.6	0.49	1.5	4	200	8	1000	0.2	15	2.2	20	----	7.5	----	10
APRIL	0.0157	---	0.0305	---	0.35	0.6	0.49	1.5	3	200	9	1000	0.2	15	2	20	----	7.5	----	10
MAY	0.0187	---	0.03	---	0.27	0.6	0.48	1.5	25	200	27	1000	----	15	----	20	0.4	7.5	2.5	10
JUNE	0.0213	---	0.0483	---	0.16	0.6	0.49	1.5	1	200	1	1000	----	15	----	20	0.3	7.5	2	10
JULY	0.0219	---	0.044	---	0.11	0.6	0.44	1.5	1	200	1	1000	----	15	----	20	0.8	7.5	4	10
AUGUST	0.0178	---	0.028	---	0.2	0.6	0.48	1.5	6	200	33	1000	----	15	----	20	0.4	7.5	2	10
SEPTEMBER	0.0178	---	0.028	---	0.32	0.6	0.49	1.5	1	200	1	1000	----	15	----	20	0.3	7.5	2.1	10

C. Small Flow Treatment Systems

Small flow treatment systems are for areas where underlying soils do not support the use of on lot subsurface disposal systems. The locations of these areas are too remote for economical extensions to public sewers. Therefore a small treatment system is constructed to treat the sewage flows.

There is one small flow treatment system, Ringfield Development, located within Chadds Ford Township. In this development, each cluster of homes is serviced by 1 system. There are 4 on-lot systems in total in the development, each system serving 2-4 homes.

The small flow treatment systems are owned and maintained by the homeowner's association and their licensed operator.

D. OLDS Inventory

1. Types of On-lot systems in use

In accordance with Chadds Ford Township's Comprehensive Plan, 63% of the Township's land is occupied by single-family detached residential dwellings. The sewage system utilized for these dwellings is on-lot systems. The following types of in-lot systems are used:

a. Conventional Systems – this system includes a septic tank, distribution box and absorption area. In this system, the tank retains the solids while allowing the wastewater to flow to the distribution box which evenly distributes flow to the absorption area. The absorption area is where the soil absorbs and treats the liquid effluent.

b. Elevated Sand Mound Systems – this system is utilized in areas with restrictive zones within the top 60-inches of soil. The system is comprised of a septic tank, pump, dose tank and sand mound. In this system, wastewater flows from the house to the septic tank. The solids sink to the bottom of the tank and the wastewater is discharged to the dose tank. When the effluent level reaches a certain elevation, the pump turns on and pumps the effluent to the elevated sand mound area which acts as the absorption area.

c. Spray Irrigation Systems – this system is utilized in areas with restrictive zones and or high water tables. The system is comprised of a septic tank, filtration unit, chlorine contact unit, storage tank/dose tank and spray field. In this system, sewage flows from the house to the septic tank. The solids settle to the bottom of the tank and the effluent flows to the filtration unit which filters out all of the remaining solids. The effluent then flows to the chlorine unit where chlorine is added. It then flows to the storage tank where it is stored until it is sprayed onto the spray field.

Tables 1 thru 3 of Appendix II, lists the suitability of soils within the Township for underground sewage systems. As shown in the Tables, portions of the soils within the Township show some limitations to underground systems.

2. Comparison – Types of On-Lot Sewage Systems in Use vs. Types that are Appropriate

   Selection and regulation of OLDS type utilized within the Township is the responsibility of the Sewage Enforcement Officer (SEO). The SEO utilizes soil data to determine the suitability of the system for the parcel of land being developed. New developments are required to test for both a primary and alternate location. Existing failing systems that are not malfunctioning but fail the certification process will be required to be repaired when a house is sold. Systems are typically replaced following a certification failure. The Sewer Authority SEO will respond to customer complaints and conduct investigations when permits are requested from the Sewer Authority.

3. Description of On-Lot O&M Requirements

   Chadds Ford Township has adopted an ordinance governing the management of individual on-lot sewage disposal systems.

   This ordinance has been adopted to promote public health, safety, welfare as well as protect the environment. The ordinance applies to both existing and future on-lot systems. It defines the requirements for on-lot system installation, operation and maintenance.

   All individual on-lot systems are to be owned and maintained by the property owner. The property owner is responsible for having septic systems containing a tank pumped. All sewage haulers must be a DEP licensed hauler and approved by the Township.

E. Identify Wastewater Sludge and Septage Generation/Transport/Disposal

1. Location of Sources

   Septage is the partially treated waste that is stored in septic tanks. This waste must be periodically pumped and/or removed from the tank in order to ensure the proper operation of the system. Septage is located in every conventional on-lot system within the Township.

2. Quantities and Types

   63% of the parcels within the Township have on-lot sewer system. Septage is located in all of the conventional on-lot systems.

3. Present Disposal Method's, Locations, Capacities

The septage that is pumped out of the tanks of the conventional on-lot systems is hauled by a licensed by the DEP Contractor that is also approved by the Township.

IV. Future Growth and Land Development

A. Comprehensive Plan and Zoning

1. Comprehensive Plan

Chadds Ford Township's Comprehensive Plan was adopted May 5, 2010. The goal of the plan is *"to be consistent with the goals and objectives included in the Delaware County policies, provide Chadds Ford Township with the opportunity to proactively implement policy objectives that positively influence its future and seek to promote responsible land use and environmental stewardship*". A copy of the Comprehensive Plan is located in Appendix IV.

a. Existing Land Use

A summary of the existing land uses and a percentage of each use within the Township is shown in the Table below.

LAND USE	PARCELS	ACRES	PERCENT	AVG. LOT SIZE (ACRES)
Single Family Attached	387	15.92	0.3%	0.04
Single Family Detached	1,069	3,349.41	63.1%	3.13
Apartment	2	0.49	0.0%	0.25
Agricultural	1	141.2	2.7%	141.2
Commercial – Retail & Service	78	176.13	3.3%	2.26
Office & Storage	11	30.13	0.6%	2.74
Institutional	4	53.67	1.0%	13.42
Recreation	3	48.6	0.9%	16.2
Open Space	101	1,119.73	21.1%	11.09
Utility	6	5.54	0.1%	0.92
Vacant	172	370.61	7.0%	2.15

Sources: Delaware County Planning Department and the Chadds Ford Township Comprehensive Plan

2. Zoning

Chadds Ford Township (formerly Birmingham Township) adopted its Zoning Ordinance in 1951. The current Zoning Ordinance is known as the "Chadds Ford Township Zoning Ordinance" was adopted in 2009 which amended the 1951 Ordinance in its entirety. The Zoning Ordinance is Chapter 135 of the Code of Chadds Ford Township.

The Township's land area is divided into sixteen (16) districts as shown on Map 1 in Appendix IV and as listed below:

a. Business (B)

   1) Minimum Lot Area – 1 Acre

   2) Sewage Facilities – On-Site or Off-Site, If public sewer is accessible, the Use shall tie into such systems.

b. Business (B-1)

   1) Minimum Lot Area – 1 Acre

   2) Sewage Facilities – On-Site or Off-Site, If public sewer is accessible, the Use shall tie into such systems.

c. Light Industrial (LI)

   1) Minimum Lot Area – 3 Acres

   2) Sewage Facilities – Per Board of Supervisors Approval

d. Planned Business Center (PBC)

   1) Minimum Lot Area – 4 Acers

   2) Sewage Facilities – Individual or Community Sewage Disposal Systems, Where public sewer is accessible, the Use shall tie-into such systems.

e. Planned Business Center (PBC-1)

   1) Minimum Lot Area – 4 Acers

   2) Sewage Facilities – Individual or Community Sewage Disposal Systems, Where public sewer is accessible, the Use shall tie-into such systems.

f. Planned Office Center (POC)

   1) Minimum Lot Area – 4 Acres

   2) Sewage Facilities – Individual or Community Sewage Disposal Systems, Where public sewer is accessible, the Use shall tie-into such systems.

g. Residence (R-1)
   1) Minimum Lot Area – 2 Acres
   2) Sewage Facilities – On-lot

h. Residence – (R-2)
   1) Minimum Lot Area – 1 Acre
   2) Sewage Facilities – On-lot

i. Residence/Apartment – (R-A)
   1) Minimum Lot Area – 2 Acres
   2) Sewage Facilities – Off-Site Sewage Facilities May be Required

j. Residence/Multi-Family (R-M)
   1) Minimum Lot Area – 2 Acres
   2) Sewage Facilities – Off-site sewage facilities may be required. A sewage treatment plant may be installed on-site.

k. Planned Residential Development (PRD-1)
   1) Minimum Lot Area – 1 acre
   2) Sewage Facilities – Off-site Sewage facilities may be required. A sewage treatment plant may be installed on-site.

l. Planned Residential Development (PRD-2)
   1) Minimum Lot area – 1 Acre
   2) Sewage Facilities - Off-site Sewage facilities may be required. A sewage treatment plant may be installed on-site.

m. Towers & Cellular & Wireless Towers (T)

n. Flood Plain (F-P)
   1) Sewage Facilities – Systems shall be designed minimize or eliminate flood damages and to prevent the discharge of untreated sewage into flood waters.

o. Historic (H)
   1) Sewage Facilities - Individual or Community Sewage Disposal Systems May be Used. Where Public Sewer is Accessible, the Use shall Tie Into such Systems.

p. Baltimore Pike Overlay District (BPO)
   1) Sewage Facilities – On-lot. On-lot systems shall not be located on one-hundred year floodplains, watercourses, surface water bodies, wetlands, wetland margins and slopes 25% and greater.

q. Steep Slope Conservation

1) Sewage Facilities – On-lot. On-lot systems are not permitted in areas of very steep slopes (25% and greater). On-lot systems are permitted as a conditional use in areas of steep slopes (15% to 25%).

3. Environmental Resources and Stormwater Management Plans and Limitations

a. Environmental Resources

Chadds Ford Township adopted an Open Space Plan in 2007. The purpose of this Plan is to protect areas of natural resources including; woodlands, stream valleys and riparian areas, surface water and open space/meadow areas.

b. Floodplain Conservation District

The Floodplain District is shown on the Township Zoning Map is those areas of the Township which are subject to the one-hundred year flood as identified by the Federal Emergency Management Agency (FEMA). The Township code divides the floodplain district into three areas:

1) Floodway Area – this includes the areas identified in the FIS and the FIRM as "Floodway". In this area no new construction is allowed unless a permit is obtained from the PA DEP.

2) The AE Area/District – this shall be those areas identified as an AE Zone on the FIRM included in the FIS prepared by FEMA for which base flood elevations have been provided. In this area any new construction shall have the lowest floor elevated up to, or above, the regulatory flood elevation. No new construction or development shall be located within the area measured 50 feet landward from the top of bank of any watercourse.

3) The A Area/District –this shall be those areas identified as an A Zone on the FIRM included in the FIS prepared by FEMA for which no base flood elevations have been provided. In this area any new construction shall have the lowest floor elevated up to, or above, the regulatory flood elevation. No new construction or development shall be located within the area measured 50 feet landward from the top of bank of any watercourse.

c. Stormwater Management

Chadds Ford Township adopted an updated Stormwater Management Ordinance in 2015. Stormwater management is required by Act 167 for all new development projects. The Township's ordinance requires that all proposed stormwater systems be designed provide a 50 percent reduction in the rate of runoff over the present existing conditions at the site. The ordinance also includes water quality, infiltration, stream bank erosion and operation and maintenance requirements.

d. Steep Slope Conservation District

Chadds Ford Township added a Steep Slope Conservation District to the zoning ordinance in 2015. The code regulates use and disturbance within areas of steep and very steep slopes.

B. Build-out Plan

1. Projected Future Population

The following are population estimates for Chadds Ford Township (data has been obtained from 2025 Municipal Population Forecasts, Published by the Delaware Valley Planning Commission)

2000 Population	3,170
2010 Population	3,640
Estimated 2015 Population	3,663
Estimated 2025 Population	3,887
Increase 2010- 2025	***247***

As shown above, the Township's population is anticipated to grow over the next several years. Based on the population estimates and using the US. Census average for the Township of 2.54 persons per household, this equates to an estimated future number of new EDU's of 97 (247/2.54). *(Please note, the future population projections do not govern the estimated number of EDU's. The Future Land Use Plan as described below establishes the estimated number of future EDU's).*

2. Future Land Use

a. Known Projects

The Tables below indicate known future developments that will create growth within the sewer service areas of the Turners Mill and Ridings WWTP in the next 5 to 10 years.

TURNERS MILL WWTP SERVICE AREA							
CONNECTIONS	**EDUs**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021+**
Currently Connected							
Other residential	324						
Non-Residential	136						
Total Currently Connected	***460***						
Properties Assessed but not Connected							
Residential							
3 Upper Bank Road	1						1
89 Ring Road	1						1
1386 Baltimore Pike (Chadds Ford One)	1						1
Non Residential							
1392 Baltimore Pike (New Horizons)	1	1					
Total Assessed but not Connected	***4***	***1***	***0***	***0***	***0***	***0***	***3***
Dedicated Connections							
1361 Baltimore Pike	1	1					
E3 Ventures	45		45				
Total Dedicated Connections	***46***	***1***	***0***	***0***	***0***	***0***	***0***
TOTAL COMMITTED CAPACITY	**510**						
NEW CONNECTIONS		**2**	**45**	**0**	**0**	**0**	**3**
TOTAL CONNECTIONS	**460**	**462**	**507**	**507**	**507**	**507**	**510**

RIDINGS WWTP SERVICE AREA							
CONNECTIONS	**EDUs**	**2016**	**2017**	**2018**	**2019**	**2020**	**2020+**
Currently Connected							
Residential	165						
Non-Residential	76						
Total Currently Connected	***241***						
Future EDU's							
Residential							
205 Heyburn Road	1				1		
183 Ridge Road	1	1					
191 Ridge Road	1	1					
182 Ridge Road	1			1			
Coopers Hawk Lane	5						5
Non-Residential							
1792, 1794, 1796, 1798 Wilmington Pike	19		11	8			
Ridge Associates	21		10	11			
Joann Toanone to Varriale	4	4					
Pileggi Option from Grace	59						59
Grace Left Capacity	8						8
TOTAL PROJECTED CAPACITY	361						
PROJECTED NEW CONNECTIONS		**6**	**21**	**20**	**1**		**72**
TOTAL CONNECTIONS	**241**	**247**	**268**	**288**	**289**	**289**	**361**

b. Estimated number of Future EDU's

The projected number of future EDU's was estimated by analyzing the remaining vacant parcels within the Township. The Table below summarizes the number of estimated future EDU's within the Township:

LAND USE	GROSS ACRES	AVAILABLE ACRES	RECOMMENDED DENSITY		FUTURE EDU's	NON-RESIDENTIAL FLOOR AREA (S.F.)
			UNITS/ACRE	IMPERVIOUS COVERAGE (%)		
GROWTH AREA	650	193	1		193	
COMMERCIAL/HIGH DENSITY RESIDENTIAL	502	45	10	70	149	435,000
HISTORIC VILLAGE	305	60	5	40	200	175,000
SCENIC AREAS	650	213	0.5		0	
SCENIC AREAS WITHIN THE GROWTH AREA	158	36	0.5		18	
OPEN SPACE	1,149	1,274	0.1		127	
LOW DENSITY RESIDENTIAL	1,299	283	0.5		142	
EXISTING CONSERVATION EASEMENTS	899	-	0		0	
TOTAL ANTICIPATED FUTURE DEVELOPMENT					**829**	**610,000**

Source: Township of Chadds Ford Comprehensive Plan

c. Evaluation of Existing Public Sewer System Capacity

WWTP	PERMITTED CAPACITY (GPD)	CURRENT AVERAGE DAILY FLOW (GPD) [1]	COMMITTED USAGE BASED ON KNOWN PROJECTS (GPD)[2]	REMAINING AVAILABLE CAPACITY (GPD)	REMAINING AVAILABLE NUMBER OF EDU's	BUILD OUT PER FUTURE LAND USE		
						DWELLING UNITS	NON-RESIDENTIAL FLOOR AREA [3]	PROJECTED NUMBER OF FUTURE EDU's
TURNERS MILL	140,000	71,300	9,982	73,059	270	420	175,000	501
RIDINGS	80,000	39,900	26,040	14,060	65	122	435,000	322

1. Current Average Daily Flow taken from the 2015 Chapter 94 Report
2. 1 EDU = 217 GPD
3. Non-residential EDU = 100 gpd/1,000 s.f. of floor area (0.46 EDU's per 1,000 s.f of floor area)

As shown in the Table above, the projected number of EDU's for the Turners Mill and Ridings WWTP is 501 and 322 EDU's respectively. The remaining available capacity for Turners Mill and Ridings WWTP is 270 and 65 EDU's respectively.

V. Alternatives Analysis and Evaluation

In order to provide collection and treatment options for current and future needs within Chadds Ford Township, following two alternatives were identified:

- Do nothing – Continue to maintain and operate existing sewage collection, conveyance and treatment systems.

- Ridings Conversion / Turners Mill Expansion – this option involves decommissioning the Ridings WWTP by converting the treatment plant to a pump station that conveys sewage flow to the Turner's Mill WWTP. The Turner's Mill WWTP would be expanded to accommodate the additional flow.

A. Alternative 1 – Continued Operation and Maintenance of Existing Public Sewer Collection, Conveyance and Treatment Systems (graphic representation provided in Appendix V)

1. Turner's Mill WWTP

   The service area to Turner's Mill WWTP would remain relatively unchanged with the exception of removing a number of parcels along Baltimore Pike where collection/conveyance systems are not in place. An expansion of the Turner's Mill WWTP would not be required under this alternative. Turners Mill WWTP will continue to be maintained and repaired as required to meet the PA DEP permitting requirements.

2. Ridings WWTP

   The service area to Ridings WWTP would remain relatively unchanged with the exception of removing 364 Wilmington-West Chester Pike which is expected to be treated in Concord Township. Ridings WWTP will continue to be maintained and repaired as required to meet the PA DEP permitting requirements.

3. Knight's Bridge WWTP (Private)

   The service area to Knight's Bridge WWTP would be limited to properties currently connected to the plant, and properties under ownership of the Henderson Group (owner of the treatment plant).

4. Springhill Farm WWTP (Private)

   At this time, the Springhill Farm Wastewater Treatment Facility Association (SFWTFA) is in the process of negotiating an Agreement with Concord Township allowing them to connect to their public sewer system. For the purposes of this report,

it is assumed that Springhill Farm will connect to Concord Township's system. Once SFWTFA obtains all of the necessary approvals, a separate special study/planning module will be submitted to the PA DEP for their review and approval.

5. Concord

A Concord Township service area has been established as a number of properties within Chadds Ford Township have connected, or plan to connect to the Concord Township WWTP.

B. Alternative 2 – Ridings Conversion / Turners Mill Expansion (graphic representation provided in Appendix VI)

1. Turner's Mill WWTP

The service area to Turner's Mill WWTP would be expanded to include the Ridings service area. Sewage flowing to the Ridings WWTP would be pumped to Turners Mill WWTP for treatment and disposal. A force main would be installed to convey sewage from the Ridings pump station to a gravity sewer system in the Estates at Chadds Ford Development (approximately 1,100 feet of force main). The existing gravity sewer system in the Estates of Chadds Ford development flows to the Estates pump station where the sanitary sewage is conveyed by force main to Turners Mill WWTP (approximately 2,600 feet of existing 4-inch diameter and 6,800 feet of existing 6-inch diameter force main).

Ridings WWTP's existing tank, equipment and influent pump station would be utilized to pump sewage flows to Turners Mill WWTP. The existing influent pump station pumps and controls would be upgraded and the existing wet well would be lined or epoxy coated to extent its useful life. The wet well will act as a tank and will equalize flow to the pump station at the Estates of Chadds Ford development. Flow equalization will create a consistent pump rate and will allow the existing 4-inch diameter force main from the Estates pump to Turners Mill WWTP to be used.

The Estates pump station is currently owned and maintained by the Chadds Ford Sewer Authority. In order to accept the increased flows (existing and estimated future) from Ridings pump station, the station's pumping capacity will need to be increased from 100 gpm to approximately 225 gpm. The capacity of the wet well would also need to be increased, this can be accomplished through the installation of a new larger diameter wet well on site.

The combined hydraulic loading projection thru 2030 from the Ridings and Turners Mill WWTP is 871 EDU's. Using a value of 217 GPD/EDU this equates to approximately 189,007 gpd. Turners Mill WWTP is permitted for 140,000 gpd. Therefore, the WWTP will need to be upgraded to increase the permitted capacity of the plant. The Turners Mill plant was constructed with the ability to add a third

treatment train to accommodate an additional 70,000 gallons per day of treatment. The plant's modular design will allow expansion using available space on site with the construction of additional concrete compartments and piping, pumps, and controls.

The combined annual average organic loading projections for 2016 thru 2020 from the Ridings and Turners Mill WWTP are 265.2 lbs/day with a projected maximum monthly loading of 373.9 lbs/day. This value was calculated by using Turners Mill WWTP 2015 Chapter 94 Report as follows:

a. Average 2015 Loading – 180.91lbs/day
b. Total EDU's – 460
c. Average Loading - 0.39 lbs/day/EDU
d. 5 Year Avg. Ratio – 1.51
e. Projected new EDU's – 411
f. Increase Loading (lbs/day) – (411 EDU's * 0.39lbs/day/EDU)= 160.29 lbs/day
g. Projected Loading (lbs/day) – (180.91 + 160.29) = 341.2 lbs/day
h. Projected Peak Loading (lbs/day) – (341.2 * 1.51) = 515.2 lbs/day

Turners Mill WWTP has a current permitted organic loading capacity of 280.22 lbs BOD_5/day.

The Turners Mill WWTP was constructed with the ability to add a third treatment train that can accept an additional 50% of flows from the system. Based on the ability to expand and with a more detailed analysis of the plant loading, the Turners Mill WWTP should be able to accept the future projections.

2. Ridings WWTP

The service area to Ridings WWTP would be removed as the plant would be converted to a pump station with sewage flows sent to Turner's Mill WWTP for treatment and disposal. The Ridings pump station will be sized to match the current capacity of the Ridings WWTP. The annual average capacity will be 40,000 gpd and the hydraulic design capacity will be 100,000 gpd to match the existing plant capacity.

3. Knight's Bridge WWTP (Private)

The service area to Knight's Bridge WWTP would be limited to properties currently connected to the plant, and properties under ownership of the Henderson Group (owners of the treatment plant).

4. Springhill Farm WWTP (Private)

   At this time, the Springhill Farm Wastewater Treatment Facility Association (SFWTFA) is in the process of negotiating an Agreement with Concord Township allowing them to connect to their public sewer system. For the purposes of this report, it is assumed that Springhill Farms will connect to Concord Township's system. Once SFWTFA obtains all of the necessary approvals, a separate special study/planning module will be submitted to the PA DEP for their review and approval.

