Borough of Clementon Stormwater Management Plan

Prepared by

Robert Freiling

March 7,2019

The Borough of Clementon's Municipal Stormwater Management Plan (MSWMP)

Table of Contents

List of Tables

List of Figures (at the end of the MSWMP)

Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Borough of Clementon ("the Borough") to address stormwater-related impacts to surface and ground waters. N.J.A.C. 7:14A-25 Municipal Stormwater Regulations requires the creation of this plan. This plan contains all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acre of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides baseflow in receiving waterbodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

A "build-out" analysis has been included in this plan based upon existing zoning and land available for development. The plan also addresses the review and update of existing ordinances, the Borough Master Plan, and other planning documents to allow for project designs that include low impact development techniques. The final component of this plan is a mitigation strategy used when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

Goals

The goals of this MSWMP and stormwater control ordinance are to:
- reduce flood damage, including damage to life and property;
- minimize, to the extent practical, any increase in stormwater runoff from any new development;
- reduce soil erosion from any development or construction project;
- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge;
- prevent, to the greatest extent feasible, an increase in nonpoint pollution;
- maintain the integrity of stream channels for their biological functions, as well as for drainage;
- minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and
- protect public safety through the proper design and operation of stormwater basins.

The Borough of Clementon, a municipality, is designated as the agency to prepare the MSWMP. To achieve the above goals, this plan outlines specific stormwater design and performance standards for new development and includes structural and nonstructural

stormwater management strategies. The Borough of Clementon's municipal stormwater management plan complies with N.J.A.C. 7:8-4. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan to ensure long-term effectiveness of stormwater management facilities. The plan also outlines safety standards (N.J.A.C. 7:8-6) for stormwater infrastructure to be implemented to protect public safety. To develop this MSWMP and identify appropriate stormwater management measures, the Borough will consider the physical characteristics and ecological resources of the stormwater management area, the Borough of Clementon's municipal boundaries.

Stormwater Discussion

Land development can dramatically alter the hydrologic cycle (Figure 1) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration, which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

In addition to increases in runoff peaks, volumes, and loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes, and leakage and wear from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients.

Aside from increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on

impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community (NJDEP Stormwater BMP Manual).

Background

The Borough of Clementon is a small town located in the southwest portion of the state of New Jersey in Camden County (Figure 2). Figure 3 depicts the boundaries of the Borough on a GIS orthophotographical map. Census records for 1990 and 2000 show the population of Clementon decreasing, from 5601 in 1990 to 4986 in 2000. The storm drainage basin occupies approximately 1.99 square miles. The Borough of Clementon's Stormwater Collection System contains 92 inlets or culverts discharging into various waterways. These waterways are Clementon Lake, Pillings Lake, Rowands Lake, Bottoms Lake, Silver Lake, Trout Run, Big Timber Creek, and various wetlands (Figure 4). According to NJDEP wetlands are designated as deciduous scrub, deciduous wooded, herbaceous, managed (modified), mixed scrub (deciduous dominated), mixed forest wetland (coniferous dominated), and coniferous wooded.

The Borough of Clementon has three (3) wells for potable water supply. To date (11/2004) the NJDEP has not determined wellhead-protected area for these wells. However the Borough has had its own Wellhead Protection Plan in place since 1994 using the calculated fixed radius (CFR) method based on well capacity (flow) and depth. The CFR for the wells is: Well #9 780 ft., Well #10 990 ft., and Well #11 900 ft. The wells and the CFR wellhead protected areas are shown on Figure 5. Groundwater recharge areas are demonstrated on Figure 6.

Clementon appears in Watershed Management Area 18, the Lower Delaware Region (Figure 7). This management area covers parts of Burlington, Camden, and Gloucester counties and includes 68 municipalities and 391 square miles.

