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Map Information

Data used to prepare the soils maps referenced in this section were produced by Roy F. Weston, Inc., through their *Wastewater Needs Evaluation and Plan for Southern*

New Castle County, Delaware. This data layer is housed in DNREC's Geographical Information System (directory: arc/piedbas/ncsoils). The data cover soil classifications, soil series, erodibility (K) factors, septic suitability factors, slope information, erosional characteristics, and acceptable soil-loss factors.

This preliminary assessment called for an in-house literature review of geological reports and maps. Most of those found consisted of Delaware Geological Survey publications, as well as reports by the U.S. Geological Survey in Dover, the Delaware Geological Survey, and the Water Resources Agency for New Castle County. The following is a summary of the more important Piedmont geological/ soil resources.

Delaware Geological Survey Maps

A regolith thickness (overburden) map and geologic maps are available for the entire Piedmont geologic province. The Delaware Geological Survey developed these maps through field exercises designed to characterize earth resources in the area.

Geology Maps

Geology of the Newark Area, Delaware, 1972.

Geology of the Wilmington Area, Delaware, 1975.

These maps provide the following pertinent information regarding locations and boundaries of geologic formations that comprise the Piedmont province: lithological descriptions of geologic formations, including the mineral assemblages comprising them; and major geological structures (faults, folds, and joints, etc.).

Digital information is not available. Hard copies (paper documents) are available. These maps provide a starting point for estimating the natural soil chemistry for various areas within the Piedmont. Piedmont field mapping is currently in progress, and a new digital geology map will be developed within approximately two years that is substantially different from current maps due to the use of newer criteria for making geological interpretations (pers. comm., Kevin Ramsey, Delaware Geological Survey).

Regolith Map

Thickness of Regolith in the Delaware Piedmont (Province), 1982.

This map provides general information regarding the erodibility of the Piedmont geologic formations and the various sediment textures derived from their weathering. They also provide regolith thickness zones for the entire Piedmont. (The slopes for these areas are also provided.) These maps enable users to identify areas where large volumes of sediments exist. Hard copies

(paper documents) are available. Digital information is not available.

Water Resource Protection Area Maps

The Water Resources Agency for New Castle County, with the assistance of other state and county agencies, developed Water Resource Protection Area maps for the purpose of protecting public ground- and surface-water supplies in New Castle County. Three maps cover the entire county. Map 1 of that set covers Delaware's Piedmont Basin. (Also, see Map 30 in this report.)

Water Resource Protection Areas for City of Newark, City of Wilmington, New Castle County, Delaware, 1993. (Map 1 of 3.)

These maps provide floodplain locations upgradient of an approved public surface-water supply intake. Flood areas consist of the 100-year floodplain (as derived from the 1986 Federal Emergency Management Agency Flood Insurance Rate maps), and flood-hazard soils and tidal marsh soils (as defined in 1970 U.S. Department of Agriculture soil survey maps of New Castle County). These maps also provide erosion-prone slope locations upgradient of an approved public water-supply intake by identifying areas that have the potential to contribute significant amounts of sediments into streams. (Erosion-prone slopes consist of those areas containing soils with service capability classifications as defined in the aforementioned soil survey.) The maps also show the Cockeysville Formation outcrop area. (The outcrop area for the Cockeysville Formation was taken from a map produced by the Delaware Geological Survey.)

Digital information for the floodplain locations and for the erosion-prone slope locations is available from the Water Resources Agency for New Castle County's Geographical Information System.

Delaware Geological Survey Reports

Many of the Delaware Geological Survey reports describe the geology of Delaware's Piedmont Basin. However, the best descriptions are provided through the aforementioned geologic maps. For this reason, an exhaustive listing of these reports is not warranted.

The Delaware Geological Survey's Bulletin #19, *Geology and Hydrology of the Cockeysville Formation, Northern New Castle County, Delaware*, provides an in-depth and updated description of the geology of the Pleasant Hill - Hockessin area. A recent geologic map is provided with this report. Information from this report will prove useful in environmental assessments of the White Clay Creek and Red Clay Creek watersheds.

Table 76

NUMBER OF SITE EVALUATIONS BY TAX PARCEL

TAX PARCEL #	# OF SITE EVALUATIONS
06009.00001 to 06131.00151	22
07001.00011 to 07026.00002	472
08001.00003 to 08232.00082	510
09002.00002 to 09037.00036	156
10006.10029 to 10053.00029	96
11002.00006 to 11102.03190	507
Total	1,763

Table 77

NUMBER OF PERMITS ISSUED BY TAX PARCEL

TAX PARCEL #	# OF PERMITS ISSUED
06009.00001 to 06131.00151	22
06009.00001 to 06131.00151	8
07001.00011 to 07026.00002	214
08001.00003 to 08232.00082	545
09002.00002 to 09037.00036	163
10006.10029 to 10053.00029	105
11002.00006 to 11102.03190	524
Total	1,559

Data from Water Supply Branch

Modified grid numbers are used to locate on-site wells and the corresponding septic approval numbers for DNREC's Division of Water Resources, Water Supply Branch. Information can be obtained about depth and type of wells in a given area, septic system permit numbers, and in some cases, the location of the septic system.