5. Concord

   A Concord Township service area has been established as a number of properties within Chadds Ford Township have connected, or plan to connect to the Concord Township WWTP.

C. Analysis of Alternatives

A cost analysis was completed to evaluate the feasibility of the Alternatives, specifically for the Ridings Service Area.

CAPITAL COST – RIDINGS WWTP CONVERSION TO PUMP STATION TO TURNER'S MILL WWTP AND EXPANSION OF TURNER'S MILL WWTP

Item No.	Item (Sub-Item) Description	Sub-Item Cost	Item Cost
1	**Influent Pump Station Rehabilitation**		
	New Pumps	$ 20,000.00	
	New Pump Controls	$ 15,000.00	
	Rehabilitation of Wet Well	$ 40,000.00	
	New Valve Chamber	$ 30,000.00	
	Valves	$ 15,000.00	
	Accessories	$ 30,000.00	
	Piping modifications	$ 20,000.00	
	Emergency Generator	$ 50,000.00	
	Gen. Auto Transfer Switch	$ 17,500.00	
	Generator Electrical installation	$ 35,000.00	
			$ 272,500.00
2	**Force Main**		
	1,100 LF of 6" F.M. @ $125/LF	$ 137,500.00	
	Misc. (Easements, etc).	$ 15,000.00	
			$ 152,500.00
3	**Existing Facility**		
	Demolition/Decommissioning	$ 100,000.00	
			$ 100,000.00
4	**Civil Site Work**		
	Upgrades to Estates Pump Station	$ 400,000.00	
	Upgrades to Painters Crossing PS	$ 25,000.00	
			$ 425,000.00
5	**Subtotal 1**		**$ 950,000.00**
6	**Bonds and Insurance**	**2.0%**	**$ 19,000.00**
7	**Traffic Control**	**0.2%**	**$ 1,900.00**
8	**Construction layout**	**0.5%**	**$ 4,750.00**
9	**As-builts**	**0.5%**	**$ 4,750.00**
10	**Testing**	**1.0%**	**$ 9,500.00**
11	**Mobilization/ Demobilization**	**2.0%**	**$ 19,000.00**
12	**Subtotal 2**		**$ 1,008,900.00**
13	**Contingency**	**10%**	**$ 101,000.00**
14	**Subtotal 3 (Probable Construction Cost)**		**$ 1,109,900.00**
15	**Legal, Admin., Engineering, Construction Review**	**15%**	**$ 167,000.00**
16	***Probable Project Cost***		***$ 1,276,900.00***
17	**Turners Mill Expansion Cost**		**$ 750,000.00**
18	***Total Project Cost Including Capacity Purchase***		***$ 2,026,900.00***

MAINTENANCE COST – RIDINGS PUMP STATION

Client: Chadds Ford Township Sewer Authority
Job No.: CFTP 0570
Project: Ridings Conversion to Pumping Station
Location: Chadds Ford Township

Description: **Ridings Pumping Station Annual Costs**

Item No.	Item (Sub-Item) Description		Sub-Item Cost		Item Cost
1	**Operations**				
		DELCORA Operations	$ 12,500.00		
		DELCORA Additional Support	$ 1,500.00		
				$	14,000.00
2	**Maintenance, Supplies and Grounds**				
		Equipment & Supplies	$ 5,000.00		
		Grounds	$ 500.00		
		Maintenance and Grounds Costs:		$	5,500.00
4	**Utilities**				
		Electric	$ 5,000.00		
		Water	$ 100.00		
		Communications	$ 2,500.00		
		Fuel (Emergency Generator)	$ 500.00		
		Utilities Costs:		$	8,100.00
5	**Chemicals and Laboratory Analysis**				
		Chemicals	$ -		
		Additional Lab Analysis	$ -		
				$	-
6	**Disposal**				
		Sludge	$ -		
		Grit and Screenings	$ 1,500.00		
				$	1,500.00
7	**Professional Services**				
		Engineering	$ 2,500.00		
		Legal	$ 500.00		
		Financial	$ -		
		Professional Services Costs:		$	3,000.00
8	**Subtotal 1**			$	32,100.00
9	**Contingency**		10.0%	$	3,210.00
10	***Probable Project Operation & Maintenance Cost***			*$*	*35,310.00*
			Use	*$*	*35,400.00*

ANNUAL COST DIFFERENCE FOR OPERATION AND MAINTENANCE OF RIDINGS PUMP STATION IN LIEU OF RIDINGS WWTP

Client:	Chadds Ford Township Sewer Authority			
Job No.:	CFTP 0570			
Project:	Ridings Conversion to Pumping Station			
Location:	Chadds Ford Township			
Description:	**Ridings Pumping Station Annual Costs vs. STP**			
Year	**STP O&M Cost[1]**	**Pumping Station O & M**	**Annual Savings**	**Accumulated Savings**
1	$183,403.00	$35,400.00	$148,003.00	$148,003.00
2	$188,905.09	$36,462.00	$152,443.09	$300,446.09
3	$192,683.19	$37,191.24	$155,491.95	$455,938.04
4	$196,536.86	$37,935.06	$158,601.79	$614,539.83
5	$200,467.59	$38,693.77	$161,773.83	$776,313.66
6	$204,476.94	$39,467.64	$165,009.30	$941,322.96
7	$208,566.48	$40,256.99	$168,309.49	$1,109,632.45
8	$212,737.81	$41,062.13	$171,675.68	$1,281,308.13
9	$216,992.57	$41,883.38	$175,109.19	$1,456,417.32
10	$221,332.42	$42,721.04	$178,611.38	$1,635,028.70
11	$225,759.07	$43,575.47	$182,183.60	$1,817,212.30
12	$230,274.25	$44,446.97	$185,827.28	$2,003,039.58
13	$234,879.74	$45,335.91	$189,543.82	$2,192,583.40
14	$239,577.33	$46,242.63	$193,334.70	$2,385,918.10
15	$244,368.88	$47,167.48	$197,201.39	$2,583,119.49
16	$249,256.25	$48,110.83	$201,145.42	$2,784,264.91
17	$254,241.38	$49,073.05	$205,168.33	$2,989,433.24
18	$259,326.21	$50,054.51	$209,271.69	$3,198,704.93
19	$264,512.73	$51,055.60	$213,457.13	$3,412,162.06
20	$269,802.99	$52,076.71	$217,726.27	$3,629,888.33
	[1] O&M Cost taken from most recent Authority Budget. Annual increases are calculated at 3%			

The capital cost of converting Ridings WWTP to a pump station can potentially be recovered in 13 years. Should the Township/Authority receive grant funding or developer support for the conversion and construction of the conveyance force main and the Turner's Mill WWTP expansion, the return period would decrease.

D. Implementation Plan / Schedule

Due to the analysis of the current and future operations as indicated in Section III.A.1, the only viable alternative based on the feasibility and economics is the conversion of the Ridings WWTP to a Pumping Station and expansion of the Turners Mill WWTP to accommodate the additional flows and avoid anticipated operational issues at the Ridings WWTP.

The Act 537 Plan will be implemented in various stages. Prior to implementation of any construction projects, the Township will require approval of the overall Act 537 Plan Revision. Once the Act 537 Plan Revision has been approved, the Township will be able to begin implementation of projects to meet the wastewater needs as outlined in this study.

The following schedule will be used to implement the Act 537 planning phase of the project:

Phase of Project	Months from Start
• Submit draft Act 537 Plan Revision to PADEP for Review and Comment	0
• Receive initial comments from PADEP	3
• Adopt Act 537 Plan Revision by Township	5
• Receive PADEP Approval of Act 537 Revision	6
• Submit Final Act 537 Plan Revision to PADEP	7

Upon receipt of approval of the Act 537 Plan Revision, the Township will be able to proceed with implementing the various construction projects associated with meeting the wastewater treatment needs of the Township.

The implementation schedule for construction of the improvements to convert the Ridings WWTP and to expand the Turners Mill WWTP is as follows:

Phase of Project	Months from Start
• Approval of Act 537 Plan Revision	0
• Submit Plans and Specifications of the Plant Conversion and Expansion for PADEP Review	12
• Obtain PADEP Construction Permits and Local Approvals	16
• Submit Project for Bids	18
• Award Contract	20
• Start Construction	22
• Complete Construction	32

The Capital Financing Plan would consist of the Township borrowing the funds in conjunction with Developer associated contributions to finance the improvements. The Sewer Authority would be able to utilize the cost savings from the operations of the conversion of the WWTP to Pumping Station to fund the debt service. No increase in current Township fees are anticipated with the completion of these improvements.

VI. Institutional Evaluation

A. Financial and Debt Status

A summary of the Chadds Ford Township's 2015 wastewater budget for the RidingsWWTP is summarized as follows:

Operating Income:	
Sewer Fees	$206,000.00
Certifications/ Finance Charges	$3,900.00
Total	$209,900.00
Operating Cost:	
Salaries	$74,953.00
Sludge Hauling/Disposal	$27,000.00
Chemicals/Lab fees	$12,500.00
Equip O & M	$30,000.00
Elect/ Fuel/ Water/ Tele/ etc.	$38,950.00
Total	$183,403.00
Expenses (Admin/Legal/Engineering)	$5,181.00
Net Income	$21,316.00

The Chadds Ford Township Sewer Authority budget has been set to ensure the Operating Income exceeds the Operating Cost. These funds are set aside to cover costs associated with anticipated wastewater collection system maintenance and major capital expenditures. It also establishes budgets for meeting future obligations associated with collection and conveyance system operations, maintenance, and improvements.

B. Available Staff and Administrative Resources

Chadds Ford Township has an established Sewer Authority. The sewer Authority is made up of five (5) residents of the Township and includes a sewer authority solicitor and a sewer authority engineer. The sewer authority engineer is a Professional Engineer, registered in the State of Pennsylvania. The Township Manger is also the Sewer Authority Manager and is assisted by an Administrative Manager. The Authority Manager reports to the three-person Board of Supervisors. The Board of Supervisors meets twice per month. The sewer Authority meets every other month or more frequently, if necessary. The sewer Authority meets to discuss only sewer issues that affect the Township and its residents. The Board of Supervisors meets to discuss all Township business and municipal wastewater needs as they arise or are forwarded to them by the Sewer Authority.

The existing sewage collection and conveyance systems are owned and operated by the Chadds Ford Township Sewer Authority or the neighborhood association in which they are

located. Each owner utilizes a private contractor to maintain their respective waste water treatment plant, pump station, or collection system. At the present time DELCORA is the contractor who is maintaining the public and private systems in Chadds Ford Township.

DELCORA has the necessary staff, training, and resources to maintain the sanitary sewer infrastructure within Chadds Ford Township.

C. Existing Legal Authority

Each owner of its respective sewage collection, conveyance, and/or treatment system has the obligation to maintain their respective system. Only the Township has the ability to set user fees and take actions against ordinance violations. The individual private owners have the ability to levy assessments against their residents to make capital expenditure/upgrades. However, Chadds Ford Township understands ultimately they are responsible for the health, safety, and welfare of their residents. If any private system is not functioning properly or the appropriate maintenance is not being done as required, the health, safety, and welfare of their residents is jeopardized.

Section § 95-29 of the Township Code (Individual and community sewerage systems and appurtenances) states the following...

1. This § 95-29 applies to all individual and community sewerage facilities for collecting, pumping, transporting, treating and disposing of sanitary sewage and industrial wastes, situate in or adjacent to the Township of Chadds Ford, whether or not owned, maintained, operated or controlled by the Township or the Chadds Ford Township Sewer Authority.

2. Any and all individual and community sewerage systems and appurtenances in the Township of Chadds Ford shall be designed, installed, operated and maintained in accordance with and pursuant to rules and regulations adopted, from time to time, by the Chadds Ford Township Sewer Authority and the Pennsylvania Department of Environmental Protection, or its successors.

3. A certified copy of all such rules and regulations adopted by the Chadds Ford Township Sewer Authority shall be filed with the Township, for informational purposes, within 30 days after adoption.

APPENDIX I

Pennsylvania Department of Environmental Protection - General Plan Contents Checklist".

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

Instructions for Completing Act 537 Plan Content and Environmental Assessment Checklist

Remove and recycle these instructions prior to submission

CHECKLIST INSTRUCTIONS

These instructions are designed to assist the applicant in completing the Act 537 Plan Content and Environmental Assessment Checklist.

This checklist is composed of three parts: one for "General Information," one for "Administrative Completeness," and one for "General Plan Content". A plan must be "administratively complete" in order to be formally reviewed by DEP. The General Plan Content portion of the checklist identifies each of the issues that must be addressed in your Act 537 Plan Update based on the pre-planning meeting between you and/or your consultant and DEP.

Use the right-hand column blanks in the checklist to identify the page in the plan on which each planning issue is found or to reference a previously approved update or special study (title and page number).

If you determine a planning issue is not applicable even though it was previously thought to be needed, please explain your decision within the text of the plan (or as a footnote) and indicate the page number where this documentation is found.

When information required as part of an official plan update revision has been developed separately or in a previous update revision, incorporate the information by reference to the planning document and page.

For specific details covering the Act 537 planning requirements, refer to Chapters 71 and 73 of DEP's regulations.

Wastewater projects proposing funding through the following sources must prepare an "Environmental Report" as described in the Uniform Environmental Review Process (UER) and include it with the plan submission designated as "Plan-Appendix A". The following funding programs use the UER process.

- The Clean Water State Revolving Loan Fund (PENNVEST, DEP, EPA)
- The RUS Water and Waste Disposal Grant and Loan Program (USDA-RD)
- The Community Development Block Grant Program (DCED, HUG)
- Other Federal Funding Efforts (EPA)

The checklist items or portions of checklist items required in the Act 537 Plan Update revision and that are also included in the UER process are indicated by shading. Most of the "Environmental Report" document may be constructed from the Act 537 Official Plan Update revision by using "copy & paste" techniques. The technical guidance document *Uniform Environmental Review Process* (UER) (DEP ID. 381-5511-111) is available electronically on DEP's website at www.dep.state.pa.us.

After Municipal Adoption by Resolution, submit three copies of the plan, any attachments or addenda and this checklist to DEP.

A copy of this completed checklist must be included with your Act 537 plan. DEP will use the "DEP USE ONLY" column during the completeness evaluation of the plan. This column may also be used by DEP during the pre-planning meeting with the municipality to identify planning elements that are not required to be included in the plan.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

Act 537 Plan Content and Environmental Assessment Checklist

PART 1 GENERAL INFORMATION

A. Project Information

1. Project Name Chadds Ford Township Act 537 Plan Update

2. Brief Project Description Update to the Township's current Act 537 plan

B. Client (Municipality) Information

Municipality Name	County	City	Boro	Twp
Chadds Ford Towsnhip	Delaware	☐	☐	☒

Municipality Contact Individual - Last Name	First Name	MI	Suffix	Title
Serock	Amanda			Manager
Additional Individual Last Name	First Name	MI	Suffix	Title

Municipality Mailing Address Line 1	Mailing Address Line 2
10 Ring Rd	

Address Last Line -- City	State	ZIP+4
Chadds Ford	Pa	19317

Phone + Ext.	FAX (optional)	Email (optional)
610-388-8800		MGR@chaddsfordpa.gov

C. Site Information

Site (or Project) Name	
Chadds Ford Township	(Municipal Name) Act 537 Plan

Site Location Line 1	Site Location Line 2

D. Project Consultant Information

Last Name	First Name	MI	Suffix
Schneider	Michael		

Title	Consulting Firm Name
Township Engineer	Pennoni Associates, Inc

Mailing Address Line 1	Mailing Address Line 2
One South Church Street	Second Floor

Address Last Line – City	State	ZIP+4	Country
West Chester	Pa	19382	USA

Email	Phone + Ext.	FAX
mschneider@pennoni.com	215-422-2461	

PART 2 ADMINISTRATIVE COMPLETENESS CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan	In addition to the main body of the plan, the plan must include items one through eight listed below to be accepted for formal review by the department. Incomplete Plans will be returned unless the municipality is clearly requesting an advisory review.
_____	i-iii	1. **Table of Contents**
		2. **Plan Summary**
_____	6-15	A. Identify the proposed service areas and major problems evaluated in the plan. (Reference - Title 25, §71.21.a.7.i).
_____	36	B. Identify the alternative(s) chosen to solve the problems and serve the areas of need identified in the plan. Also, include any institutional arrangements necessary to implement the chosen alternative(s). (Reference Title 25 §71.21.a.7.ii).
_____	33	C. Present the estimated cost of implementing the proposed alternative (including the user fees) and the proposed funding method to be used. (Reference Title 25, §71.21.a.7.ii).
_____	36	D. Identify the municipal commitments necessary to implement the Plan. (Reference Title 25, §71.21.a.7.iii).
_____	36	E. Provide a schedule of implementation for the project that identifies the MAJOR milestones with dates necessary to accomplish the project to the point of operational status. (Reference Title 25, §71.21.a.7.iv).
_____	IX	3. **Municipal Adoption: Original,** signed and sealed Resolution of Adoption by the municipality which contains, at a minimum, alternatives chosen and a commitment to implement the Plan in accordance with the implementation schedule. (Reference Title 25, §71.31.f) Section V.F. of the Planning Guide.
_____	VIII	4. **Planning Commission / County Health Department Comments**: Evidence that the municipality has requested, reviewed and considered comments by appropriate official planning agencies of the municipality, planning agencies of the county, planning agencies with area wide jurisdiction (where applicable), and any existing county or joint county departments of health. (Reference-Title 25, §71.31.b) Section V.E.1 of the Planning Guide.
_____	X	5. **Publication:** Proof of Public Notice which documents the proposed plan adoption, plan summary, and the establishment and conduct of a 30 day comment period. (Reference-Title 25, §71.31.c) Section V.E.2 of the Planning Guide.
_____	VIII	6. **Comments and Responses:** Copies of ALL written comments received and municipal response to EACH comment in relation to the proposed plan. (Reference-Title 25, §71.31.c) Section V.E.2 of the Planning Guide.
_____	36	7. **Implementation Schedule:** A complete project implementation schedule with milestone dates specific for each existing and future area of need. Other activities in the project implementation schedule should be indicated as occurring a finite number of days from a major milestone. (Reference-Title 25, §71.31.d) Section V.F. of the Planning Guide. Include dates for the future initiation of feasibility evaluations in the project's implementation schedule for areas proposing completion of sewage facilities for planning periods in excess of five years. (Reference Title 25, §71.21.c).
_____	XI	8. **Consistency Documentation:** Documentation indicating that the appropriate agencies have received, reviewed and concurred with the method proposed to resolve identified inconsistencies within the proposed alternative and consistency requirements in 71.21.(a)(5)(i-iii). (Reference-Title 25, §71.31.e). Appendix B of the Planning Guide.

PART 3 GENERAL PLAN CONTENT CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan		Item Required
_____	1	**I.**	**Previous Wastewater Planning**
			A. Identify, describe and briefly analyze all past wastewater planning for its impact on the current planning effort:
_____	1		1. Previously undertaken under the Sewage Facilities Act (Act 537). (Reference-Act 537, Section 5 §d.1).
_____	1		2. Has not been carried out according to an approved implementation schedule contained in the plans. (Reference-Title 25, §71.21.a.5.i.A-D). Section V.F of the Planning Guide.
_____	1		3. Is anticipated or planned by applicable sewer authorities or approved under a Chapter 94 Corrective Action Plan. (Reference-Title 25, §71.21.a.5.i.A&B). Section V.D. of the Planning Guide.
_____	1		4. Through planning modules for new land development, planning "exemptions" and addenda. (Reference-Title 25, §71.21.a.5.i.A).
_____	1	**II.**	**Physical and Demographic Analysis utilizing written description and mapping** (All items listed below require maps, and all maps should show all current lots and structures and be of appropriate scale to clearly show significant information).
_____	2		A. Identification of planning area(s), municipal boundaries, Sewer Authority/Management Agency service area boundaries. (Reference-Title 25, §71.21.a.1.i).
_____	2-3		B. Identification of physical characteristics (streams, lakes, impoundments, natural conveyance, channels, drainage basins in the planning area). (Reference-Title 25, §71.21.a.1.ii).
_____	3-4		C. Soils - Analysis with description by soil type and soils mapping for areas not presently served by sanitary sewer service. Show areas suitable for in-ground onlot systems, elevated sand mounds, individual residential spray irrigation systems, and areas unsuitable for soil dependent systems. (Reference-Title 25, §71.21.a.1.iii). Show Prime Agricultural Soils and any locally protected agricultural soils. (Reference-Title 25, §71.21.a.1.iii).
_____	4-5		D. Geologic Features - (1) Identification through analysis, (2) mapping and (3) their relation to existing or potential nitrate-nitrogen pollution and drinking water sources. Include areas where existing nitrate-nitrogen levels are in excess of 5 mg/L. (Reference-Title 25, §71.21.a.1.iii).
_____	5		E. Topography - Depict areas with slopes that are suitable for conventional systems; slopes that are suitable for elevated sand mounds and slopes that are unsuitable for onlot systems. (Reference-Title 25, §71.21.a.1.ii).
_____	5		F. Potable Water Supplies - Identification through mapping, description and analysis. Include public water supply service areas and available public water supply capacity and aquifer yield for groundwater supplies. (Reference-Title 25 §71.21.a.1.vi). Section V.C. of the Planning Guide.
_____	6		G. Wetlands-Identify wetlands as defined in Title 25, Chapter 105 by description, analysis and mapping. Include National Wetland Inventory mapping and potential wetland areas per USDA, SCS mapped hydric soils. Proposed collection, conveyance and treatment facilities and lines must be located and labeled, along with the identified wetlands, on the map. (Reference-Title 25, §71.21.a.1.v). Appendix B, Section II.I of the Planning Guide.