A major stream flowing through the Borough is the Big Timber Creek. The Big Timber Creek drains an area of 63 square miles. Forest appear at the headwaters of the Big Timber Creek and cities at the mouth before flowing into the Delaware River (NJDEP/DWM). The Big Timber Creek contains the tributary Trout Run. Lakes along the Big Timber are Clementon Lake, Pillings Lake and Rowands Lake; and along Trout Run are Bottoms Lake and Silver Lake. A C-1 Stream segment is located upstream of Silver Lake and is designated as a State Planning Area. By definition Category One Waters (C-1 waters) are designated in New Jersey's rules for Surface Water Quality Standards (N.J.A.C. 7:9B-1.4) "for protection from measurable changes in water quality characteristics because of their clarity, color, scenic setting, other characteristics of aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance or exceptional fisheries resources". The NJDEP has proposed special water resource protection areas to protect Category One Waters in the Stormwater Management Rules, N.J.A.C. 7:8 as published in the January 6, 2003,

New Jersey Register. This special water resource protection area requires that a 300 ft buffer zone be established for Category One Waters and perennial or intermittent streams that drain into or upstream of the Category One Waters to the HUC 14 boundary.

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more Total Maximum Daily Loads (TMDLs) are needed. A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which require an NJPDES permit to discharge, and nonpoint source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

Data to determine if a waterbody is impaired are gathered from numerous sources. The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics. In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. An integrated list of proposed waterbodies and impairments is then generated.

On reviewing NJ's 2004 Integrated List of Waterbodies Sublist 5 (June 22, 2004), the following impairments may affect the Borough's waterways: the Little and Big Timber Creeks and Clementon Lake contain fish-mercury impairment, the Big Timber Creek north branch at Park Avenue in Lindenwold and south branch at Turnersville-Sicklerville Road in Washington Twp. are impaired for benthic macroinvertebrates, and the Big Timber Creek south branch at Almonesson Road in Blenheim and Blackwood Terrace are impaired for phosphorus. The south branch of the Big Timer Creek watershed is impaired for fecal coliform (river segment identification numbers 01467327 and 01467329). This area of the Big Timber Creek requires a TMDL for fecal coliform. On comparison, the 2002 Integrated List 4 contains fish advisories for mercury on the Big Timber Creek.

The Borough has exhibited only limited water quantity problems, which include flooding at Park Blvd from Big Timber Creek, Clementon Lake, and Bottoms Lake. The Clementon staff has not observed stream bank erosion, and diminished stream base flow. With one exception, all of the culverts of the Borough are sized properly. Backflow of stormwater has been observed from the culvert at Princeton and Holly Avenues.

The Ambient Parameters of pesticides, radionuclides, nutrients, VOCs, major anions, and metals are not displayed in the NJDEP GIS as of 2004 (Figure 9). Figure 10 shows the various soils of the Borough. Landscape projects are displayed in Figure 11 and are mainly forests. The NJDEP GIS show the Kirkwood Cohancey (Figure 12) as the bedrock aquifer while the Public Water Supply wells for the Borough are in the Englishtown and Potomac-Raritan-Magothy Aquifers. Finally Figure 13 demonstrates the bedrock geology.

Design and Performance Standards

The Borough will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for adequate long term operation as well as preventative and corrective maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements; and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinance, entitled the Stormwater Control Ordinance, will be submitted to the county for review and approval on or before April 2006 [24 months of the effective date of the Stormwater Management Rules.]

During construction, Borough inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed.

Plan Consistency

The Borough of Clementon is not within any adopted Regional Stormwater Management Planning Area at this time. Therefore this plan does not need to be consistent with any regional stormwater management plans (RSWMPs). If any RSWMPs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent.

To date, one TMDL is being developed for waters within the Borough of Clementon at the south branch of the Big Timber Creek for fecal coliform. The Borough will try to limit its loading of fecal coliform by implementing BMPs strategies which may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The municipality will utilize the most current update of the RSIS in the stormwater management review of residential areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS.

The Borough of Clementon's Stormwater Management Ordinance requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. During construction, Borough inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District.