Data from Small Systems Branch

The Small System Branch of the Division of Water Resources has maintained a d-Base III file of New Castle County site evaluations and permits from 1987; however, permit data for the Piedmont Basin does not begin until 1991. Tables 76 and 77 account for the total number of site evaluations approved by DNREC.

The Hazardous Waste Management Branch had soil samples analyzed for various volatile organic compounds, semi-volatile organics, polychlorinated biphenyls, pesticides, herbicides, cyanide, metals, dioxins/furans, sulfides, and base

neutral extractables from their permitted hazardous waste treatment, storage, and disposal facilities. The Superfund Branch collected various chemical information on soils associated with their Superfund sites.

SEDIMENT

GIS Coverages

- ◆ Land Use.
- ◆ New Castle County Soils.
- ◆ Storage and Retrieval of United States Waterways Parametric Data Stations.
- ◆ Habitat Assessment Sampling Stations.
- ◆ Superfund Sites.
- ◆ Hazardous Waste Facilities.
- ◆ National Pollutant Discharge Elimination System Outfalls.
- ◆ New Castle County Regulated Erosion Prone Slopes.

Data/Data Bases

- ◆ Sampling data from Harper Thiel Inc., Hercules Research Center, DuPont Glasgow Site, and DuPont Experimental Station (Hazardous Waste Management Branch).
- ◆ Sediment data from Superfund sites (Site Investigation and Restoration Branch).
- ◆ Storage and Retrieval of U.S. Waterways Parametric Data Stations Data Base (Division of Water Resources).
- ◆ Habitat Assessment Data (Division of Water Resources).
- ◆ Active Construction Site Data Bases (Division of Soil and Water Conservation).
- ◆ Existing Stormwater Management Facilities Data Bases (Division of Soil and Water Conservation).
- ◆ Sediment toxicity and sediment chemistry data from the Environmental Monitoring and Assessment Program for Station #357; Estuaries, Virginia Province, VA91-357 (U.S. EPA, Region III).

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Ambient Air Quality Monitoring Data

Current and historical monitoring data for the Piedmont Basin are available for ozone, sulfur dioxide, nitrogen dioxide/nitrogen oxides, carbon monoxide, and particulate matter. There are also historical data for lead and some heavy metals. The number of data and the averaging interval vary by pollutant. A summary of the current data and a discussion of trends are included in the *Delaware Annual Air Quality Report* (published for 1991 through 1994; 1995 is in preparation) available from the DNREC Air Quality Management Section. Detailed air-monitoring data (hourly or daily averages) are maintained in a data base in the New Castle Office of the Air Quality Management Section. The data are also submitted to the National Airometric Information Retrieval System data base maintained by the EPA, where they are available for retrieval. This data base includes monitoring data from the early 1970s (varies by pollutant) to the present.

Acid deposition data are available for the years 1983 through 1995. Data are for wet deposition only; ion concentrations are available for 1983 through 1994. This data base is maintained in the Air Surveillance Branch; there are currently no standard printed reports from this data base.

Air toxics data for 14 specific toxic volatile organic compounds (sorber tube monitoring, 24-hour averages every sixth day) are available for 1993 through 1995; however, there are significant gaps and various levels of confidence and accuracy. The data base is maintained in the Air Surveillance Branch; there are currently no standard printed reports from this data base, although summary information is included in the *Delaware Annual Air Quality Report*.

Peak ozone season (June through August) data on more than 50 volatile organic compounds from the Lums Pond site are available from 1994 to the present, although some years have significant gaps. The data base is maintained in the Air Surveillance Branch as well as in EPA's national data base. There are currently no standard printed reports from this data base.

Emissions Information

Toxics Release Inventory

This inventory, generated annually, covers more than 650 toxic chemicals. The major limitation of the inventory is the restricted universe of facilities required to report releases. The EPA recently proposed adding seven more industry sectors to the program: metal mining, coal mining, electric utilities, commercial hazardous waste treatment, chemical wholesalers, bulk petroleum wholesalers, and solvent recovery services. These inventories have been compiled and reported since 1987; the current annual toxics release inventory report (1994) is available from the Air Quality Management Section.

Ozone Precursor Emissions Inventories (State Implementation Plan Inventories)

These inventories are compiled every three years. The first inventory was done in 1990 and is referred to as the 1990 Base Year Inventory. Inventories compiled after that are referred to as Periodic Emissions Inventories. These cover emissions of ozone precursors (volatile organic compounds, nitrogen oxides, and carbon monoxide) from all types of sources in Delaware. Point source emissions are compiled for each facility. Area, mobile, and biogenic emissions are compiled by county. At this time, the 1990 Base Year Inventory has been completed, and the 1993 Periodic Inventory is in draft form. Copies of summary reports are available from the Air Quality Management Section. The actual inventory documents, which are several hundred pages in length, can be reviewed at the section's New Castle or Dover offices.