_____	6	**III.**	**Existing Sewage Facilities in the Planning Area - Identifying the Existing Needs**
		A.	Identify, map and describe municipal and non-municipal, individual and community sewerage systems in the planning area including:
_____	6-19	1.	Location, size and ownership of treatment facilities, main intercepting lines, pumping stations and force mains including their size, capacity, point of discharge. Also include the name of the receiving stream, drainage basin, and the facility's effluent discharge requirements. (Reference-Title 25, §71.21a.2.i.A).
_____	7,10	2.	A narrative and schematic diagram of the facility's basic treatment processes including the facility's NPDES permitted capacity, and the Clean Streams Law permit number. (Reference-Title 25, §71.21.a.2.i.A).
_____	7	3.	A description of problems with existing facilities (collection, conveyance and/or treatment), including existing or projected overload under Title 25, Chapter 94 (relating to municipal wasteload management) or violations of the NPDES permit, Clean Streams Law permit, or other permit, rule or regulation of DEP. (Reference-Title 25, §71.21.a.2.i.B).
_____	12	4.	Details of scheduled or in-progress upgrading or expansion of treatment facilities and the anticipated completion date of the improvements. Discuss any remaining reserve capacity and the policy concerning the allocation of reserve capacity. Also discuss the compatibility of the rate of growth to existing and proposed wastewater treatment facilities. (Reference-Title 25, §71.21.a.4.i & ii).
_____	18	5.	A detailed description of the municipality's operation and maintenance requirements for small flow treatment facility systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs. (Reference-Title 25, §71.21.a.2.i.C).
_____	N/A	6.	Disposal areas, if other than stream discharge, and any applicable groundwater limitations. (Reference-Title 25, §71.21.a.4.i & ii).
_____	18-19	B.	Using DEP's publication titled *Sewage Disposal Needs Identification*, identify, map and describe areas that utilize individual and community onlot sewage disposal and, unpermitted collection and disposal systems ("wildcat" sewers, borehole disposal, etc.) and retaining tank systems in the planning area including:
_____	18	1.	The types of onlot systems in use. (Reference-Title 25, §71.21.a.2.ii.A).
_____	N/A	2.	A sanitary survey complete with description, map and tabulation of documented and potential public health, pollution, and operational problems (including malfunctioning systems) with the systems, including violations of local ordinances, the Sewage Facilities Act, the Clean Stream Law or regulations promulgated thereunder. (Reference-Title 25, §71.21.a.2.ii.B).
_____	19	3.	A comparison of the types of onlot sewage systems installed in an area with the types of systems which are appropriate for the area according to soil, geologic conditions, topographic limitations sewage flows, and Title 25 Chapter 73 (relating to standards for sewage disposal facilities). (Reference-Title 25, §71.21.a.2.ii.C).
_____	N/A	4.	An individual water supply survey to identify possible contamination by malfunctioning onlot sewage disposal systems consistent with DEP's *Sewage Disposal Needs Identification* publication. (Reference-Title 25 §71.21.a.2.ii.B).
_____	19	5.	Detailed description of operation and maintenance requirements of the municipality for individual and small volume community onlot systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs. (Reference-Title 25, §71.21.a.2.i.C).

_____ 19 C. Identify wastewater sludge and septage generation, transport and disposal methods. Include this information in the sewage facilities alternative analysis including:

_____ 19 1. Location of sources of wastewater sludge or septage (Septic tanks, holding tanks, wastewater treatment facilities). (Reference-Title 25 §71.71).

_____ 19 2. Quantities of the types of sludges or septage generated. (Reference-Title 25 §71.71).

_____ 19 3. Present disposal methods, locations, capacities and transportation methods. (Reference-Title 25 §71.71).

_____ 20 **IV. Future Growth and Land Development**

A. Identify and briefly summarize all municipal and county planning documents adopted pursuant to the Pennsylvania Municipalities Planning Code (Act 247) including:

_____ 20 1. All land use plans and zoning maps that identify residential, commercial, industrial, agricultural, recreational and open space areas. (Reference-Title 25, §71.21.a.3.iv).

_____ 21 2. Zoning or subdivision regulations that establish lot sizes predicated on sewage disposal methods. (Reference – Title 25§71.21.a.3.iv).

_____ 23 3. All limitations and plans related to floodplain and stormwater management and special protection (Ch. 93) areas. (Reference-Title 25 §71.21.a.3.iv) Appendix B, Section II.F of the Planning Guide.

_____ _____ B. Delineate and describe the following through map, text and analysis.

_____ 25-26 1. Areas with existing development or plotted subdivisions. Include the name, location, description, total number of EDU's in development, total number of EDU's currently developed and total number of EDU's remaining to be developed (include time schedule for EDU's remaining to be developed). (Reference-Title 25, §71.21.a.3.i).

_____ 21-22 2. Land use designations established under the Pennsylvania Municipalities Planning Code (35 P.S. 10101-11202), including residential, commercial and industrial areas. (Reference-Title 25,§71.21.a.3.ii). Include a comparison of proposed land use as allowed by zoning and existing sewage facility planning. (Reference-Title 25, §71.21.a.3.iv).

_____ 24-27 3. Future growth areas with population and EDU projections for these areas using historical, current and future population figures and projections of the municipality. Discuss and evaluate discrepancies between local, county, state and federal projections as they relate to sewage facilities. (Reference-Title 25, §71.21.a.1.iv). (Reference-Title 25, §71.21.a.3.iii).

_____ 23 4. Zoning, and/or subdivision regulations; local, county or regional comprehensive plans; and existing plans of any other agency relating to the development, use and protection of land and water resources with special attention to: (Reference-Title 25, §71.21.a.3.iv).

--public ground/surface water supplies
--recreational water use areas
--groundwater recharge areas
--industrial water use
--wetlands

_____ 24-27 5. Sewage planning necessary to provide adequate wastewater treatment for five and ten year future planning periods based on projected growth of existing and proposed wastewater collection and treatment facilities. (Reference-Title 25, §71.21.a.3.v).

_____	_____	**V. Identify Alternatives to Provide New or Improved Wastewater Disposal Facilities**
		A. Conventional collection, conveyance, treatment and discharge alternatives including:
_____	30,32	1. The potential for regional wastewater treatment. (Reference-Title 25, §71.21.a.4).
_____	30-32	2. The potential for extension of existing municipal or non-municipal sewage facilities to areas in need of new or improved sewage facilities. (Reference-Title 25, §71.21.a.4.i).
_____	_____	3. The potential for the continued use of existing municipal or non-municipal sewage facilities through one or more of the following: (Reference-Title 25, §71.21.a.4.ii).
_____	29	a. Repair. (Reference-Title 25, §71.21.a.4.ii.A).
_____	30-31	b. Upgrading. (Reference-Title 25, §71.21.a.4.ii.B).
_____	XII	c. Reduction of hydraulic or organic loading to existing facilities. (Reference-Title 25, §71.71).
_____	30,31,XII	d. Improved operation and maintenance. Reference-Title 25, §71.21.a.4.ii.C).
_____	N/A	e. Other applicable actions that will resolve or abate the identified problems. (Reference-Title 25, §71.21.a.4.ii.D).
_____	N/A	4. Repair or replacement of existing collection and conveyance system components. (Reference-Title 25, §71.21.a.4.ii.A).
_____	N/A	5. The need for construction of new community sewage systems including sewer systems and/or treatment facilities. (Reference-Title 25, §71.21.a.4.iii).
_____	30-31	6. Use of innovative/alternative methods of collection/conveyance to serve needs areas using existing wastewater treatment facilities. (Reference-Title 25, §71.21.a.4.ii.B).
_____	N/A	B. The use of individual sewage disposal systems including individual residential spray irrigation systems based on:
_____	N/A	1. Soil and slope suitability. (Reference-Title 25, §71.21.a.2.ii.C).
_____	N/A	2. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.21.a.2.ii.C).
_____	N/A	3. The establishment of a sewage management program. (Reference-Title 25, §71.21.a.4.iv). See also Part "F" below.
_____	N/A	4. The repair, replacement or upgrading of existing malfunctioning systems in areas suitable for onlot disposal considering: (Reference-Title 25, §71.21.a.4).
_____	N/A	a. Existing technology and sizing requirements of Title 25 Chapter 73. (Reference-Title 25, §73.31-73.72).
_____	N/A	b. Use of expanded absorption areas or alternating absorption areas. (Reference-Title 25, §73.16).
_____	N/A	c. Use of water conservation devices. (Reference-Title 25, §71.73.b.2.iii).
_____	N/A	C. The use of small flow sewage treatment facilities or package treatment facilities to serve individual homes or clusters of homes with consideration of: (Reference-Title 25, §71.64.d).
_____	N/A	1. Treatment and discharge requirements. (Reference-Title 25, §71.64.d).
_____	N/A	2. Soil suitability. (Reference-Title 25, §71.64.c.l).

_____	N/A	3. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.64.c.2).
_____	N/A	4. Municipal, Local, Agency or other controls over operation and maintenance requirements through a Sewage Management Program. (Reference-Title 25, §71.64.d). See Part "F" below.
_____	N/A	D. The use of community land disposal alternatives including:
_____	N/A	1. Soil and site suitability. (Reference-Title 25, §71.21.a.2.ii.C).
_____	N/A	2. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.21.a.2.ii.C).
_____	N/A	3. Municipality, Local Agency or Other Controls over operation and maintenance requirements through a Sewage Management Program (Reference-Title25, §71.21.a.2.ii.C). See Part "F" below.
_____	N/A	4. The rehabilitation or replacement of existing malfunctioning community land disposal systems. (See Part "V", B, 4, a, b, c above). See also Part "F" below.
_____	N/A	E. The use of retaining tank alternatives on a temporary or permanent basis including: (Reference- Title 25, §71.21.a.4).
_____	N/A	1. Commercial, residential and industrial use. (Reference-Title 25, §71.63.e).
_____	N/A	2 Designated conveyance facilities (pumper trucks). (Reference-Title 25, §71.63.b.2).
_____	N/A	3. Designated treatment facilities or disposal site. (Reference-Title 25, §71.63.b.2).
_____	N/A	4. Implementation of a retaining tank ordinance by the municipality. (Reference-Title 25, §71.63.c.3). See Part "F" below.
_____	N/A	5. Financial guarantees when retaining tanks are used as an interim sewage disposal measure. (Reference-Title 25, §71.63.c.2).
_____	N/A	F. Sewage Management Programs to assure the future operation and maintenance of existing and proposed sewage facilities through:
_____	N/A	1. Municipal ownership or control over the operation and maintenance of individual onlot sewage disposal systems, small flow treatment facilities, or other traditionally non-municipal treatment facilities. (Reference-Title 25, §71.21.a.4.iv).
_____	N/A	2. Required inspection of sewage disposal systems on a schedule established by the municipality. (Reference-Title 25, §71.73.b.1.).
_____	N/A	3. Required maintenance of sewage disposal systems including septic and aerobic treatment tanks and other system components on a schedule established by the municipality. (Reference-Title 25, §71.73.b.2).
_____	N/A	4. Repair, replacement or upgrading of malfunctioning onlot sewage systems. (Reference-Title 25, §71.21.a.4.iv) and §71.73.b.5 through:
_____	XII	a. Aggressive pro-active enforcement of ordinances that require operation and maintenance and prohibit malfunctioning systems. (Reference-Title 25, §71.73.b.5).
_____	XII	b. Public education programs to encourage proper operation and maintenance and repair of sewage disposal systems.
_____	N/A	5. Establishment of joint municipal sewage management programs. (Reference-Title 25, §71.73.b.8).
_____	N/A	6. Requirements for bonding, escrow accounts, management agencies or associations to assure operation and maintenance for non-municipal facilities. (Reference-Title 25, §71.71).

_____ N/A G. Non-structural comprehensive planning alternatives that can be undertaken to assist in meeting existing and future sewage disposal needs including: (Reference-Title 25, §71.21.a.4).

1. Modification of existing comprehensive plans involving:

_____ N/A a. Land use designations. (Reference-Title 25, §71.21.a.4).

_____ N/A b. Densities. (Reference-Title 25, §71.21.a.4).

_____ N/A c. Municipal ordinances and regulations. (Reference-Title 25, §71.21.a.4).

_____ N/A d. Improved enforcement. (Reference-Title 25, §71.21.a.4).

_____ N/A e. Protection of drinking water sources. (Reference-Title 25, §71.21.a.4).

_____ N/A 2. Consideration of a local comprehensive plan to assist in producing sound economic and consistent land development. (Reference-Title 25, §71.21.a.4).

_____ N/A 3. Alternatives for creating or changing municipal subdivision regulations to assure long-term use of on-site sewage disposal that consider lot sizes and protection of replacement areas. (Reference-Title 25, §71.21.a.4).

_____ N/A 4. Evaluation of existing local agency programs and the need for technical or administrative training. (Reference-Title 25, §71.21.a.4).

_____ N/A H. A no-action alternative which includes discussion of both short-term and long-term impacts on: (Reference-Title 25, §71.21.a.4).

_____ N/A 1. Water Quality/Public Health. (Reference-Title 25, §71.21.a.4).

_____ N/A 2. Growth potential (residential, commercial, industrial). (Reference-Title 25, §71.21.a.4).

_____ N/A 3. Community economic conditions. (Reference-Title 25, §71.21.a.4).

_____ N/A 4. Recreational opportunities. (Reference-Title 25, §71.21.a.4).

_____ N/A 5. Drinking water sources. (Reference-Title 25, §71.21.a.4).

_____ N/A 6. Other environmental concerns. (Reference-Title 25, §71.21.a.4).

VI. Evaluation of Alternatives

_____ XIII A. Technically feasible alternatives identified in Section V of this check-list must be evaluated for consistency with respect to the following: (Reference-Title 25, §71.21.a.5.i.).

_____ XIII 1. Applicable plans developed and approved under **Sections 4 and 5 of the Clean Streams Law or Section 208 of the Clean Water Act** (33 U.S.C.A. 1288). (Reference-Title 25, §71.21.a.5.i.A). Appendix B, Section II.A of the Planning Guide.

_____ XIII 2. Municipal wasteload management **Corrective Action Plans or Annual Reports** developed under PA Code, Title 25, Chapter 94. (Reference-Title 25, §71.21.a.5.i.B). The municipality's recent Wasteload Management (Chapter 94) Reports should be examined to determine if the proposed alternative is consistent with the recommendations and findings of the report. Appendix B, Section II.B of the Planning Guide.

_____ XIII 3. Plans developed under **Title II of the Clean Water Act** (33 U.S.C.A. 1281-1299) or **Titles II and VI of the Water Quality Act of 1987** (33 U.S.C.A 1251-1376). (Reference-Title 25, §71.21.a.5.i.C). Appendix B, Section II.E of the Planning Guide.

_____	IV	4. **Comprehensive plans** developed under the Pennsylvania Municipalities Planning Code. (Reference-Title 25, §71.21.a.5.i.D). The municipality's comprehensive plan must be examined to assure that the proposed wastewater disposal alternative is consistent with land use and all other requirements stated in the comprehensive plan. Appendix B, Section II.D of the Planning Guide.
_____	XIII	5. **Antidegradation requirements** as contained in PA Code, Title 25, Chapters 93, 95 and 102 (relating to water quality standards, wastewater treatment requirements and erosion control) and the Clean Water Act. (Reference-Title 25, §71.21.a.5.i.E). Appendix B, Section II.F of the Planning Guide.
_____	XIII	6. **State Water Plans** developed under the Water Resources Planning Act (42 U.S.C.A. 1962-1962 d-18). (Reference-Title 25, §71.21.a.5.i.F). Appendix B, Section II.C of the Planning Guide.
_____	XIII	7. **Pennsylvania Prime Agricultural Land Policy** contained in Title 4 of the Pennsylvania Code, Chapter 7, Subchapter W. Provide narrative on local municipal policy and an overlay map on prime agricultural soils. (Reference-Title 25, §71.21.a.5.i.G). Appendix B, Section II.G of the Planning Guide.
_____	N/A	8. **County Stormwater Management Plans** approved by DEP under the Storm Water Management Act (32 P.S. 680.1-680.17). (Reference-Title 25, §71.21.a.5.i.H). Conflicts created by the implementation of the proposed wastewater alternative and the existing recommendations for the management of stormwater in the county Stormwater Management Plan must be evaluated and mitigated. If no plan exists, no conflict exists. Appendix B, Section II.H of the Planning Guide.
_____	XIII	9. **Wetland Protection.** Using wetland mapping developed under Checklist Section II.G, identify and discuss mitigative measures including the need to obtain permits for any encroachments on wetlands from the construction or operation of any proposed wastewater facilities. (Reference-Title 25, §71.21.a.5.i.I) Appendix B, Section II.I of the Planning Guide.
_____	XIII	10. **Protection of rare, endangered or threatened plant and animal species** as identified by the Pennsylvania Natural Diversity Inventory (PNDI). (Reference-Title 25, §71.21.a.5.i.J). Provide DEP with a copy of the completed Request For PNDI Search document. Also provide a copy of the response letter from the Department of Conservation and Natural Resources' Bureau of Forestry regarding the findings of the PNDI search. Appendix B, Section II.J of the Planning Guide.
_____	XIII	11. **Historical and archaeological resource protection** under P.C.S. Title 37, Section 507 relating to cooperation by public officials with the Pennsylvania Historical and Museum Commission. (Reference-Title 25, §71.21.a.5.i.K). Provide the department with a completed copy of a Cultural Resource Notice request of the Bureau of Historic Preservation (BHP) to provide a listing of known historical sites and potential impacts on known archaeological and historical sites. Also provide a copy of the response letter from the BHP. Appendix B, Section II.K of the Planning Guide.
_____	N/A	B. Provide for the resolution of any inconsistencies in any of the points identified in Section VI.A. of this checklist by submitting a letter from the appropriate agency stating that the agency has received, reviewed and concurred with the resolution of identified inconsistencies. (Reference-Title 25, §71.21.a.5.ii). Appendix B of the Planning Guide.
_____	XIII	C. Evaluate alternatives identified in Section V of this checklist with respect to applicable water quality standards, effluent limitations or other technical, legislative or legal requirements. (Reference-Title 25, §71.21.a.5.iii).

_____ 33-35 D. Provide cost estimates using present worth analysis for construction, financing, on going administration, operation and maintenance and user fees for alternatives identified in Section V of this checklist. Estimates shall be limited to areas identified in the plan as needing improved sewage facilities within five years from the date of plan submission. (Reference-Title 25, §71.21.a.5.iv).

_____ 36-37 E. Provide an analysis of the funding methods available to finance the proposed alternatives evaluated in Section V of this checklist. Also provide documentation to demonstrate which alternative and financing scheme combination is the most cost-effective; and a contingency financial plan to be used if the preferred method of financing cannot be implemented. The funding analysis shall be limited to areas identified in the plan as needing improved sewage facilities within five years from the date of the plan submission. (Reference-Title 25, §71.21.a.5.v).

_____ N/A F. Analyze the need for immediate or phased implementation of each alternative proposed in Section V of this checklist including: (Reference-Title 25, §71.21.a.5.vi).

_____ N/A 1. A description of any activities necessary to abate critical public health hazards pending completion of sewage facilities or implementation of sewage management programs. (Reference-Title 25, §71.21.a.5.vi.A).

_____ N/A 2. A description of the advantages, if any, in phasing construction of the facilities or implementation of a sewage management program justifying time schedules for each phase. (Reference-Title 25, §71.21.a.5.vi.B).

_____ 38 G. Evaluate administrative organizations and legal authority necessary for plan implementation. (Reference - Title 25, §71.21.a.5.vi.D.).

_____ 37-38 **VII. Institutional Evaluation**

A. Provide an analysis of all existing wastewater treatment authorities, their past actions and present performance including:

_____ 37 1. Financial and debt status. (Reference-Title 25, §71.61.d.2).

_____ 37-38 2. Available staff and administrative resources. (Reference-Title 25, §71.61.d.2)

_____ 38 3. Existing legal authority to:

_____ 38 a. Implement wastewater planning recommendations. (Reference-Title 25, §71.61.d.2).

_____ 38 b. Implement system-wide operation and maintenance activities. (Reference-Title 25, §71.61.d.2).

_____ 38 c. Set user fees and take purchasing actions. (Reference-Title 25, §71.61.d.2).

_____ 38 d. Take enforcement actions against ordinance violators. (Reference-Title 25, §71.61.d.2).

_____ 38 e. Negotiate agreements with other parties. (Reference-Title 25, §71.61.d.2).

_____ 38 f. Raise capital for construction and operation and maintenance of facilities. (Reference-Title 25,§71.61.d.2).

_____ N/A B. Provide an analysis and description of the various institutional alternatives necessary to implement the proposed technical alternatives including:

_____ N/A 1. Need for new municipal departments or municipal authorities. (Reference-Title 25, §71.61.d.2).

_____ N/A 2. Functions of existing and proposed organizations (sewer authorities, onlot maintenance agencies, etc.). (Reference-Title 25, §71.61.d.2).

_____ N/A 3. Cost of administration, implementability, and the capability of the authority/agency to react to future needs. (Reference-Title 25, §71.61.d.2).

_____	N/A	C. Describe all necessary administrative and legal activities to be completed and adopted to ensure the implementation of the recommended alternative including:
_____	N/A	1. Incorporation of authorities or agencies. (Reference-Title 25, §71.61.d.2).
_____	N/A	2. Development of all required ordinances, regulations, standards and inter-municipal agreements. (Reference-Title 25, §71.61.d.2).
_____	N/A	3. Description of activities to provide rights-of-way, easements and land transfers. (Reference-Title 25, §71.61.d.2).
_____	N/A	4. Adoption of other municipal sewage facilities plans. (Reference-Title 25, §71.61.d.2).
_____	N/A	5. Any other legal documents. (Reference-Title 25, §71.61.d.2).
_____	N/A	6. Dates or timeframes for items 1-5 above on the project's implementation schedule.
_____	37-38	D. Identify the proposed institutional alternative for implementing the chosen technical wastewater disposal alternative. Provide justification for choosing the specific institutional alternative considering administrative issues, organizational needs and enabling legal authority. (Reference-Title 25, §71.61.d.2).
_____	6-19	**VIII. Implementation Schedule and Justification for Selected Technical & Institutional Alternatives**
		A. Identify the technical wastewater disposal alternative which best meets the wastewater treatment needs of each study area of the municipality. Justify the choice by providing documentation which shows that it is the best alternative based on:
_____	6-15	1. Existing wastewater disposal needs. (Reference-Title 25, §71.21.a.6).
_____	24-27	2. Future wastewater disposal needs. (five and ten years growth areas). (Reference-Title 25, §71.21.a.6).
_____	29-32	3. Operation and maintenance considerations. (Reference-Title 25, §71.21.a.6).
_____	35	4. Cost-effectiveness. (Reference-Title 25, §71.21.a.6).
_____	37-38	5. Available management and administrative systems. (Reference-Title 25, §71.21.a.6).
_____	36	6. Available financing methods. (Reference-Title 25, §71.21.a.6).
_____	XIII	7. Environmental soundness and compliance with natural resource planning and preservation programs. (Reference-Title 25, §71.21.a.6).
_____	36	B. Designate and describe the capital financing plan chosen to implement the selected alternative(s). Designate and describe the chosen back-up financing plan. (Reference-Title 25, §71.21.a.6)
_____	36	C. Designate and describe the implementation schedule for the recommended alternative, including justification for any proposed phasing of construction or implementation of a Sewage Management Program. (Reference – Title 25 §71.31d)
_____	N/A	**IX. Environmental Report (ER) generated from the Uniform Environmental Review Process (UER)**
_____	N/A	A. Complete an ER as required by the UER process and as described in the DEP Technical Guidance 381-5511-111. Include this document as "Appendix A" to the Act 537 Plan Update Revision. Note: *An ER is required only for Wastewater projects proposing funding through any of the funding sources identified in the UER.*

PENNVEST I.D. No. _____

ADDITIONAL REQUIREMENTS FOR PENNVEST PROJECTS

Municipalities that propose to implement their official sewage facilities plan updates with PENNVEST funds must meet six additional requirements to be eligible for such funds. See A Guide for Preparing Act 537 Update Revisions (362-0300-003), Appendix N for greater detail or contact the DEP regional office serving your county listed in Appendix J of the same publication.