The Borough of Clementon's Master Plan is consistent with the Stormwater Management Plan and the use of both Plans and the respective Ordinances will serve to enhance the goals of stormwater management planning.

Nonstructural and Structural Stormwater Management Strategies

A key area of stormwater management is known collectively as Low Impact Development or LID. LID strategies seek to reduce and/or prevent adverse runoff impacts through proper site planning with both nonstructural and structural techniques that preserve or closely mimic the site's natural or pre-developed hydrologic response to precipitation. Rather than responding to the rainfall-runoff process through centralized structural facilities, low impact development techniques interact with the process, controlling stormwater runoff and pollutants closer to the source and providing site design measures that can significantly reduce the overall impact of land development on stormwater runoff. As such, low impact development promotes the concept of designing with nature.

Low impact development includes the use of both nonstructural and structural stormwater management measures known as LID-BMPs. Of the two, nonstructural LID-BMPs play a particularly important role. The NJDEP Stormwater Management Rules at N.J.A.C. 7:8 require in Section 5.2(a) that the design of any development that disturbs at least 1 acre of land or increases impervious surface by at least 1/4 acre must incorporate nonstructural stormwater management strategies "to the maximum extent practicable." Such a development is defined in the Rules as a "major development."

Subchapter 5 of the NJDEP Stormwater Management Rules requires the maximum practical use of the following nine nonstructural strategies at all major developments:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.
3. Maximize the protection of natural drainage features and vegetation.

4. Minimize the decrease in the pre-construction "time of concentration."
5. Minimize land disturbance including clearing and grading.
6. Minimize soil compaction.
7. Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.
8. Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.
9. Provide preventative source controls.

Structural Stormwater Management Measures

In addition to the nonstructural LID-BMPs presented above, structural stormwater management measures can also be used to implement low impact development. Known as structural LID BMPs, these structural measures are identified as low impact BMPs by storing, infiltrating, and/or treating runoff close to its source. Unlike typical structural BMPs that are centrally located along a site's drainage system, structural LID-BMPs are normally dispersed throughout a development site and, like the nonstructural LID measures discussed above, provide ways to more closely mimic the site's predeveloped hydrology than standard structural BMPs. As structural facilities, the configuration, operation, and maintenance of structural LID-BMPs are similar to standard structural BMPs, although their location closer to the runoff source typically allows them to be smaller in size. Structural LID-BMPs techniques may also be recommended for stormwater management. Structural LID-BMPs include various types of basins, filters, surfaces, and devices located on individual lots in a residential development or throughout a commercial, industrial, or institutional development site in areas not typically suited for larger, centralized structural facilities. Finally, low impact development promotes the view of rainwater as a resource to be preserved and protected, not a nuisance to be eliminated. Examples include capturing roof runoff, bioretention and infiltration basins.

Ordinance Reviews

The Borough's Professional contractor has reviewed their Master Plan and relevant ordinances, and provides here a list of the sections in the Borough's land use and zoning ordinances that may be modified to incorporate nonstructural stormwater management strategies. These are the ordinances identified for potential revision. Once the ordinance texts are completed, they will be submitted to the county review agency for evaluation and approval within [24 months of the effective date of the Stormwater Management Rules]. A copy will be sent to the Department of Environmental Protection at the time of submission.

Chapter 38 of the Code of the Borough of Clementon Ordinances is entitled Land Use Procedures and includes articles on the Planning Board, the Zoning Board of Adjustments, and General Provisions. References are made to the existing Planning, Subdivision, and Zoning Ordinances set forth in Chapters 49, 249, and 298 of the

Borough Code. No development or building information is noted so stormwater management strategies either nonstructural or structural are absent.

The Planning Board is described in **Chapter 5** and considers its members, terms, organization, Master Plan adoption, regulation of land subdivision, and the Planning Board to act as the Zoning Commission. No development or building information is noted so stormwater management strategies either nonstructural or structural are absent.