Annual Point Source Inventory

This inventory is compiled annually. It covers emissions of volatile organic compounds, nitrogen oxides, carbon dioxide, sulfur dioxide, particulate matter, total suspended particulates, and lead from facilities that are major source emitters or potential major source emitters of at least one of these pollutants. This inventory has been generated since 1990. Currently, 1990, 1992, and 1993 are completed; 1994 is in draft form. Currently, there are no written reports of these inventories, but emissions summary printouts can be generated from the computer data base called *i-STEPS®*.

CONTAMINANT SOURCES

Geldreich, E. E., and B. A. Kenner. 1969. Concepts of Fecal *Streptococci* in Stream Pollution. *Journal of Water Pollution Control Fed.* 41:336.

Nizeyimana, E., G. W. Peterson, M. C. Anderson, B. M. Evans, J. M. Hamlett, and G. M. Baumer. 1996. Statewide GIS/Census Data Assessment Of Nitrogen Loadings from Septic Systems in Pennsylvania. *Journal of Environmental Quality* 25: 346 - 354.

Pipes, W. O. 1992. *Bacterial Indicators of Pollution*. CRC Press.

LAND USE

Applicable GIS data layers that the DNREC Division of Water Resources is responsible for include the following: Drainage Basins, Ground Water Recharge Areas, Land Use, NPDES Discharges, Sewer Districts, Shellfish Closure Areas, Sludge Disposal Areas, Storet Stations, Subaqueous Structures, and Water Supply Franchise Areas. The DNREC GIS Office is responsible for the following data layers: Census, Floodplain Maps (data not available at this time), National Wetlands Inventory, Population Projections (by county), Quad Index, Railroads, Roads All, Roads Major, Towns, and Water.

As a product of their Christina River Basin Nonpoint Source Strategy Plan, the Water Resources Agency for New Castle County has provided maps of the Christina River Basin that also include the Pennsylvania portion of the Christina River. These maps cover the Piedmont Preliminary Assessment study area except for the Shellpot and Naamans watersheds.

October 1995 Base Map. Data layers on this map show the Christina Basin, Watersheds, Sub-basin Boundaries, Major Roadways, Major and Minor Hydrology, and Municipal Boundaries

May 1996 Land Use Map. This map shows areas that are classified according to uses of lands including Single Family, Multi-Family, Office, Industrial, Transportation/Utility, Commercial, Institutional, Public Private Open Space, Wooded, Agriculture, Mining, Water, and Vacant Land.

April 1996 Water Resource Areas Map. Shown are data layers for Water Resource Protection Areas including the Cockeysville Formation, Wissahickon Formation, Cockeysville Drainage Area, Class-C Wellhead, Hoopes Reservoir Watershed, Floodplains (100-Year FEMA), Erosion-Prone Slopes, Recharge Areas, and National Wetlands Inventory.

Mackenzie, John. 1989. *Land Use Transitions in Delaware, 1974-1984.* Newark: University of Delaware, Agricultural Experimental Station.

This 16-page report measures land-use changes in acres and percent by county through digitizing and photo-interpreting 1974 and 1984 photography. During this period, residential land – single family/duplex was the fastest growing category, showing an increase of 4,492.2 acres, displacing agriculture, which showed a loss of 5,489.3 acres, and wetlands, which showed a loss of 1,502.1 acres. Also during this period, 7,400 new persons were added to New Castle

County's population, which resulted in the conversion of 5,074 acres into residential uses, for a ratio of 1.46 new persons per acre converted. A greater number of acres also were converted to residential uses in Kent and Sussex counties.

The Delaware Coastal Management Program's Coastal Ocean Management, Planning, and Assessment System (COMPAS) can be used to model the relationship between selected nonpoint pollution sources, land-use activities, habitat trends, and associated species. To date, COMPAS has not been involved with studies in the Piedmont Basin. However, it has applications for modeling using multiple attributes for resource management and is likely a useful tool for Whole Basin Management.

Other sources include census data from the State Data Center and special reports from the University of Delaware Bureau of Demographic Research. Reports and land-use planning/consulting also are available from the University of Delaware College of Urban Affairs and Public Policy, including the Delaware Public Administration Institute and the Center for Energy and Environmental Policy.

The Delaware Population Consortium provides population projections for use by all agencies in Delaware who need population growth forecasts. These projections are provided and can be used at the census-tract level, which very roughly coincides with the Piedmont Basin boundary. Data can be shown for population, income, age, race, and targeted census subdivision that coincide with blue-collar jobs credit programs.

RECREATION

Parks and Greenways

The DNREC Division of Parks and Recreation maintains detailed information and records regarding recreation resources. The division has created a comprehensive Outdoor Recreation Inventory, which includes information on all recreational facilities and parks in Delaware. The Delaware State Parks' Geographic Information Systems Lab maintains the geographic component to the Outdoor Recreation Inventory data base, incorporating all open space and recreational facilities, including greenways and trails. The division also updates the State Comprehensive Outdoor Management Plan approximately every five years. This document depicts the state of recreation in Delaware and general trends, and outlines a course of action to meet the state's recreational needs.