DEP Use Only	Indicate Page #(s) in Plan	Item Required
_____	_____	1. Environmental Impact Assessment. (Planning Phase) The Uniform Environment Review (UER) replaces the Environmental Impact Assessment that was a previous requirement for PENNVEST projects.
_____	_____	2. Cost Effectiveness (Planning Phase) The cost-effectiveness analysis should be a present-worth (or equivalent uniform annual) cost evaluation of the principle alternatives using the interest rate that is published annually by the Water Resources Council. Normally, for PENNVEST projects the applicant should select the most cost-effective alternative based upon the above analysis. Once the alternative has been selected the user fee estimates should be developed based upon interest rates and loan terms of the selected funding method.
_____		3. Second Opinion Project Review. (Design Phase)
_____		4. Minority Business Enterprise/Women's Business Enterprise (Construction Phase)
_____		5. Civil Rights. (Construction Phase)
_____		6. Initiation of Operation/Performance Certification. (Post-construction Phase)

I/A TECHNOLOGIES

PARTIAL LISTING OF INNOVATIVE AND ALTERNATIVE TECHNOLOGIES

TREATMENT TECHNOLOGIES
Aquaculture
Aquifer Recharge
Biological Aerated Filters
Constructed Wetlands
Direct Reuse (NON-POTABLE)
Horticulture
Overland Flow
Rapid Infiltration
Silviculture
Microscreens
Controlled Release Lagoons
Swirl Concentrator

ENERGY RECOVERY TECHNOLOGIES
Anaerobic Digestion with more than 90 percent Methane Recovery
Cogeneration of Electricity
Self-Sustaining Incineration

SLUDGE TREATMENT TECHNOLOGIES

Aerated Static Pile Composting
Enclosed Mechanical Composting (In vessel)
Revegetation of Disturbed Land
Aerated Windrow Composting

INDIVIDUAL & SYSTEM-WIDE COLLECTION TECHNOLOGIES
Cluster Systems
Septage Treatment
Small Diameter Gravity Sewers
Step Pressure Sewers
Vacuum Sewers
Variable Grade Sewers
Septic Tank Effluent Pump with Pressure Sewers

APPENDIX II

MAPS

Map 1 Chadds Ford Township Public Sewer Services Areas

Map 2 Chadds Ford Township, Water Resources Map

Map 3 Soils of Chadds Ford Township with Soil Data *by Natural Resources Conservation Service*

Map 4 Prime Agricultural Soils in Chadds Ford Township

Map 5 Historical Resources in Chadds Ford Township

Map 6 Archeological Areas in Chadds Ford Township

Map 7 Physiographic Provinces of Pennsylvania *by Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey*

Map 8 Surficial Materials of Pennsylvania, *by Commonwealth of Pennsylvania, Department of Environmental Resources, Office of Parks and Forestry, Bureau of Topographic and Geologic Survey*

Map 9 Limestone and Dolomite Distribution in Pennsylvania *by Commonwealth of Pennsylvania, Department of Natural Resources, Bureau of Topographic and Geologic Survey*

Map 10 Density of Mapped Karst Features in South-Central and Southeastern Pennsylvania by *Department of Conservation and Natural Resources*

Map 11 USGS Map

Map 12 National Wetlands Inventory *by U.S. Fish and Wildlife Service*

FEMA Maps

42045C0064F – Delaware County, PA - Panel 64 of 250

42045C0151F – Delaware County, PA - Panel 151 of 250

42045C0152F – Delaware County, PA – Panel 152 of 250

42045C0154F – Delaware County, PA – Panel 154 of 250

42045C0156F – Delaware County, PA – Panel 156 of 250

TABLES

MAP 1 – PUBLIC SEWER SERVICE AREAS

LEGEND

- STATE ROAD
- TOWNSHIP ROAD
- PRIVATE ROAD
- STATE BOUNDARY
- COUNTY BOUNDARY
- TOWNSHIP BOUNDARY
- RIGHT–OF–WAY
- STREAMS
- SEWER FORCE MAIN
- SEWER GRAVITY LINE
- KNIGHTS BRIDGE SERVICE AREA
- TURNERS MILL SERVICE AREA
- SPRING HILL FARMS SERVICE AREA
- RIDINGS SERVICE AREA

THORNBURY TOWNSHIP

CHESTER COUNTY
DELAWARE COUNTY

WAWA STORE AND AUDI DEALERSHIP SERVED BY THORNBURY TOWNSHIP (DELAWARE COUNTY) BY LOW PRESSURE SEWER (INTER-MUNICIPAL AGREEMENT) DISCHARGING TO CONCORD TOWNSHIP

THORNBURY TOWNSHIP

BIRMINGHAM TOWNSHIP

DELAWARE COUNTY

CONCORD TOWNSHIP

PENNSBURY TOWNSHIP

CHESTER COUNTY

BIRMINGHAM TOWNSHIP

NEW CASTLE COUNTY, DELAWARE

KNIGHTS BRIDGE WWTP (PRIVATE)

PAINTERS CROSSING PS (PRIVATE)

ESTATES AT CHADDS FORD P.S. (PRIVATE)

E3 VENTURES

WOODLAND DRIVE P.S.

1792–1798 WILMINGTON PIKE (19 EDUs)

1820 WILMINGTON PIKE (29 EDUs)

SPRING HILL FARM WWTP (PRIVATE)

RIDINGS WWTP

CONCORD TOWNSHIP

RIDGE ASSOCIATES (21 EDU)

INTERMEDIATE (ECKMAN) P.S.

REMOTE (SMITH BRIDGE) P.S.

1386 Baltimore Pike (1 EDUs)

1361 BALTIMORE PIKE (1 EDU)

1392 Baltimore Pike (1 EDU)

89 RING ROAD (1 EDU)

COOPERS HAWK LANE (5 EDU)

160 RIDGE RD (5 EDUs)

182 RIDGE

205 HAYBURN

191 RIDGE

183 RIDGE

3 UPPER BANK DR (1 EDU)

TURNERS MILL WWTP
OPENED FEBRUARY 2008

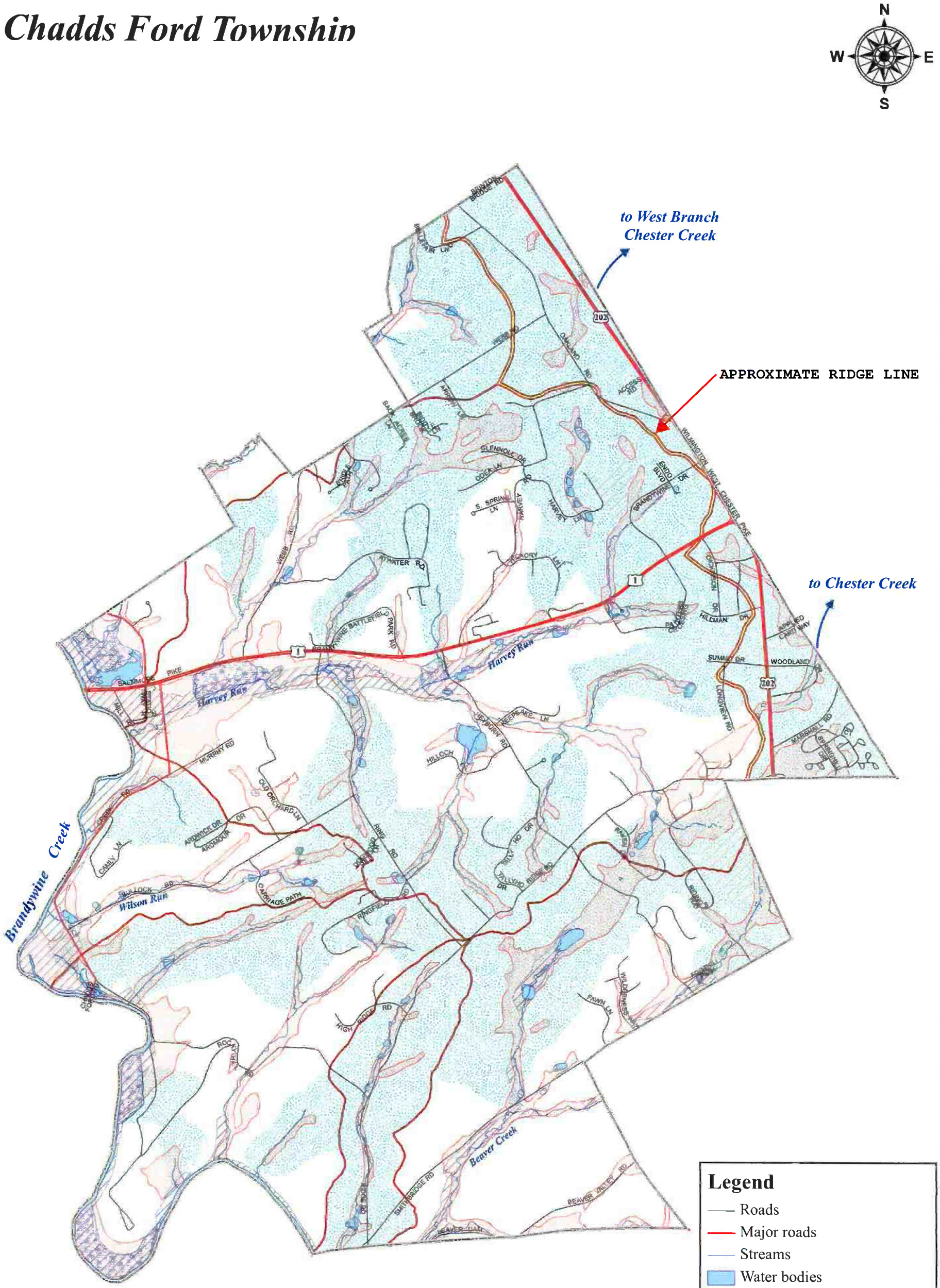
1609 BALTIMORE PIKE (10 EDUs)

INSERT

SPRING HILL FARMS WWTP

MAP 2 - CHADDS FORD TOWNSHIP - WATER RESOURCES MAP

Chadds Ford Townshin



Brandywine Conservancy

Environmental Management Center

P. O. Box 141 Chadds Ford, Pennsylvania 19317 (610) 388-2700

Data source: Base data from Delaware County GIS Department, 3/2006 (editied to reflect recent subdivisions, 8/2006). Streams and waterbodies from Delaware County and Chester County GIS Departments edited, 7/2006. Floodplains from FEMA, 1996. Hydric soils from NRCS, Soil Survey Digital Database, 1996. Wetlands from FWS National Wetlands Inventory, 1994. Watersheds from USGS, 1996. Headwaters watersheds created by the Brandywine Conservancy, 8/2006.

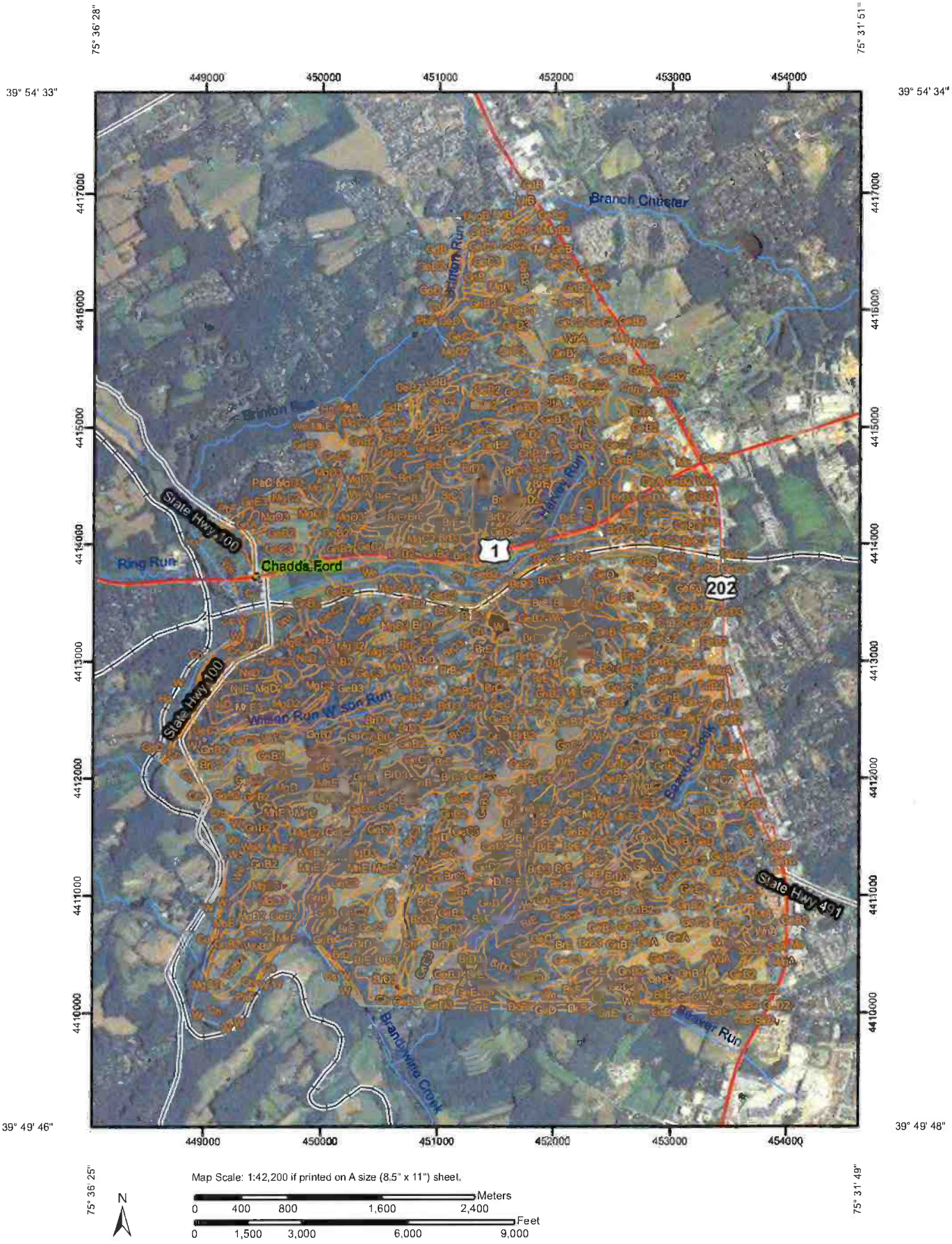
Map created: August 31, 2006

Legend

- Roads
- Major roads
- Streams
- Water bodies
- Pending development
- Tax parcels
- Municipal boundary
- Hydric soils
- Wetlands
- Floodplain
- Headwaters
- Chester Creek / Brandywine Creek watershed boundary
- Minor watersheds within the Brandywine Creek Watershed

MAP 3 - SOILS OF CHADDS FORD TOWNSHIP

Soil Map—Chester County, Pennsylvania, Delaware County, Pennsylvania, and New Castle County, Delaware
(Chadds Ford Soils Map)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:42,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 3, Dec 3, 2008

Soil Survey Area: Delaware County, Pennsylvania
Survey Area Data: Version 6, Feb 24, 2009

Soil Survey Area: New Castle County, Delaware
Survey Area Data: Version 6, Sep 28, 2012

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Chester County, Pennsylvania (PA029)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CaA	Califon loam, 0 to 3 percent slopes	1.8	0.0%
CaB	Califon loam, 3 to 8 percent slopes	0.6	0.0%
Co	Codorus silt loam	2.7	0.0%
CpA	Cokesbury silt loam, 0 to 3 percent slopes	0.2	0.0%
Cs	Comus silt loam	13.6	0.2%
GaD	Gaila silt loam, 15 to 25 percent slopes	0.0	0.0%
GdB	Gladstone gravelly loam, 3 to 8 percent slopes	16.9	0.3%
GdC	Gladstone gravelly loam, 8 to 15 percent slopes	5.1	0.1%
GdD	Gladstone gravelly loam, 15 to 25 percent slopes	0.8	0.0%
GeD	Gladstone-Parker gravelly loams, 15 to 25 percent slopes	2.3	0.0%
GgC	Glenelg silt loam, 8 to 15 percent slopes	0.0	0.0%
Ha	Hatboro silt loam	17.3	0.3%
MaE	Manor loam, 25 to 35 percent slopes	0.1	0.0%
MlB	Mount Lucas silt loam, 3 to 8 percent slopes	0.7	0.0%
PaC	Parker gravelly loam, 8 to 15 percent slopes	2.8	0.0%
PaD	Parker gravelly loam, 15 to 25 percent slopes	1.0	0.0%
PaE	Parker gravelly loam, 25 to 35 percent slopes	0.8	0.0%
PaF	Parker gravelly loam, 35 to 60 percent slopes	0.6	0.0%
PbF	Parker loam, 25 to 60 percent slopes, extremely stony	5.3	0.1%
ToB	Towhee silt loam, 3 to 8 percent slopes	1.1	0.0%
UrB	Urban land, 0 to 8 percent slopes	3.3	0.1%
UrlB	Urban land-Gladstone complex, 0 to 8 percent slopes	9.9	0.2%
UugB	Urban land-Udorthents, schist and gneiss complex, 0 to 8 percent slopes	0.1	0.0%
UugD	Urban land-Udorthents, schist and gneiss complex, 8 to 25 percent slopes	0.3	0.0%
W	Water	15.2	0.2%
Subtotals for Soil Survey Area		**102.5**	**1.6%**
Totals for Area of Interest		**6,237.6**	**100.0%**

Delaware County, Pennsylvania (PA045)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BrB2	Brandywine loam, 3 to 8 percent slopes, moderately eroded	13.8	0.2%

Delaware County, Pennsylvania (PA045)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BrC	Brandywine loam, 8 to 15 percent slopes	41.8	0.7%
BrC3	Brandywine loam, 8 to 15 percent slopes, severely eroded	331.9	5.3%
BrD	Brandywine loam, 15 to 25 percent slopes	33.8	0.5%
BrD2	Brandywine loam, 15 to 25 percent slopes, moderately eroded	8.3	0.1%
BrD3	Brandywine loam, 15 to 25 percent slopes, severely eroded	403.7	6.5%
BrE	Brandywine loam, 25 to 40 percent slopes	363.2	5.8%
BsD	Brandywine very stony loam, 8 to 25 percent slopes	0.6	0.0%
BsF	Brandywine very stony loam, 25 to 50 percent slopes	28.1	0.5%
ByB2	Butlertown silt loam, 3 to 8 percent slopes, moderately eroded	1.9	0.0%
CdA	Chester silt loam, 0 to 3 percent slopes	2.0	0.0%
CdA2	Chester silt loam, 0 to 3 percent slopes, moderately eroded	1.0	0.0%
CdB2	Chester silt loam, 3 to 8 percent slopes, moderately eroded	227.8	3.7%
CdC2	Chester silt loam, 8 to 15 percent slopes, moderately eroded	3.7	0.1%
Ch	Chewacla silt loam	195.3	3.1%
Cn	Congaree silt loam	44.9	0.7%
GeA	Glenelg channery silt loam, 0 to 3 percent slopes	27.7	0.4%
GeB	Glenelg channery silt loam, 3 to 8 percent slopes	29.0	0.5%
GeB2	Glenelg channery silt loam, 3 to 8 percent slopes, moderately eroded	698.6	11.2%
GeB3	Glenelg channery silt loam, 3 to 8 percent slopes, severely eroded	239.7	3.8%
GeC	Glenelg channery silt loam, 8 to 15 percent slopes	114.1	1.8%
GeC2	Glenelg channery silt loam, 8 to 15 percent slopes, moderately eroded	569.6	9.1%
GeC3	Glenelg channery silt loam, 8 to 15 percent slopes, severely eroded	532.0	8.5%
GeD	Glenelg channery silt loam, 15 to 25 percent slopes	112.5	1.8%
GeD2	Glenelg channery silt loam, 15 to 25 percent slopes, moderately eroded	31.0	0.5%
GeD3	Glenelg channery silt loam, 15 to 25 percent slopes, severely eroded	114.1	1.8%
GeE	Glenelg channery silt loam, 25 to 35 percent slopes	18.9	0.3%