Chapter 249 of the Borough Ordinances deals with land subdivision. The purpose of this ordinance is to provide rules, regulations and standards to guide land subdivisions in the Borough. Administration of these provisions is through the Planning Board.

> **249-4. Definitions: Drainage Right of Way** defines land required for installation of stormwater sewers or drainage ditches, or watercourse for preserving the channel and safeguarding against flood hazards. A sentence may be added to this definition encouraging the use of vegetated swales, natural vegetation, and other low impact development techniques as defined in N.J.A. C. 7:8-5.3 Nonstructural stormwater management strategies.
>
> **249-14. Design Standards.** A subdivider shall observe the following requirements under General, the following language should be added: "The subdivision plat shall conform to design standards that will encourage good development patterns and effective stormwater management within the municipality."
>
> **249-14. A. (1) (d) Streets** describes the requirements for streets in the Borough. The Borough has several street classifications, ranging from "Arterial," which has a minimum right-of-way of 80 feet, to "Marginal streets," which has a minimum right-of-way of 40 feet. Street paving widths are a function of the number of units served, whether a street is curbed, whether on-street parking is permitted, whether the interior streets serve lots of two acres or larger, and whether on-site topographical constraints allow design flexibility. Depending on these factors, paving width for secondary local streets has a range from 20 to 32 feet. **This section may be amended to encourage developers to limit on-street parking to allow for narrower paved widths while still accommodating the maximum access for fire-fighting equipment.**
>
> **249-14. A. (4) Public use and service areas (b)** describes where a subdivision is traversed by a watercourse, etc. Recommended language revision here is: "where a subdivision is traversed by a watercourse, drainage way, channel or street, there shall be provided a stormwater easement or drainage right-of-way conforming substantially with the lines of such watercourse and **employing low impact stormwater management techniques,** and such further width or construction, or both, as will be adequate for the purpose."

Chapter 298 is the Zoning Ordinance for the Borough of Clementon and is known as a "comprehensive ordinance regulating and restricting the use of land and the use and location of buildings and structures; regulating and restricting the height and bulk of buildings and determining the area of yards, courts, and other places surrounding them." The function of this ordinance is to "encourage the most appropriate use of land throughout the municipality." To this end property value will be conserved, overcrowding prevented, street congestion lessened, fire safety secured, adequate provisions facilitated for all utilities, open space provided, and general welfare, health, and safety promoted. For this purpose the ordinance divides and classifies the Borough into 10 zoning districts for the most appropriate use of land.

298-19 B. (2) Landscaping: Addresses areas that are not used for building and parking shall be seeded or landscaped. Language can be added that whenever possible natural vegetation shall be retained and protected to minimize and retain runoff facilitating groundwater recharge; and install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance. Further a reference to the N.J.A.C. Soil Conservation Control N.J.A.C. 2:90 is warranted.

298-19 B. (4) (b) Describes an entire area for parking to be a hard surface. Language may be modified to use pervious cover such as porous pavement, interlocking blocks or bricks (pavers), concrete or asphalt porous pavement and gravel for groundwater infiltration.

298-23 B. (12) Describes provision for collection and dispersal of storm and surface waters from the project and contributory areas and requires meeting engineering standards. Supplemental language may include the use of LID-BMPs for better control of stormwater as noted in N.J.A.C. 7:8.

298-23 B. (17) describes high rises to be provided with liberal and functioning landscaping. Language may be added that whenever possible natural vegetation shall be retained and protected to minimize and retain runoff facilitating groundwater recharge; and install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance. If natural vegetation cannot be retained, native plants should be used corresponding to soil characteristics. Further a reference to the N.J.A.C. Soil Conservation Control N.J.A.C. 2:90 is warranted.

298-23 B. (21) Road and parking areas shall be hard-surfaced and provided with curbing. This section may be amended to allow for flush curb with curb stop, or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management. Language may also be modified to use pervious cover such as porous pavement, interlocking blocks or bricks (pavers), concrete or asphalt porous pavement and gravel for groundwater infiltration.