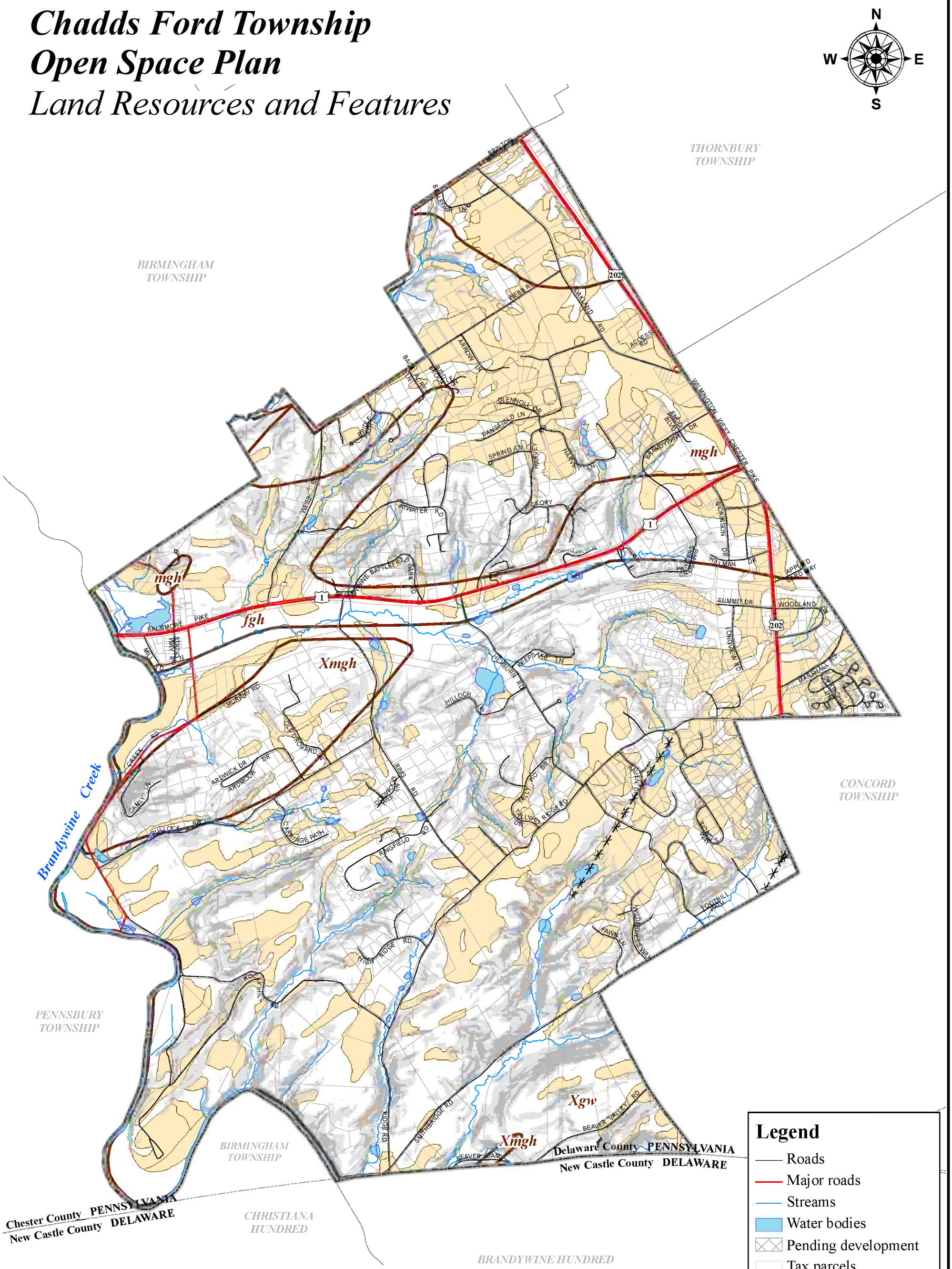
Delaware County, Pennsylvania (PA045)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
GeE3	Glenelg channery silt loam, 25 to 35 percent slopes, severely eroded	19.5	0.3%
GnA	Glenville silt loam 0 to 3 percent slopes	61.7	1.0%
GnB	Glenville silt loam, 3 to 8 percent slopes	157.7	2.5%
GnB2	Glenville silt loam, 3 to 8 percent slopes, moderately eroded	437.5	7.0%
GnC2	Glenville silt loam, 8 to 15 percent slopes, moderately eroded	11.4	0.2%
GsB	Glenville very stony silt loam, 0 to 8 percent slopes	2.4	0.0%
Ma	Made land, gravelly materials	3.5	0.1%
Mc	Made land, silt and clay materials	5.7	0.1%
Me	Made land, schist and gneiss materials	95.0	1.5%
MgB2	Manor loam, 3 to 8 percent slopes, moderately eroded	87.4	1.4%
MgC	Manor loam, 8 to 15 percent slopes	5.6	0.1%
MgC2	Manor loam, 8 to 15 percent slopes, moderately eroded	157.4	2.5%
MgC3	Manor loam, 8 to 15 percent slopes, severely eroded	71.2	1.1%
MgD	Manor loam, 15 to 25 percent slopes	15.3	0.2%
MgD2	Manor loam, 15 to 25 percent slopes, moderately eroded	37.3	0.6%
MgD3	Manor loam, 15 to 25 percent slopes, severely eroded	118.6	1.9%
MhE	Manor loam and channery loam, 25 to 35 percent slopes	38.4	0.6%
MhE3	Manor loam and channery loam, 25 to 35 percent slopes, severely eroded	80.6	1.3%
MkF	Manor soils, 35 to 60 percent slopes	13.9	0.2%
MmF	Manor very stony loam, 25 to 60 percent slopes	2.1	0.0%
NaB2	Neshaminy gravelly silt loam, 3 to 8 percent slopes, moderately eroded	0.5	0.0%
NaC2	Neshaminy gravelly silt loam, 8 to 15 percent slopes, moderately eroded	0.8	0.0%
NsB	Neshaminy very stony silt loam, 0 to 8 percent slopes	4.5	0.1%
NsD	Neshaminy very stony silt loam, 8 to 25 percent slopes	31.5	0.5%
NsF	Neshaminy very stony silt loam, 25 to 45 percent slopes	18.0	0.3%
OtA	Othello silt loam	8.7	0.1%
Qu	Quarries	10.7	0.2%
SaA	Sassafras loam, 0 to 3 percent slopes	7.8	0.1%

Delaware County, Pennsylvania (PA045)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
SaB2	Sassafras loam, 3 to 8 percent slopes, moderately eroded	34.4	0.6%
W	Water	31.6	0.5%
We	Wehadkee silt loam	237.3	3.8%
WnA	Woodstown loam, 0 to 3 percent slopes	16.5	0.3%
WoA	Worsham silt loam, 0 to 3 percent slopes	64.5	1.0%
WoB	Worsham silt loam, 3 to 8 percent slopes	4.3	0.1%
WoB2	Worsham silt loam, 3 to 8 percent slopes, moderately eroded	6.0	0.1%
Subtotals for Soil Survey Area		**6,088.2**	**97.6%**
Totals for Area of Interest		**6,237.6**	**100.0%**

New Castle County, Delaware (DE003)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BkD	Brinklow channery loam, 15 to 25 percent slopes	0.6	0.0%
DcB	Delanco-Codorus-Hatboro complex, 0 to 8 percent slopes, flooded	15.6	0.3%
GaD	Gaila loam, 15 to 25 percent slopes	7.8	0.1%
GaE	Gaila loam, 25 to 45 percent slopes	11.3	0.2%
GeB	Glenelg loam, 3 to 8 percent slopes	0.7	0.0%
GeC	Glenelg loam, 8 to 15 percent slopes	5.2	0.1%
GgB	Glenelg silt loam, 3 to 8 percent slopes	1.0	0.0%
GgC	Glenelg silt loam, 8 to 15 percent slopes	0.4	0.0%
GnB	Glenville silt loam, 3 to 8 percent slopes	1.1	0.0%
Hw	Hatboro-Codorus complex, 0 to 3 percent slopes, frequently flooded	0.7	0.0%
MaE	Manor loam, 25 to 45 percent slopes	0.3	0.0%
MzB	Mount Lucas silt loam, 3 to 8 percent slopes	1.0	0.0%
TaB	Talleyville silt loam, 3 to 8 percent slopes	0.9	0.0%
W	Water	0.2	0.0%
Subtotals for Soil Survey Area		**46.9**	**0.8%**
Totals for Area of Interest		**6,237.6**	**100.0%**

MAP 4 – PRIME AGRICULTURAL SOILS IN CHADDS FORD TOWNSHIP

Chadds Ford Township
Open Space Plan
Land Resources and Features



0 500 1000 2000 3000 4000 5000

Scale in Feet

Brandywine Conservancy

Environmental Management Center

P. O. Box 141 Chadds Ford, Pennsylvania 19317 (610) 388-2700

Data source: Base data from Delaware County GIS Department, 3/2006 (edited to reflect recent subdivisions, 8/2006). Prime agricultural soils from NRCS, 2001. Slopes derived from USGS contours, 1996. Headwaters created by Brandywine Conservancy, 7/2006.

Map created: July 19, 2007

Map symbol	Geology Type
fgh	Felsic and intermediate gneiss
Xgw	"Glenarm Wissahickon" formation
mgh	Mafic gneiss
Xmgh	Mafic gneiss

Legend

- Roads
- Major roads
- Streams
- Water bodies
- Pending development
- Tax parcels
- Adjacent municipalities
- Municipal boundary
- Dikes
- Geology
- Prime agricultural soils

Slopes

- 15 - 25%
- >25%

MAP 5 – HISTORIC RESOURCES IN CHADDS FORD TOWNSHIP

Chadds Ford Township
Open Space Plan
Historic Resources

N
W E
S

Inset: Chadds Ford Village

Inset: Dilworthtown

See Inset

See Inset

THORNBURY TOWNSHIP

BIRMINGHAM TOWNSHIP

PENNSBURY TOWNSHIP

BIRMINGHAM TOWNSHIP

CONCORD TOWNSHIP

CHRISTIANA HUNDRED

BRANDYWINE HUNDRED

Brandywine Creek

Chester County PENNSYLVANIA
New Castle County DELAWARE

Delaware County PENNSYLVANIA
New Castle County DELAWARE

0 500 1000 2000 3000 4000 5000
Scale in Feet

Brandywine Conservancy
Environmental Management Center
P. O. Box 141 Chadds Ford, Pennsylvania 19317 (610) 388-2700

Data source: Base data from Delaware County GIS Department, 3/2006 (edited to reflect recent subdivisions, 8/2006). Historic resources received from Natural Lands Trust, 2005. Additional historic resources from Delaware County Planning Department, 2006.

Map created: July 19, 2007

Legend

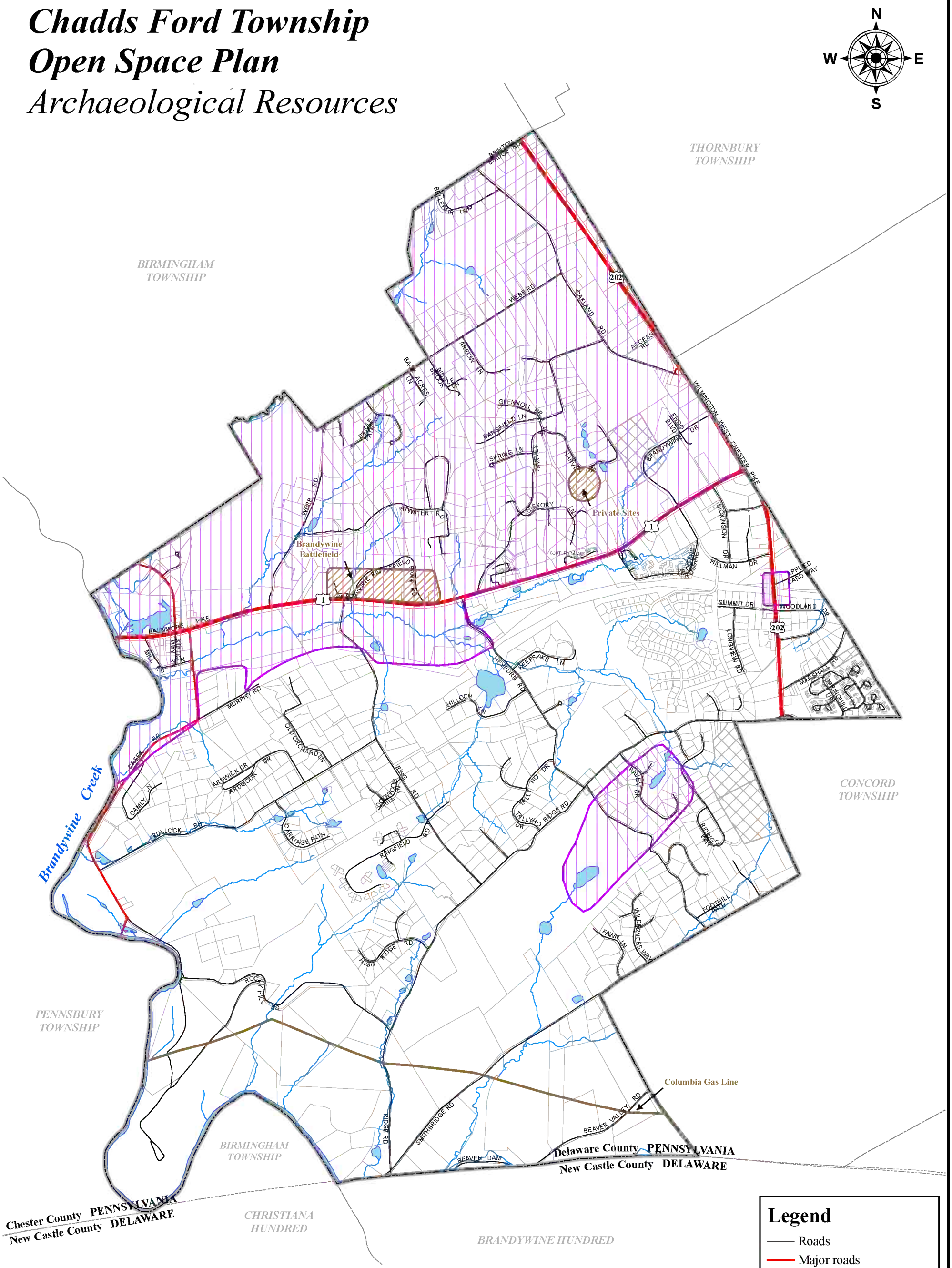
- Roads
- Major roads
- Streams
- Water bodies
- Tax parcels
- Pending development
- Adjacent municipalities
- Municipal boundary

Historic resources *(refer to Open Space Plan for inventory information)*

- Historic Sites
- Historic Structures
- Historic Fords
- Act 167 Historic District
- National Register District
- Brandywine Battlefield National Historic Landmark boundary

MAP 6 – ARCHEOLOGICAL AREAS IN CHADDS FORD TOWNSHIP

Chadds Ford Township
Open Space Plan
Archaeological Resources



Brandywine Conservancy
Environmental Management Center
P. O. Box 141 Chadds Ford, Pennsylvania 19317 (610) 388-2700

Data source: Base data from Delaware County GIS Department, 3/2006 (edited to reflect recent subdivisions, 8/2006). Streams and waterbodies from Delaware County and Chester County GIS Departments edited, 7/2006. Delaware County Archaeolgical Resource Inventory and Management Plan and accompanying map, 1991.

Map created: July 19, 2007

Legend

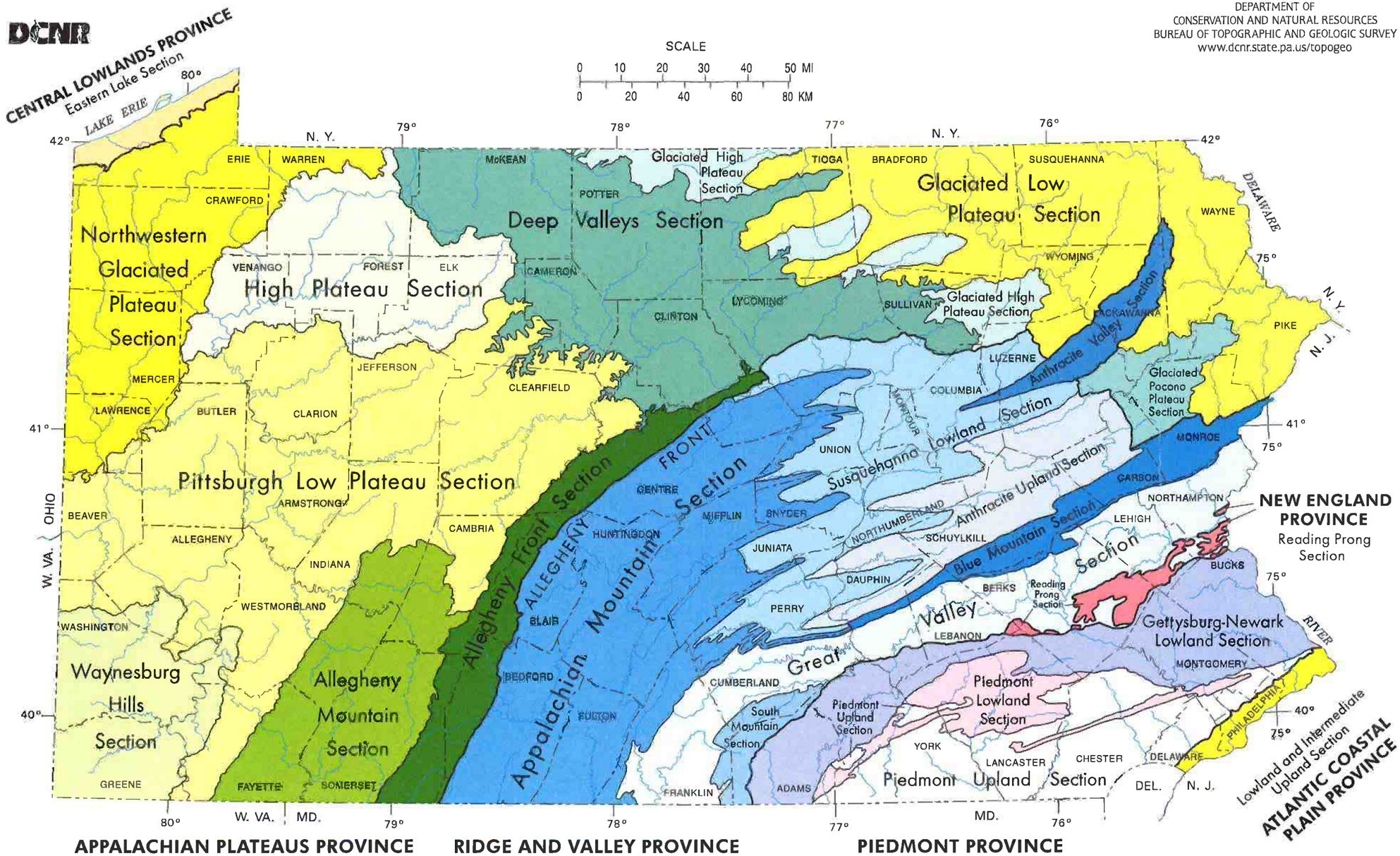
- Roads
- Major roads
- Streams
- Water bodies
- Areas of moderate to high archaeological sensitivity
- Previous archaeological investigations
- Pending development
- Tax parcels
- Adjacent municipalities
- Municipal boundary

MAP 7 – PHYSIOGRAPHIC PROVINCES OF PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF
CONSERVATION AND NATURAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
www.dcnr.state.pa.us/topogeo

DCNR

SCALE
0 10 20 30 40 50 MI
0 20 40 60 80 KM



EXPLANATION

CENTRAL LOWLANDS PROVINCE
- Eastern Lake Section

APPALACHIAN PLATEAUS PROVINCE
- Northwestern Glaciated Plateau Section
- High Plateau Section
- Pittsburgh Low Plateau Section
- Waynesburg Hills Section
- Allegheny Mountain Section
- Allegheny Front Section
- Deep Valleys Section
- Glaciated High Plateau Section
- Glaciated Low Plateau Section
- Glaciated Pocono Plateau Section

RIDGE AND VALLEY PROVINCE
- Appalachian Mountain Section
- Susquehanna Lowland Section
- Anthracite Valley Section
- Anthracite Upland Section
- Blue Mountain Section
- Great Valley Section
- South Mountain Section

NEW ENGLAND PROVINCE
- Reading Prong Section

PIEDMONT PROVINCE
- Gettysburg-Newark Lowland Section
- Piedmont Lowland Section
- Piedmont Upland Section

ATLANTIC COASTAL PLAIN PROVINCE
- Lowland and Intermediate Upland Section

SYMBOLS
- Approximate boundary between physiographic provinces
- Approximate boundary between physiographic sections

Compiled by W. D. Sevon. Fourth Edition, 2000.

PHYSIOGRAPHIC PROVINCES OF PENNSYLVANIA

PHYSIOGRAPHIC PROVINCE	PHYSIOGRAPHIC SECTION	DOMINANT TOPOGRAPHIC FORM	LOCAL RELIEF[1]	UNDERLYING ROCK TYPE	GEOLOGIC STRUCTURE	APPROXIMATE ELEVATION[2] Min.	Max.	DRAINAGE PATTERN	BOUNDARIES	ORIGIN
CENTRAL LOWLANDS	Eastern Lake	Northwest-sloping, lake-parallel, low-relief ridges.	Very low to low.	Shale and siltstone.	Beds either horizontal or having low south dip.	570	1,000	Parallel.	*Northwest:* Lake Erie. *Southeast:* Base of escarpment.	Glacial, lake, and fluvial deposition and erosion.
APPALACHIAN PLATEAUS	Northwestern Glaciated Plateau	Broad, rounded upland and deep, steep-sided, linear valleys partly filled with glacial deposits.	Very low to moderate.	Shale, siltstone, and sandstone.	Subhorizontal beds.	900	2,200	Dendritic.	*Northwest:* Base of escarpment. *Southeast:* Glacial border.	Fluvial and glacial erosion; glacial deposition.
	High Plateau	Broad, rounded to flat uplands having deep, angular valleys.	Moderate to high.	Sandstone, siltstone, shale, and conglomerate; some coal.	Low-amplitude, open folds.	980	2,360	Dendritic.	*Northwest:* Glacial border. *Northeast:* Margins of deep valleys. *South:* Arbitrary along drainage divides between coal and noncoal areas.	Fluvial erosion; periglacial mass wasting.
	Pittsburgh Low Plateau	Smooth to irregular, undulating surface; narrow, relatively shallow valleys; strip mines and reclaimed land.	Low to moderate.	Shale, siltstone, sandstone, limestone, and coal.	Moderate- to low-amplitude, open folds, decreasing in occurrence northwestward.	660	2,340	Dendritic.	*Northwest:* Glacial border. *Elsewhere:* Arbitrary at topographic changes with adjacent sections.	Fluvial erosion; periglacial mass wasting; strip mining.
	Waynesburg Hills	Very hilly with narrow hilltops and steep-sloped, narrow valleys.	Moderate.	Sandstone, shale, red beds, and limestone.	Horizontal beds.	848	1,638	Dendritic.	Arbitrary at change of topography.	Fluvial erosion and landslides.
	Allegheny Mountain	Wide ridges separated by broad valleys; ridge elevations decrease to north.	Moderate to high.	Sandstone, siltstone, shale, and conglomerate; some limestone and coal.	Large-amplitude, open folds.	775	3,210	Dendritic.	*East:* Arbitrary between coal and noncoal areas. *West:* Base of west flank of Chestnut Ridge. *North:* Approximates northeast terminus of large-amplitude, open folds.	Fluvial erosion; some periglacial mass wasting.
	Allegheny Front	*East:* Rounded to linear hills rising by steps to an escarpment; hills cut by narrow valleys. *West:* Undulating hills sloping away from escarpment.	Moderate to high.	Shale, siltstone, and sandstone.	*South:* Broad fold. *Elsewhere:* Beds having low northwest dip; some faults.	540	2,980	Parallel and trellis.	*East:* Stream at base of hills below escarpment. *West:* Arbitrary between coal and noncoal areas.	Fluvial erosion; periglacial mass wasting.
	Deep Valleys	Very deep, angular valleys; some broad to narrow uplands.	Moderate to very high.	Sandstone, siltstone, shale, and conglomerate.	Moderate-amplitude, open folds that control valley orientations.	560	2,560	Angulate and rectangular.	Arbitrary at margins of deep valleys, either at top of valley slope or along drainage divide.	Fluvial erosion; periglacial mass wasting.
	Glaciated High Plateau	Broad to narrow, rounded to flat, elongate uplands and shallow valleys.	Low to high.	Sandstone, siltstone, shale, and conglomerate; some coal.	Moderate-amplitude, open folds.	620	2,560	Angulate and dendritic.	*East:* Base of escarpment. *Elsewhere:* Arbitrary with margins of deep valleys.	Fluvial and glacial erosion; glacial deposition.
	Glaciated Low Plateau	Rounded hills and valleys.	Low to moderate.	Sandstone, siltstone, and shale.	Low-amplitude folds.	440	2,690	Dendritic.	Base of escarpments of adjacent uplands; base of Pocono escarpment. *Elsewhere:* Arbitrary.	Fluvial and glacial erosion; glacial deposition.
	Glaciated Pocono Plateau	Broad, undulatory upland surface having dissected margins.	Low to moderate.	Sandstone, siltstone, and shale; some conglomerate.	Beds having low north dip; some small folds.	1,200	2,320	Deranged.	*South and east:* Base of Pocono escarpment. *North:* Crest of drainage divide. *West:* Arbitrary.	Fluvial and glacial erosion; glacial deposition.
RIDGE AND VALLEY	Appalachian Mountain	Long, narrow ridges and broad to narrow valleys; some karst.	Moderate to very high.	Sandstone, siltstone, shale, conglomerate, limestone, and dolomite.	Open and closed plunging folds having narrow hinges and planar limbs; variety of faults.	440	2,775	Trellis, angulate, and some karst.	*Southeast:* Base of slope change on southeast side of Blue Mountain. *West and northwest:* Center of valley bottom west of westernmost linear ridge. *Elsewhere:* Base of slope change of eastern ridges; arbitrary between ridges.	Fluvial erosion; solution of carbonate rocks; periglacial mass wasting.
	Susquehanna Lowland	Low to moderately high, linear ridges; linear valleys; Susquehanna River valley.	Low to moderate.	Sandstone, siltstone, shale, conglomerate, limestone, and dolomite.	Open and closed plunging folds having narrow hinges and planar limbs.	260	1,715	Trellis and angulate.	Base of slope change to higher ridges of all surrounding areas; arbitrary in valley areas.	Fluvial erosion; some glacial erosion and deposition in northeast.
	Anthracite Valley	Narrow to wide, canoe-shaped valley having irregular to linear hills; valley enclosed by steep-sloped mountain rim.	Low to moderate.	Sandstone, siltstone, conglomerate, and anthracite.	Broad, doubly-plunging syncline; faults and smaller folds.	500	2,368	Trellis and parallel.	Outer base of surrounding mountain.	Fluvial and glacial erosion; some glacial deposition.
	Anthracite Upland	Upland surface having low, linear to rounded hills, strip mines, and waste piles; upland surrounded by an escarpment, a valley, and a mountain rim.	Low to high.	Sandstone, shale, conglomerate, and anthracite.	Many narrow folds having steep limbs; many faults.	320	2,094	Trellis.	*Northeast:* Arbitrary between coal and noncoal areas. *Elsewhere:* Outer base of surrounding mountain.	Fluvial erosion; some glacial erosion and periglacial mass wasting.
	Blue Mountain	Linear ridge to south and valley to north; valley widens eastward and includes low linear ridges and shallow valleys.	Moderate to high.	Sandstone, siltstone, and shale; some limestone and conglomerate.	*Southwest:* South limb of broad fold. *Northeast:* Small folds north of Blue Mountain.	300	1,680	Trellis.	*Southeast:* Base of slope change on southeast side of Blue Mountain. *Northwest:* Base of mountain; base of Pocono escarpment. *Northeast:* Arbitrary.	Fluvial erosion; some glacial erosion and deposition in northeast.
	Great Valley	Very broad valley. *Northwest half:* Dissected upland. *Southeast half:* Low karst terrain.	Low to moderate.	*Northwest:* Shale and sandstone; slate at east end. *Southeast:* Limestone and dolomite.	Thrust sheets, nappes, overturned folds, and steep faults; many third- and fourth-order folds.	140	1,100	Dendritic and karst.	*North:* Base of slope change on southeast side of Blue Mountain. *South:* Base of slope change to adjacent uplands.	Fluvial erosion; solution of carbonate rocks; some periglacial mass wasting.
	South Mountain	Linear ridges, deep valleys, and flat uplands.	Moderate to high.	Metavolcanic rocks, quartzite, and some dolomite.	Major anticlinorium having many second- and third-order folds.	450	2,080	Dendritic.	Base of slope change to adjacent lowlands.	Fluvial erosion of highly variable rocks; some periglacial mass wasting.
NEW ENGLAND	Reading Prong	Circular to linear, rounded hills and ridges.	Moderate.	Granitic gneiss, granodiorite, and quartzite.	Multiple nappes.	140	1,364	Dendritic.	Base of slope change to adjacent lowlands.	Fluvial erosion; some periglacial mass wasting.
PIEDMONT	Gettysburg-Newark Lowland	Rolling lowlands, shallow valleys, and isolated hills.	Low to moderate.	Mainly red shale, siltstone, and sandstone; some conglomerate and diabase.	Half-graben having low, monoclinal, northwest-dipping beds.	20	1,355	Dendritic and trellis.	Base of slope changes with adjacent uplands and lowlands. *Elsewhere:* Arbitrary.	Fluvial erosion of rocks of variable resistance.
	Piedmont Lowland	Broad, moderately dissected, karst valleys separated by broad, low hills.	Low.	Dominantly limestone and dolomite; some phyllitic shale and sandstone.	Complexly folded and faulted.	60	700	Dendritic and karst.	*South:* Base of slope change to adjacent upland. *North:* Mesozoic red rocks.	Fluvial erosion; some periglacial mass wasting.
	Piedmont Upland	Broad, rounded to flat-topped hills and shallow valleys.	Low to moderate.	Mainly schist, gneiss, and quartzite; some saprolite.	Extremely complexly folded and faulted.	100	1,220	Dendritic.	*East:* Base of low to vague Fall Line escarpment. *North:* Base of slope change to adjacent lowlands.	Fluvial erosion; some periglacial mass wasting.
ATLANTIC COASTAL PLAIN	Lowland and Intermediate Upland	Flat upper terrace surface cut by shallow valleys; Delaware River floodplain.	Very low.	Unconsolidated to poorly consolidated sand and gravel; underlain by schist, gneiss, and other metamorphic rocks.	Unconsolidated deposits underlain by complexly folded and faulted rocks.	0	200	Dendritic.	*Northwest:* Base of low to vague Fall Line escarpment. *East:* Arbitrary.	Fluvial erosion and deposition.

[1]Local relief: 0 to 100 feet, very low; 101 to 300 feet, low; 301 to 600 feet, moderate; 601 to 1,000 feet, high; >1,000 feet, very high.
(Relief categories listed here for Pennsylvania do not necessarily apply to other states or countries.)
[2]Elevations are in feet.

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MAP 8 – SURFICIAL MATERIALS OF PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF PARKS AND FORESTRY
BUREAU OF
TOPOGRAPHIC AND GEOLOGIC SURVEY

SCALE 1:2,000,000

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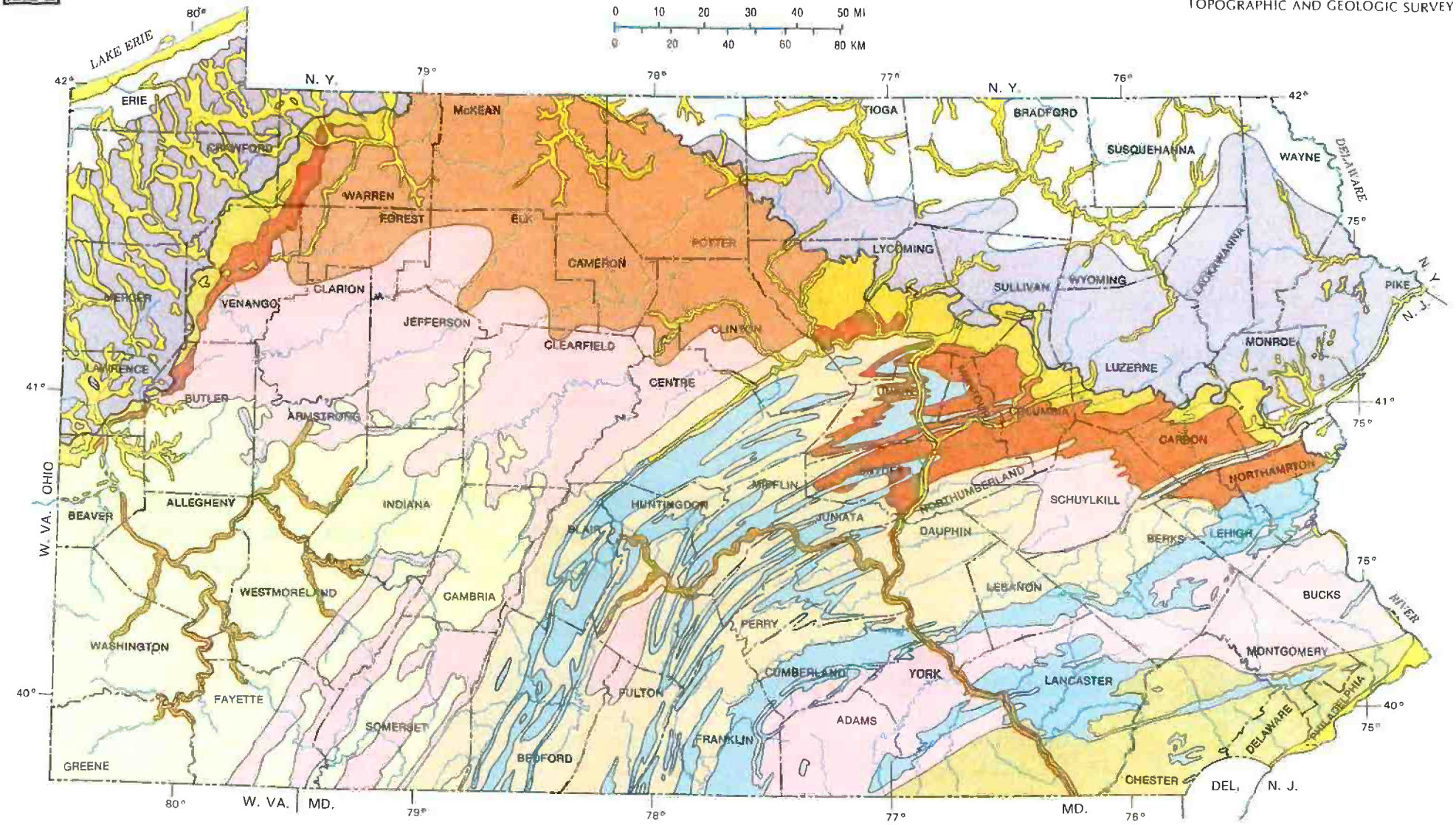
0 20 40 60 80 KM



EXPLANATION

(See reverse side for detailed explanation of map units)

GLACIAL DIAMICTS

- STRATIFIED SAND AND GRAVEL
- STREAM TERRACE DEPOSITS
- Silty glacial diamict
- Sandy glacial diamict
- Sandy to silty glacial diamict
- Sandy to clayey glacial diamict

RESIDUUM, COLLUVIUM, AND ALLUVIUM

- Plateaus and deep valleys
- Ridges and valleys
- Mixed topography and rocks
- Carbonate rocks
- Igneous and metamorphic rocks
- Residuum and landslides

SYMBOLS

- Approximate contact between surficial materials
- Late Wisconsinan glacial border

Compiled by W. D. Sevon

SURFICIAL MATERIALS OF PENNSYLVANIA

STRATIFIED SAND AND GRAVEL

Stratified sand and gravel includes flat-surfaced deposits in valley bottoms and hummocky deposits along valley sides. The valley-bottom deposits comprise clay, silt, sand, and gravel arranged in distinct layers, which are approximately parallel to the surface. The range of grain size within any layer is generally small (well sorted), and each layer may be laterally continuous for a few feet or several hundred feet. The material was deposited either from flowing water of streams (alluvium, outwash) or in quiet waters of glacial lakes (lake deposits).

The hummocky, valley-side deposits are composed mainly of sand and gravel arranged in distinct layers, which commonly are steeply inclined and have large contrasts in grain size between adjacent layers. The lateral continuity of the layers is generally a few feet or less. These materials occur in kames or kame terraces, which were deposited by flowing water adjacent to glacial ice.

STREAM TERRACE DEPOSITS

Stream terrace deposits are isolated, narrow, thin to moderately thick deposits of clay, silt, sand, gravel, and some boulders. The materials are moderately to poorly sorted and occur in layers that vary from poorly to well defined. Deposited by flowing river water when the streambed was at the level of the deposit, the deposits occur on long, narrow, relatively flat or gently inclined surfaces at various heights above the modern river. The terraces are commonly benchlike, their margins clearly defined by steep slopes.

GLACIAL DIAMICTS

Glacial diamicts, often called glacial till, are unconsolidated, nonsorted or poorly sorted, nonlayered or vaguely layered deposits consisting of clay, silt, sand, gravel, and boulders. The larger clasts, cobbles and boulders, generally appear to be floating in a finer grained matrix. Most of the pebbles, cobbles, and boulders in the diamict are sandstone or siltstone derived from underlying or nearby bedrock. Some far-travelled lithologies, such as igneous or metamorphic rocks, are locally present. Glacial diamicts are formed by a variety of mechanisms associated with movement or melting of glacial ice. Areas of glacial diamicts shown on the map are defined on the basis of texture of the matrix, the amount of rock surface covered by diamict, the degree of weathering and soil development, and the degree to which the diamict has been eroded since deposition.

Silty Glacial Diamict

Silty glacial diamict has moderate to abundant silt and clay matrix. Thickness is variable; diamict greater than 3 feet in thickness covers over 75 percent of the area of occurrence in northwestern Pennsylvania and 25 to 50 percent of the area of occurrence in northeastern Pennsylvania. Deposits less than 3 feet thick are common. The diamict has minimal weathering, has thin soil development, and generally has suffered little erosion.

Sandy Glacial Diamict

Sandy glacial diamict has moderate to abundant silt and sand matrix and minimal clay. The diamict overlies mainly sandstone bedrock. Thickness is variable; diamict greater than 3 feet thick covers over 75 percent of the area of occurrence in northwestern Pennsylvania and 25 to 50 percent of the area of occurrence in northeastern Pennsylvania. Deposits less than 3 feet thick are common. The diamict has minimal weathering, has thin soil development, and generally has suffered little erosion.

Sandy to Silty Glacial Diamict

Sandy to silty glacial diamict has variable amounts of sand and silt in the matrix and generally small amounts of clay. Thickness is variable; diamict greater than 3 feet thick covers only 10 to 25 percent of the area of occurrence, and there is no diamict on the remaining surface. The diamict has been moderately weathered, has moderately thick soil development, and has been moderately to severely eroded.

Sandy to Clayey Glacial Diamict

Sandy to clayey glacial diamict has variable amounts of sand, silt, and clay in the matrix. Thickness is variable; diamict greater than 3 feet thick covers less than 10 percent of the area of occurrence, and there is no diamict on the remaining surface. The diamict has been deeply weathered, has thick soil development, and has been largely removed by erosion.

RESIDUUM, COLLUVIUM, AND ALLUVIUM

Differences in the general character of residuum, colluvium, and alluvium deposits are used to define several areas shown on the map.

Residuum is a surface accumulation of unconsolidated rock debris developed in place by the processes of physical and chemical weathering operating on the underlying bedrock. Residuum varies in character from thin accumulations of angular rock fragments broken from the bedrock by the physical process of freeze and thaw to thick accumulations of unfragmented bedrock that has been extensively altered by chemical weathering (**saprolite**).

Colluvium is a hillside deposit of unconsolidated, generally matrix-supported, poorly sorted material that has been transported downslope by gravity-driven processes ranging in rate from slow (creep) to fast (debris flow). **Talus** is a form of colluvium that lacks matrix and generally offers poor support for vegetation. Rock fragments in colluvium are generally angular to subangular and range widely in size. The material originated from weathering of bedrock. Most colluvium in Pennsylvania was formed during multiple intervals of the Pleistocene.

Alluvium comprises unconsolidated, well- to poorly defined layers of clay, silt, sand, gravel, and some boulders. The constituent particles vary from well to poorly sorted and are subangular to well rounded. Individual layers generally are not continuous for more than a few feet. The alluvium is a flat-surfaced deposit on valley bottoms into which the modern stream is trenching. Alluvium is deposited by flowing water in stream channels and on adjacent floodplains.

Plateaus and Deep Valleys

Flat-surfaced to gently sloping uplands developed on mixed rock types are generally covered with thick (>5 feet) residuum. The uplands are dissected by steep-sloped valleys, which have some colluvium on the hillsides and thin (<3 feet) alluvium in narrow valley bottoms.

Ridges and Valleys

Long, steep-sloped, curvilinear ridges developed on resistant sandstones have broken rock at their crests and/or thick talus or colluvium covering most of the adjacent hillsides. The colluvium is generally thickest on the lower parts of the hillsides. Broad to narrow, low-relief, interridge valleys are developed on less resistant rock types and have thin to moderately thick (3 to 5 feet) residuum on the crest of low hills and some thin to moderately thick colluvium on the hillsides. Thin to moderately thick alluvium occurs in narrow drainageways.

Mixed Topography and Rocks

Mixed topography developed on mixed rock types has moderately thick residuum on upland surfaces and thin to moderately thick colluvium on hillsides. Thin to moderately thick alluvium occurs in the valley bottoms.

Carbonate Rocks

Carbonate rocks underlie lowland areas having low relief and poorly developed surface drainage. Both open and filled sinkholes are common. Thin to moderately thick residuum covers most of the surface, but bedrock outcrops are locally common. Thin to moderately thick colluvium derived from adjacent, noncarbonate uplands occurs in some places along the margins of the carbonate areas. Alluvium is generally thin.

Igneous and Metamorphic Rocks

Igneous and metamorphic rocks underlie broad upland areas having smoothly rounded and nearly flat hilltops, which grade laterally into smoothly shaped and gradually deepening valleys. The upland surfaces are underlain by very thick (>10 feet) saprolite. The upper parts of the hillsides are underlain by thin to thick saprolite, and the lower parts of the hillsides are underlain by thin to thick colluvium. Thin to thick alluvium covers the broad valley bottoms and grades into the colluvium at the base of the hillsides.

Residuum and Landslides

Mixed topography developed on mixed rock types has moderately thick to thick residuum on the upland surfaces and moderately thick to thick colluvium on the hillsides. Up to 30 percent of the surface is underlain by landslide debris, particularly in the southwestern five counties. The landslide debris in many places comprises chaotic mixtures of residuum, colluvium, and bedrock, which have moved down the hillside by gravity-driven sliding. Alluvium is thin to thick.

MAP 9 – LIMESTONE AND DOLOMITE DISTRIBUTION IN PENNSYLVANIA

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DEPARTMENT OF
CONSERVATION AND NATURAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
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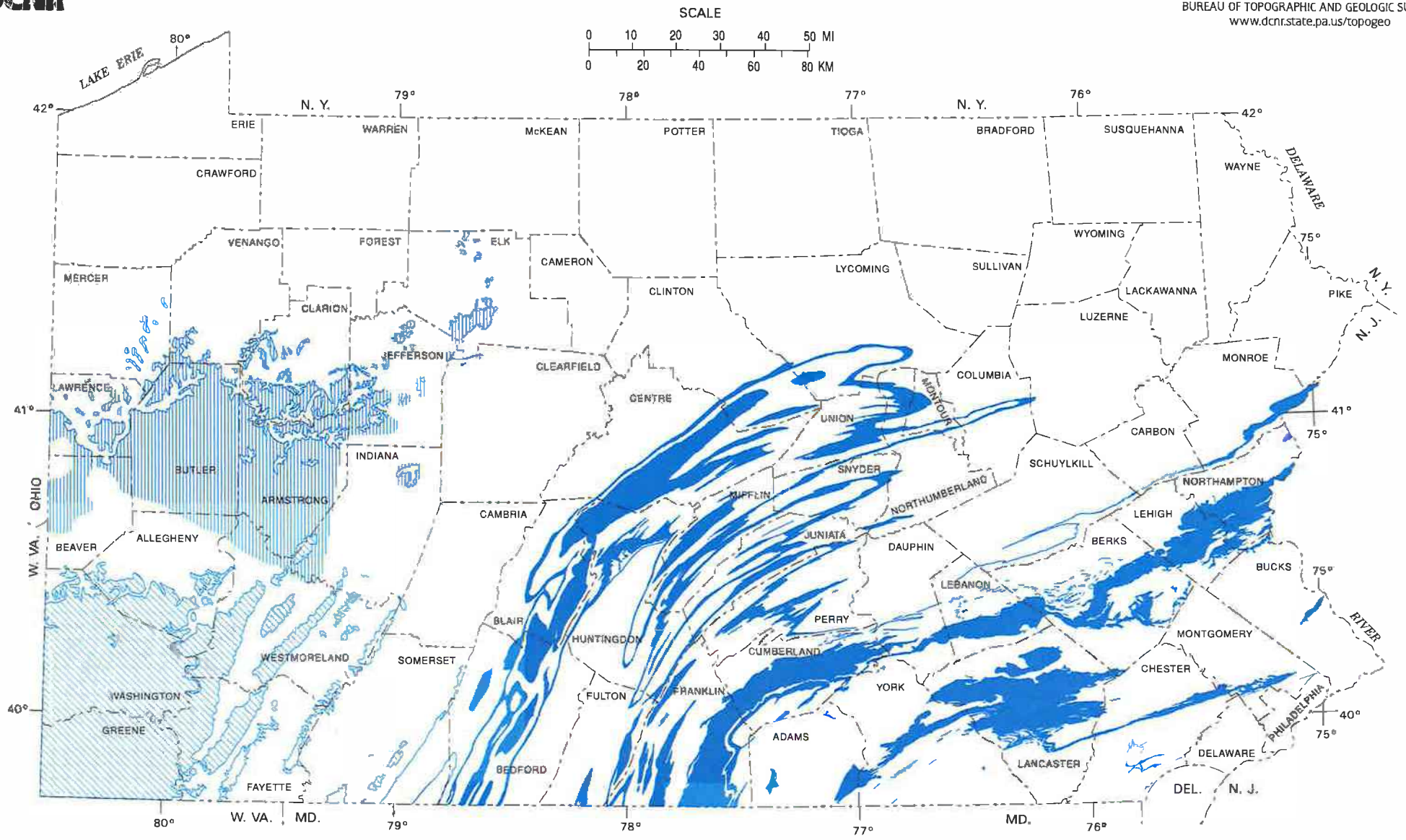

EXPLANATION

Area where limestone, dolomite, or both are at the surface. Layers are usually strongly folded and steeply dipping. Includes economically important high-calcium limestones of the Kinzers, Annville, Benner, and Keyser Formations and the Cockeysville Marble, as well as the high-magnesian dolomites of the Ledger Formation and the Cockeysville Marble. This area is most susceptible to sinkhole development.

Area underlain by flat-lying, generally thin, but locally thick, limestone beds, which are discontinuous in places and are commonly interbedded with shale.

Area underlain by the generally flat lying Pennsylvanian Vanport Limestone, a high-calcium limestone. This limestone is generally overlain by less than 100 feet of sedimentary rocks, except in the southern part of the area.

LIMESTONE AND DOLOMITE DISTRIBUTION IN PENNSYLVANIA

Carbonate rocks, consisting of limestone and dolomite, are significant among the great variety of rock types in Pennsylvania. These rocks affect man's activities in three major ways: as hazards, as mineral resources, and as groundwater reservoirs. This map shows the distribution of limestone and dolomite in Pennsylvania and will be of assistance to those engaged in planning and development in these carbonate areas.

HAZARDS–Carbonate rocks can present potential construction problems and hazards due to the presence of solution cavities and bedrock irregularities in the subsurface and sinkholes at the surface. The cavities are the result of the gradual dissolving of the rock by water, particularly along fractures or joints. In turn, joints and cavities are enlarged and can form caves. Related features, such as surface depressions and sinkholes, are caused by the movement of surficial materials into the cavities shaped by the dissolving process. Sinkholes also can result from the collapse of the roof of a cave. Because the potential exists for sinkhole development in most of the carbonate rocks of Pennsylvania, areas underlain by these rocks should receive a thorough subsurface investigation prior to construction so that remedial measures may be designed to cope with these hazards. These investigations should include local geologic mapping, test borings, and possibly geophysical surveys to establish subsurface conditions for such structures as highways, dams, bridges, disposal sites, transmission lines, and buildings.

RESOURCES–Limestone ($CaCO_3$-rich) and dolomite ($MgCO_3$-rich) are major sources of mineral raw materials for the construction, agricultural, and manufacturing industries of the Commonwealth. Except for coal, carbonates are the major rock type mined in Pennsylvania, accounting for about 80 percent of all nonfuel mineral production. Significant uses of mined limestone and dolomite in Pennsylvania include (1) crushed stone for roads, concrete, and railroads; (2) agricultural lime and grit; (3) the manufacture of cement; (4) fluxstone and refractory materials for the steel industry; (5) acid neutralization; (6) raw material for the glass industry; and (7) mineral fillers and whiting. Thus, the carbonates in various parts of Pennsylvania should be recognized as a valuable mineral resource, and land use planners should take this into account.

WATER–Because of the development of solution cavities in carbonate rocks, these rock formations may contain and yield large quantities of underground water. Areas underlain by limestones and dolomites may supply the water needs of a community through the proper development of the subsurface water resources. Those charged with the planning and development of water supplies should recognize the existence of this valuable underground water source.

The permeable nature of the carbonate rocks also makes them natural conduits for conveying solid and liquid wastes. Using these conduits, contaminants can rapidly enter the groundwater system and travel long distances underground over a relatively short period of time. Therefore, it is important to be particularly careful in conducting industrial, agricultural, or construction activities in limestone-dolomite areas to prevent the contamination of valuable groundwater resources.

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G 66 *Geology and biology of Pennsylvania caves,* W. B. White, ed., 1976, 103 p.

Map 1 *Geologic map of Pennsylvania,* T. M. Berg, W. E. Edmunds, A. R. Geyer, and others, compilers, 2nd ed., 1980. Scale 1:250,000 (1 inch=4 miles), 3 sheets.

M 20 *Limestones of Pennsylvania,* B. L. Miller, 1934, 729 p.

M 50 *Atlas of Pennsylvania's mineral resources.*

Part 1, Limestones and dolomites of Pennsylvania, B. J. O'Neill, Jr., 1964, 40 p., 6 maps, scale 1:250,000.

M 50 *Atlas of Pennsylvania's mineral resources.*

Part 1, Supplement, Limestones and dolomites of Pennsylvania, G. F. Deasy, P. R. Griess, R. F. Balazik, and J. W. Burtnett, 1967, 83 p.

Part 4, The distribution of limestones containing at least 90 percent $CaCO_3$ in Pennsylvania, B. J. O'Neill, Jr., 1976, 2 p., 1 map, scale 1:500,000.

M 83 *Reconnaissance survey of potential carbonate whiting sources in Pennsylvania,* S. W. Berkheiser, Jr., 1983, 53 p.

OTHER PUBLICATIONS

PUBLICATIONS ON LIMESTONES AND DOLOMITES–For publications dealing with limestones and dolomites in local areas of Pennsylvania, please refer to *Pennsylvania Geological Publications*, available on-line at www.dcnr.state.pa.us/topogeo/pub/pub.htm, and upon request from the Pennsylvania Geological Survey, Department of Conservation and Natural Resources, P. O. Box 8453, Harrisburg, Pa. 17105–8453.

OPEN-FILE REPORTS–Open-file reports on sinkholes and karst-related features of various counties in central and southeastern Pennsylvania are available for inspection at the Pennsylvania Geological Survey office in Harrisburg; copies of these county reports are also available for a price to cover copying and handling. For further information, please contact the Survey at the address listed in the previous paragraph.

Prepared by Bureau of Topographic and Geologic Survey.
Fourth Edition, 1990; Third Printing Revised, 2000.

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MAP 10 – DENSITY OF MAPPED KARST FEATURES IN SOUTH-CENTRAL AND SOUTHEASTERN PENNSYLVANINA

KARST DENSITY MAP—AN INNOVATIVE APPROACH TO VISUALIZING KARST FEATURES

INTRODUCTION

Approximately 7 percent of Pennsylvania is underlain by carbonate bedrock in the form of limestone and dolomite. Most of the carbonate bedrock occurs in the valleys and lowlands of south central and southeastern Pennsylvania, where over 2 million people live.

Carbonate rocks are unique in that they weather more readily than other types of rocks. The dissolution or dissolving away of the carbonate bedrock by water over long periods of time results in a landscape called karst topography. It is characterized by features such as sinkholes, surface depressions, and caves. The dissolution of the carbonate rock also develops the subsurface drainage network for water along widened cracks or fractures within the bedrock layers. The majority of water in karst areas does not occur as surface streams but is primarily in the subsurface as groundwater.

Sinkholes and surface depressions are subsidence features. The surface expression of these features is a result of water transporting residual material and soil through subsurface pathways established by the dissolution process. Both features are typically circular in shape and can vary in size. Sinkholes exhibit an actual break or hole on the land surface, whereas surface depressions are generally bowl-shaped hollows that do not show this land-surface break. Caves are formed as fractures widen by dissolution, creating large openings in the rocks.

Karst features often impact public safety and health. Subsidence and water-quality problems have been associated with karst topography for many years. Gradual subsidence or the sudden collapse of the land surface can cause serious damage to urban structures, utilities, and roadways. In addition, karst features serve as direct recharge zones to local and regional aquifers, making these areas highly vulnerable to groundwater contamination.

In 1985, the Pennsylvania Geological Survey began investigations to map karst features throughout the commonwealth. Results of these investigations were released as a series of county-based open-file reports (see "References"). For each county, karst surface features were located through an extensive review of aerial photographs (taken in the 1940s–70s) and a subsequent field survey. Identified features were then transferred to scale-stable, 7.5-minute topographic base maps. Additional karst features were compiled from municipal questionnaires and published and unpublished data sources. Although not karst features, small surface mines may be similar in appearance to karst subsidence features. This is most apparent where such a mine has been abandoned for a long period of time. For this reason, surface mines were identified and added to the open-file maps.

After completion of the open-file reports, karst features and surface mines were digitized as point data from the topographic base maps using GSMAP software from the U.S. Geological Survey. Points were positioned in the best-determined center of surface depressions, sinkholes, and surface mines, and at the entrance points of caves. Coordinates and feature types were saved in ASCII files, which were later converted to Microsoft Excel 2000 spreadsheet files. Shapefiles were created from the inventoried data, and point locations and feature attributes were spot-checked against the corresponding features on the original maps. Corrections to the data were made where applicable. The resultant data file served as the basis for the density layer calculations.

As a result of the inventory, 111,715 individual points were compiled for 14 counties (107 7.5-minute quadrangles). Karst features make up approximately 98.4 percent of the points in the database: 96 percent, surface depressions; 2.3 percent, sinkholes; and 0.1 percent, cave entrances. Approximately 1.6 percent of the data points were surface mines, which were not included in the density layer calculation.

DENSITY LAYER CALCULATION

To create the digital density surface, ESRI ArcView 3.2 software was used to divide the study area into 25- by 25-meter (82- by 82-foot) grid cells and to count the karst data points that fell within the area of a 250-meter (820-foot) search radius from the center of each cell. The number of points divided by the search area (approximately 0.2 square kilometer [0.08 square mile or 49 acres]) represents the karst density value of a cell. After the density value was calculated for the first cell, the search area was shifted to the next 25-square-meter grid cell, and the floating process was repeated until all of the cells were assigned a density value. This process smoothed the density data over the study area. Grid cells were then assigned a color using an ESRI ArcMap 8.3 "quantile" gradation of density values. On the map, red represents more than 150 karst features per square kilometer (nearly 400 per square mile). The darkest green color indicates that at least one karst feature falls within the 250-meter search radius of the cell.

DISCLAIMER

While this map is useful for planning and preliminary site studies, it is not a substitute for site-specific subsurface investigations.

The occurrence of a sinkhole or surface depression depends on numerous factors, including rock type, geologic structure (e.g., fractures, joints, and faults), surface and subsurface hydrology, surficial materials (particularly in the glaciated areas of Northampton and Lehigh Counties), and land use. On the map, color shows the density of karst features over a given area. Although orange and red indicate areas where karst features are interpreted to be more abundant, it does not guarantee that new sinkholes will occur in these areas. Conversely, sinkholes can occur in areas where no karst features have been observed. The occurrence of sinkholes, therefore, is not restricted to the high-density areas delineated on the map.

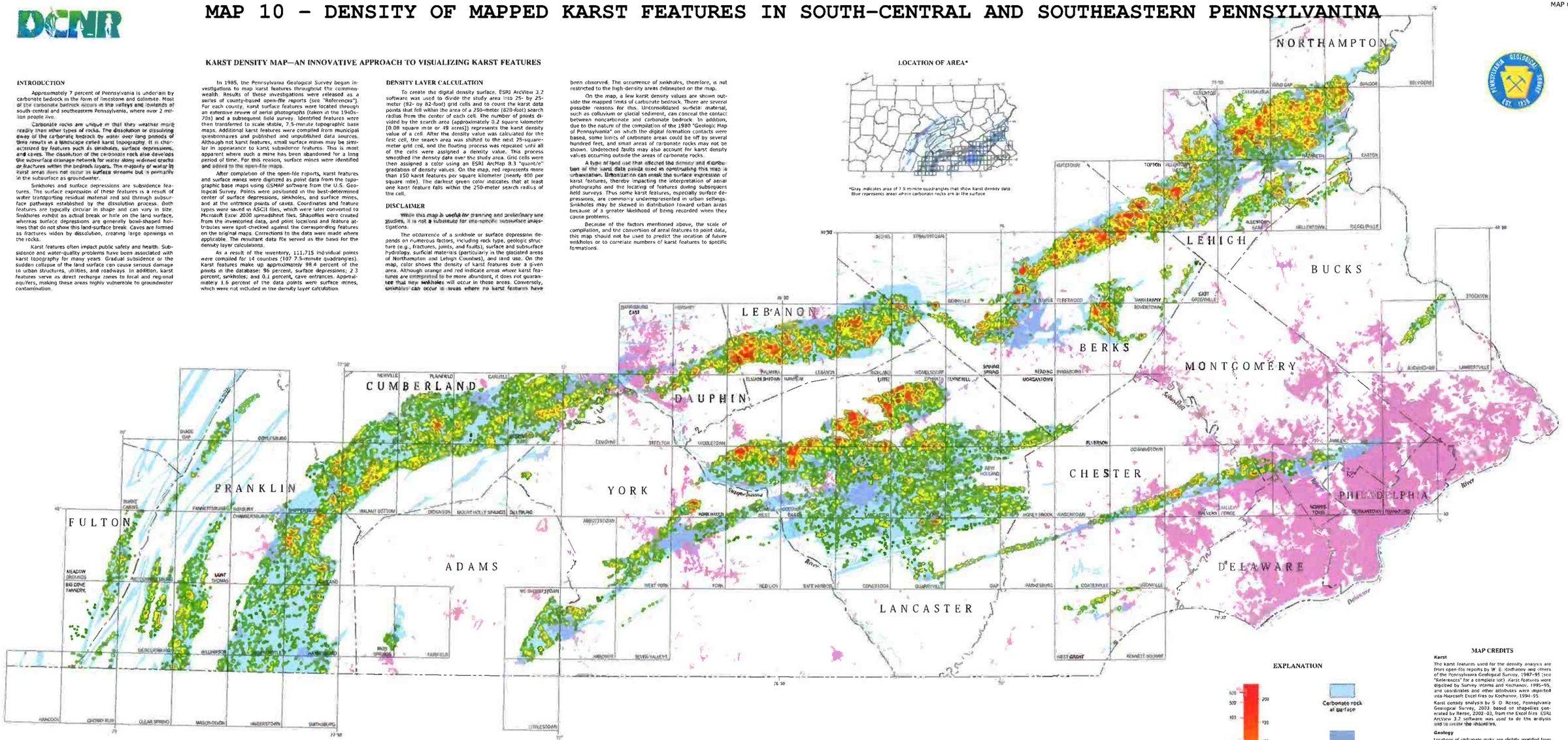
On the map, a few karst density values are shown outside the mapped limits of carbonate bedrock. There are several possible reasons for this. Unconsolidated surficial material, such as colluvium or glacial sediment, can conceal the contact between noncarbonate and carbonate bedrock. In addition, due to the nature of the compilation of the 1980 "Geologic Map of Pennsylvania" on which the digital formation contacts were based, some limits of carbonate areas could be off by several hundred feet, and small areas of carbonate rocks may not be shown. Undetected faults may also account for karst density values occurring outside the areas of carbonate rocks.

A type of land use that affected the density and distribution of the karst data points used in constructing this map is urbanization. Urbanization can mask the surface expression of karst features, thereby impacting the interpretation of aerial photographs and the locating of features during subsequent field surveys. Thus some karst features, especially surface depressions, are commonly underrepresented in urban settings. Sinkholes may be skewed in distribution toward urban areas because of a greater likelihood of being recorded when they cause problems.

Because of the factors mentioned above, the scale of compilation, and the conversion of areal features to point data, this map should not be used to predict the location of future sinkholes or to correlate numbers of karst features to specific formations.

LOCATION OF AREA*

*Gray indicates area of 7.5-minute quadrangles that show karst density data
Blue represents areas where carbonate rocks are at the surface



DENSITY OF MAPPED KARST FEATURES IN SOUTH-CENTRAL AND SOUTHEASTERN PENNSYLVANIA

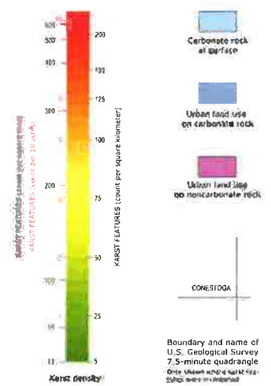
BY
WILLIAM E. KOCHANOV AND STUART O. REESE
2003

SCALE 1:300,000

5 0 5 10 15 20 25 30 KILOMETERS
5 0 5 10 15 MILES

Albers equal area conic projection
Standard parallels 40°N and 42°N, center 78°W

EXPLANATION



MAP CREDITS

Karst

The karst features used for the density analysis are from open-file reports by W. E. Kochanov and others of the Pennsylvania Geological Survey, 1987–95 (see "References" for a complete list). Karst features were digitized by Survey interns and Kochanov, 1995–95, and coordinates and other attributes were imported into Microsoft Excel files by Kochanov, 1994–95.

Karst density analysis by S. O. Reese, Pennsylvania Geological Survey, 2003, based on shapefiles generated by Reese, 2002–02, from the Excel files. ESRI ArcView 3.2 software was used to do the analysis and to create the isolines.

Geology

Locations of carbonate rocks are slightly modified from *Geologic Map of Pennsylvania*, compiled by T. M. Berg and others (1980, Pennsylvania Geological Survey, 4th ser., Map 1, 2nd ed., scale 1:250,000, 3 sheets). The latter map was prepared as a data set by C. E. Miles, T. G. Whitfield, J. G. Kochinski, and others (*Bedrock Geology of Pennsylvania*, 2001, Pennsylvania Geological Survey, 4th ser., scale 1:250,000).

Base Map

Urban areas are from the data set *Urban areas of Pennsylvania—PA Explorer CD ROM edition* by Joe Bishop (1999, University Park, Gap Analysis Program, Environmental Resources Research Institute, Pennsylvania State University).

State and county lines are slightly modified from an unpublished municipality data set (Pennsylvania Department of Environmental Protection, 1999, 1:24,000-scale accuracy).

Quadrangle lines are from shapefiles created by M. E. Hoore of the Pennsylvania Geological Survey (1990, unpublished), using ESRI Atlas GIS software.

Base information for the data set Major rivers of Pennsylvania by Environmental Resources Research Institute, Pennsylvania State University, in Pennsylvania GIS Compendium (1998, Pennsylvania Department of Environmental Protection, 1:24,000 scale accuracy). Data set derived from Pennsylvania Department of Transportation data.

Other

Map layout and design by S. O. Reese and C. E. O'Neil of the Pennsylvania Geological Survey, 2003. Cartography by S. O. Reese, 2002–03. Map editing by C. E. O'Neil, 2003.

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Kochanov, W. E., 1984, Sinkholes and karst-related features of Lehigh County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open-File Report 87–21, scale 1:24,000, 8 maps plus 13-page text.

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_____ 1989c, Sinkholes and karst-related features of Franklin County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open-File Report 89–03, scale 1:24,000, 20 maps plus 15-page text.

_____ 1993, Sinkholes and karst-related features of Lancaster County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open-File Report 93–01, scale 1:24,000, 18 maps plus 12-page text.

Kochanov, W. E., Lichtliger, J. F., and Becker, Mona, 1993a, Sinkholes and karst-related features of Bucks County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open File Report 93–03, scale 1:24,000, 4 maps plus 9-page text.

_____ 1993b, Sinkholes and karst-related features of Chester County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open-File Report 93–01, scale 1:24,000, 10 maps plus 9-page text.

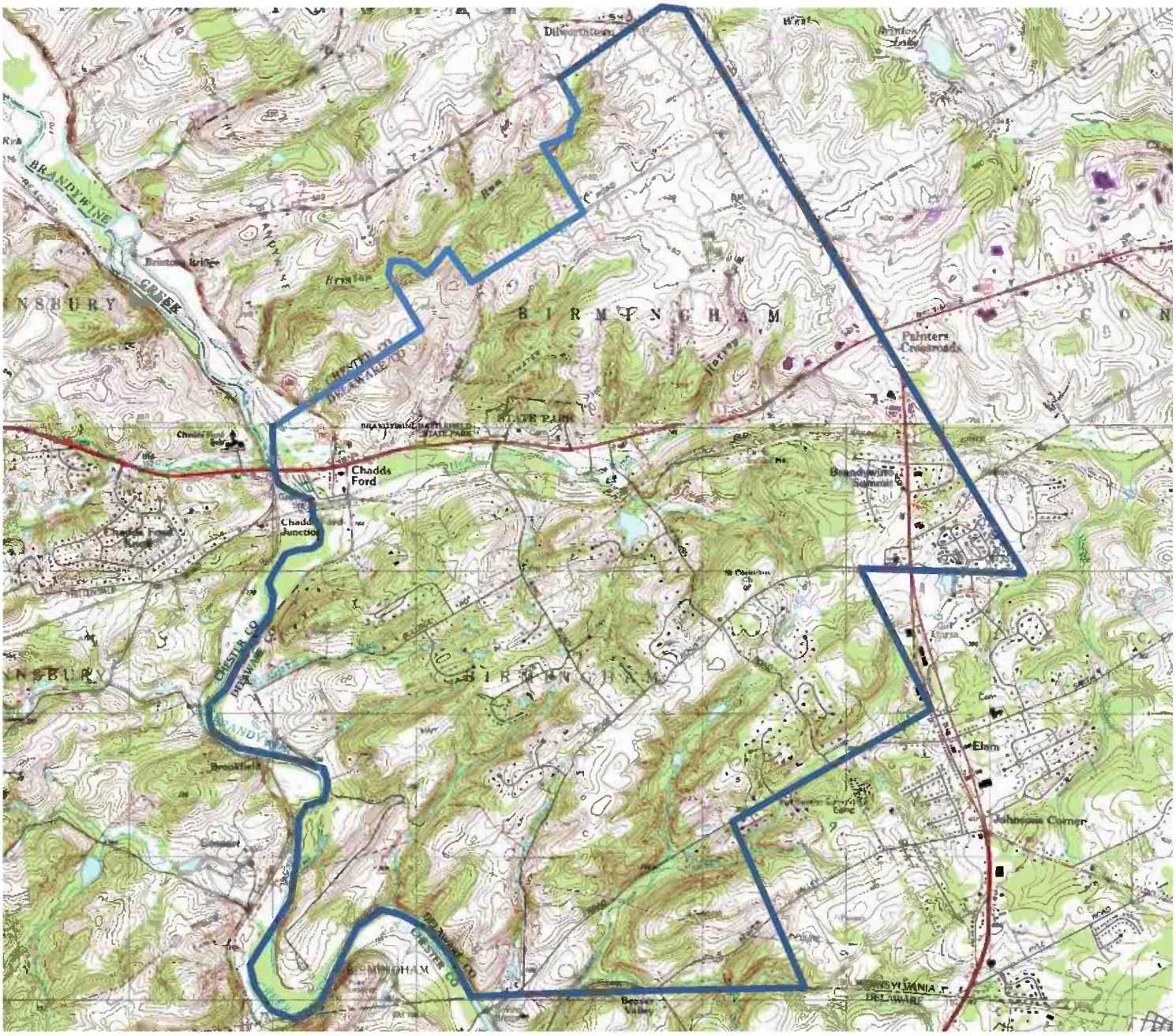
_____ 1993c, Sinkholes and karst-related features of Montgomery County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open-File Report 93–02, scale 1:24,000, 5 maps plus 7-page text.

Kochanov, W. E., and Miller, Rachel, 1995a, Sinkholes and karst-related features of Adams County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open-File Report 95–05, scale 1:24,000, 5 maps plus 9 page text.

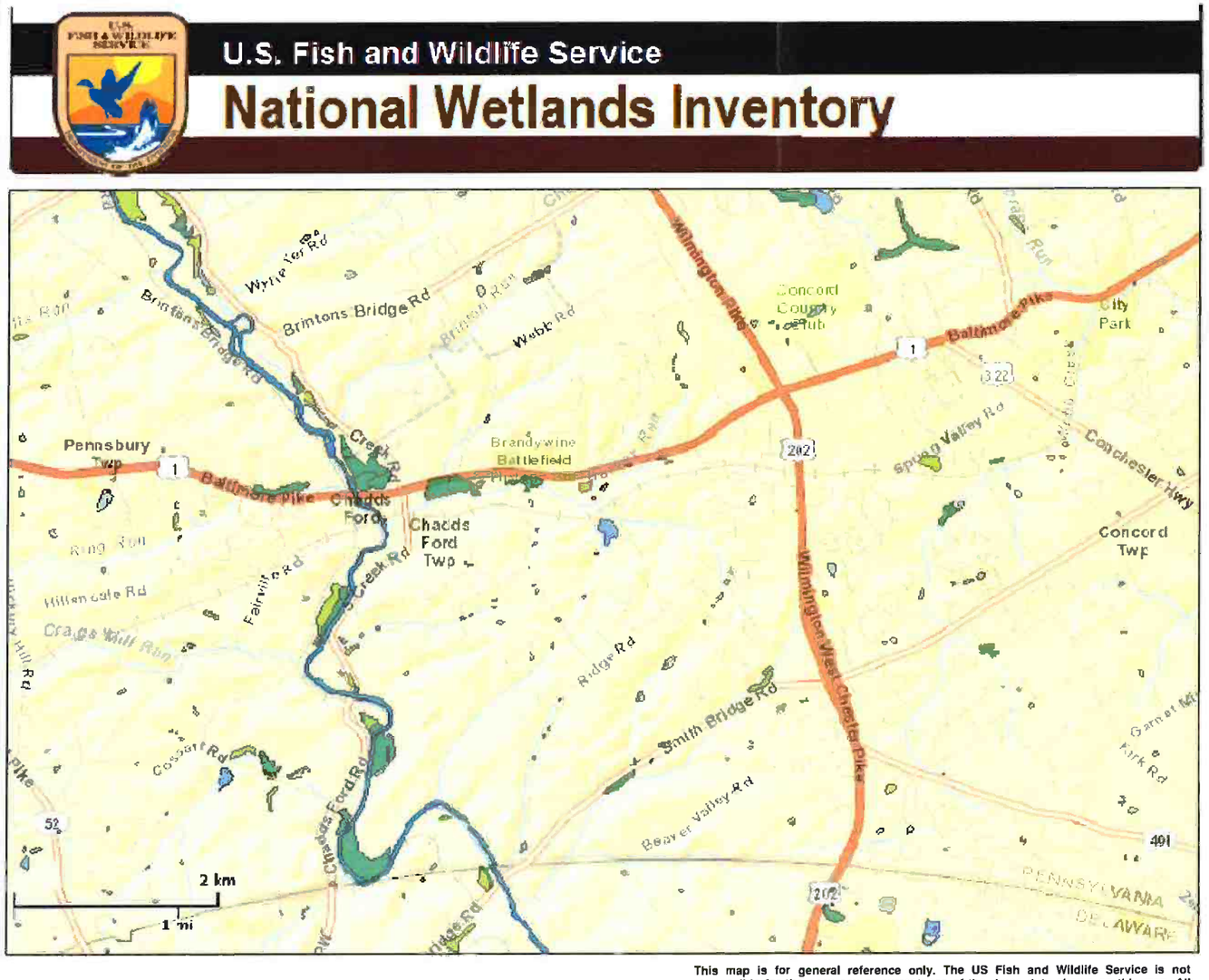
_____ 1995b, Sinkholes and karst-related features of York County, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Open File Report 95–06, scale 1:24,000, 10 maps plus 9-page text.

MAP 11

USGS West Chester and Wilmington North



MAP 12 – NATIONAL WETLANDS INVENTORY



CHADDS FORD, DELAWARE COUNTY, PA

Aug 7, 2013

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

Riparian

- Herbaceous
- Forested/Shrub

Riparian Status

- Digital Data

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

FEMA MAPS (1 OF 5)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 18. Horizontal datum was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov/.

BASE MAP SOURCE: Base map files were obtained in digital spatial data format from the Commonwealth of Virginia and Delaware County. Road centerlines, streamlines were provided by Delaware County. The Delaware political boundary was downloaded from the 2006 TIGER/Line files and 2002 digital orthophotographs were provided by the Virginia Geographic Network Division of its Department of Technology Planning (VGIN). Adjustments were made to specific base map features to align them to 1"=200' and 1"=400' scale VGIN orthophotos.

Based on the above mentioned digital orthophotographs, this map reflects more detailed and up-to-date stream channel configurations and floodplain delineations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

Stillwater elevations may be shown to the nearest tenth of a foot. Users should refer to the Flood Insurance Study (FIS) for detailed flood elevation information.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100 year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevation determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain
ZONE D	Areas in which flood hazards are undetermined, but possible

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

	Cross section and
	Transect and
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000 M	1000-meter Universal Transverse Mercator grid values, zone 18
600000 FT	5000-foot grid ticks: Pennsylvania State Plane coordinate system (FIPSZONE 3702), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 1991

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
MAY 2, 1995

NOVEMBER 18, 2009 - To change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to reflect updated topographic information, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0151F

FIRM
FLOOD INSURANCE RATE MAP

DELAWARE COUNTY, PENNSYLVANIA
(ALL JURISDICTIONS)

PANEL 151 OF 250

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHADDS FORD, TWP OF	420402	0151	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
42045C0151F
MAP REVISED
NOVEMBER 18, 2009

Federal Emergency Management Agency

FEMA MAPS (2 OF 5)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain **areas not in Special Flood Hazard Areas may be protected by flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on **flood control structures for this jurisdiction**.

The **projection** used in the preparation of this map was Universal Transverse Mercator (**UTM**) Zone 18. **Horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding **conversion between the National Geodetic Vertical Datum of 1929 and** the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov/.

BASE MAP SOURCE: Base map files were obtained in digital spatial data format from the Delaware Valley Regional Planning Commission and Delaware County. Road centerlines, streamlines, and township/borough boundaries were provided by Delaware County. The county boundary was downloaded from the 2006 TIGER/Line files. 2002 and 2005 digital orthophotographs were provided by the Delaware Valley Regional Planning Commission. Adjustments were made to specific base map features to align them to 1"=200' scale orthophotos.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the **separately printed Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each **community is located**.

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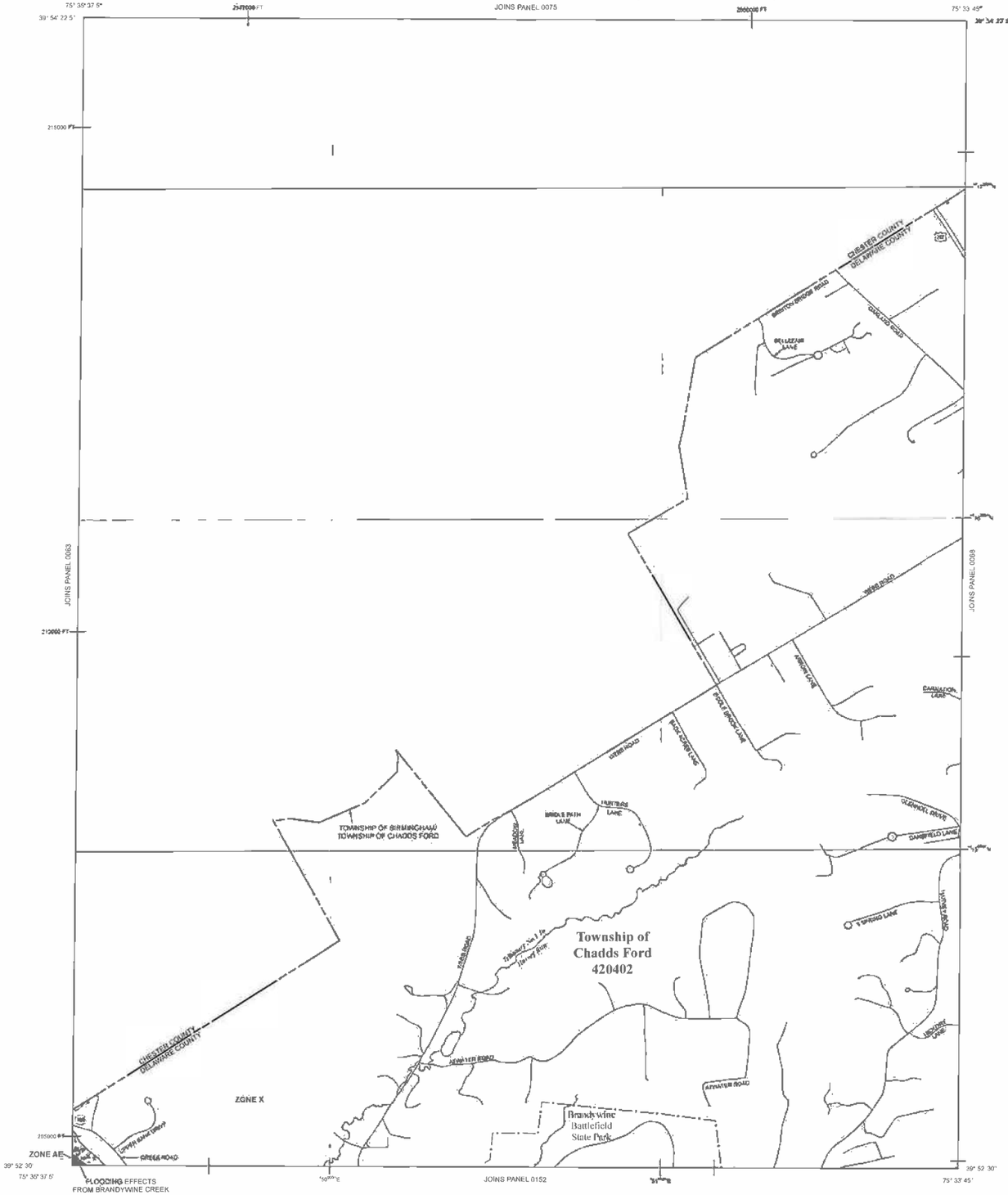
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at **http://www.fema.gov/business/nfip**.

Structure elevations may be shown to the nearest tenth of a foot. Users should refer to the Flood Insurance Study (FIS) for detailed flood elevation information.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100 year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	**No Base Flood Elevations determined.**
ZONE AE	**Base Flood Elevations determined.**
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood

OTHER AREAS

ZONE X	**Areas determined to be outside the 0.2% annual chance floodplain**
ZONE D	Areas in which flood hazards are undetermined, but possible

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

	Cross section line
	Transect ID
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000 M	1000-meter Universal Transverse Mercator grid values, zone 18
600000 FT	5000-foot grid ticks: Pennsylvania State Plane coordinate system (FIPSZONE 3702), Lambert Conformal Conic projection
DX5510 X	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 1993

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
MAY 2, 1995

NOVEMBER 18, 2009 - to change Special Flood Hazard Areas, to reflect updated topographic information, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0064F

FIRM
FLOOD INSURANCE RATE MAP

DELAWARE COUNTY, PENNSYLVANIA
ALL JURISDICTIONS

PANEL 64 OF 250
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHADDS FORD, TWP OF	420402	0064	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
42045C0064F
MAP REVISED
NOVEMBER 18, 2009

Federal Emergency Management Agency

FEMA MAPS (3 OF 5)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size The **community map repository** should be consulted for possible updated or additional flood hazard information

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures. Refer to Section** 2 4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 18 **Horizontal datum** was NAD 83 GRS80 spheroid Differences in datum, spheroid projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries These differences do not affect the accuracy of this FIRM

Flood elevations on this map are referenced to the North American Vertical Datum of 1988, These flood **elevations** must be compared to structure and ground elevations referenced to the **same vertical datum** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

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Silver Spring Metro Center
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(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, **please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov/**

BASE MAP SOURCE: Base map files were obtained in digital spatial data format from the Delaware Valley Regional Planning Commission and Delaware County Road centerlines streamlines, and township/borough boundaries were provided by Delaware County, The county boundary was downloaded from the 2006 TIGER/Line files 2002 and 2005 digital orthophotographs were provided by the Delaware Valley Regional Planning Commission, Adjustments were made to specific base map features to align them to 1"=200' scale orthophotos

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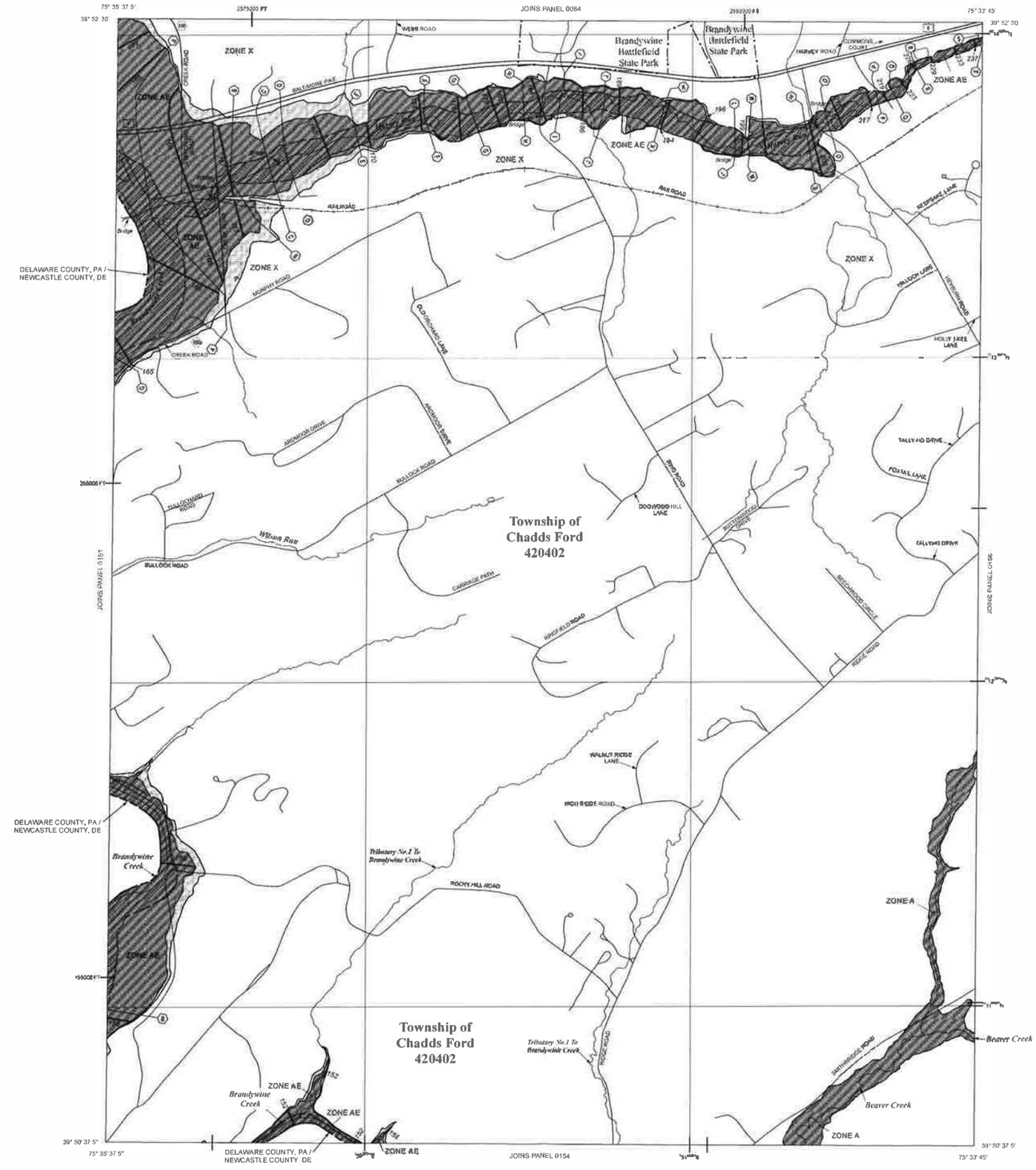
Stillwater elevations may be shown to the nearest tenth of a foot Users should refer to the Flood Insurance Study (FIS) for detailed flood elevation information



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100 year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE The Base Flood Elevation is the water surface elevation of the 1% annual chance flood

ZONE A	No Base Flood Elevations determined
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0 2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain
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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

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	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
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	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 (EL. 987)	Base Flood Elevation line and value; elevation in feet*
	Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988	
	Cross section line
	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000 M	1000-meter Universal Transverse Mercator grid values, zone 18
600000 FT	5000-foot grid ticks: Pennsylvania State Plane coordinate system (FIPSZONE 3702), Lambert Conformal Conic projection
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1 5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

SEPTEMBER 30 1993

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
MAY 2 1995

NOVEMBER 18, 2009 to change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to reflect updated topographic information, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction

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MAP SCALE 1" = 600'
250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0152F

FIRM
FLOOD INSURANCE RATE MAP

DELAWARE COUNTY, PENNSYLVANIA
(ALL JURISDICTIONS)

PANEL 152 OF 250

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHADDS FORD TWP OF	420402	152	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
42045C0152F
MAP REVISED
NOVEMBER 18, 2009

Federal Emergency Management Agency

FEMA MAPS (4 OF 5)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 18. **Horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov/.

BASE MAP SOURCE: Base map files were obtained in digital spatial data format from the Delaware Valley Regional Planning Commission and Delaware County. Road centerlines, streamlines, and township/borough boundaries were provided by Delaware County. The county boundary was downloaded from the 2006 TIGER/Line files. 2002 and 2005 digital orthophotographs were provided by the Delaware Valley Regional Planning Commission. Adjustments were made to specific base map features to align them to 1"=200' scale orthophotos.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

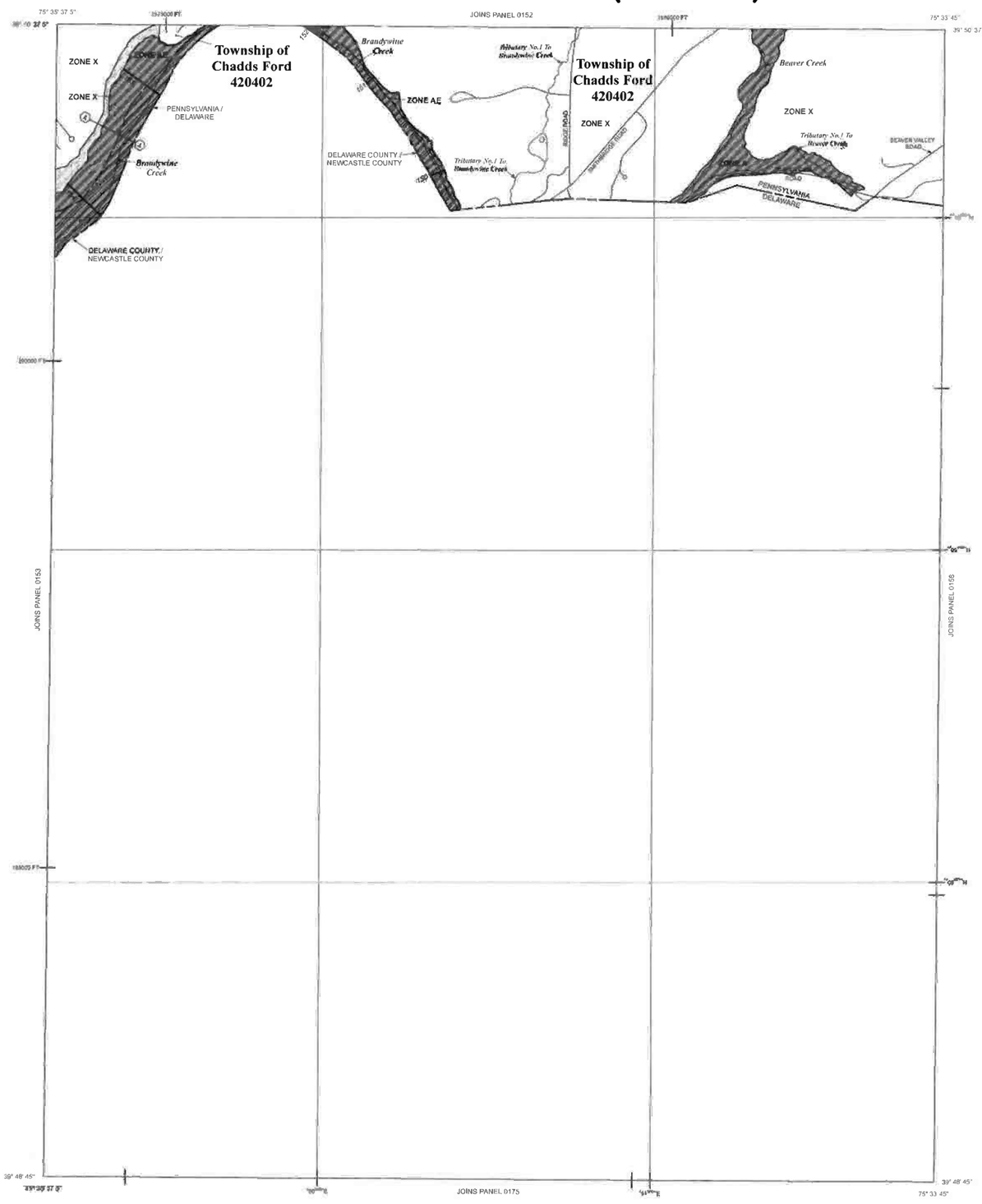
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and /or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

Base flood elevations shown on this map apply only landward of 0.0 feet. Users should refer to the Flood Insurance Study (FIS) for detailed flood elevation information.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL. 987)	Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988	
A — A	Cross section line
23 — 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000 M	1000-meter Universal Transverse Mercator grid values, zone 18
600000 FT	5000-foot grid ticks: Pennsylvania State Plane coordinate system (FIPSZONE 3702), Lambert Conformal Conic projection
DX5510 x	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
SEPTEMBER 30, 1993

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
MAY 2, 1995
NOVEMBER 18, 2009 - to change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to reflect updated topographic information, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 600'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0154F

FIRM
FLOOD INSURANCE RATE MAP

DELAWARE COUNTY, PENNSYLVANIA
(ALL JURISDICTIONS)

PANEL 154 OF 250
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHADDS FORD, TWP OF	420402	0154	F

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