298-24 Application procedures
Describes permit application and plan submittal, specifying locations, landscape type, and drainage facilities in lots and open spaces. Here additional general language may be added to require non-structural BMPs per the New Jersey Stormwater BMP Manual.

298-37. Other Provisions and requirements. B. Describes a continuous landscape screen. Language may be added that whenever possible natural vegetation shall be retained and protected to minimize and retain runoff facilitating groundwater recharge; and install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance. If the area is to be replanted, native vegetation should be used. The use of native vegetation requires less fertilization and watering than non-native species. Further a reference to the N.J.A.C. Soil Conservation Control N.J.A.C. 2:90 is warranted.

298-41 F. (1) and (4) Refers to a B-3 Commercial Zone in a Regional Shopping Center for buffer zones and landscaping. These paragraphs describe how the buffer strip shall be graded and planted (i.e. buffer zones of evergreen and deciduous tress planted with grass, seed or sod and shrubbery or trees). Language may be added that whenever possible natural vegetation shall be retained and protected to minimize and retain runoff facilitating groundwater recharge; and install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance. Further a reference to the N.J.A.C. Soil Conservation Control N.J.A.C. 2:90 is warranted.

298-45. Other provisions and requirements. B. Permitted uses of light industrial zone must landscape front yard areas and maintain such areas. Language may be added that whenever possible natural vegetation shall be retained and protected to minimize and retain runoff facilitating groundwater recharge; and install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance. If the area is to be replanted, native vegetation should be used accounting for local soil characteristics. The use of native vegetation requires less fertilization and watering than non-native species. Further a reference to the N.J.A.C. Soil Conservation Control N.J.A.C. 2:90 is warranted.

298-49 Parkland zone. References areas left in their natural state or improved as public parks and/or playgrounds. The recommendation here is to remove improvement language and add, "limited trails may be added for public access of natural areas."

298-53 E. (7) Protection of recycling area by means of landscaping and/or fencing shall be provided around any recycling area. Language may be added that whenever possible natural vegetation shall be retained and protected to minimize and retain runoff facilitating groundwater recharge; and install diversions, sediment basins, and similar required structures prior to any on-site

grading or disturbance. If the area is to be replanted, native vegetation should be used accounting for local soil characteristics. Further a reference to the N.J.A.C. Soil Conservation Control N.J.A.C. 2:90 is warranted.

298-57. Open Storage C. Open storage areas to be properly landscaped. Language may be added that whenever possible natural vegetation shall be retained and protected to minimize and retain runoff facilitating groundwater recharge; and install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance. If the area is to be replanted, native vegetation should be used accounting for local soil characteristics. Further a reference to the N.J.A.C. Soil Conservation Control N.J.A.C. 2:90 is warranted.

On review of **Nonconforming Uses** (298-62) it appears continuance is granted to already existing nonconformance. Existing and future nonconformance is restricted. Further no article for variances is observed in the Zoning Ordinance. If in the future proposed buildings exceed the maximum percent impervious cover and a variance or nonconformance use is granted, the developer must mitigate the impact of the additional impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge. A detailed description of how to develop a mitigation plan is presented in this Municipal Stormwater Management Plan.

As listed in the **Zoning Ordinance, Schedule of Area Requirements and Schedule of Bulk Requirements** (298:A1and 298:A3 respectively), the Borough has 4 types of residential zoning districts. Each residential district has a maximum percent impervious surface allocation ranging from 15 percent for the Garden Apartments to 30 percent for 1-family residence. Minimum lot size ranges from 7500 square feet for 1-family residential to 3 acres for the Garden apartments. Maximum coverage for non-residential zones ranges from 10 percent in the Amusement Park District to 60 percent for central business apartments up to 3.5 stories high, both have no designated lot size. However minimum lot size for retail services ranges from 2000 to 50,000 square feet with 25 to 40 per cent maximum coverage respectively. Although each zone has a maximum allowable coverage (percent impervious surface), **it is recommended that the Borough Code be amended to remind developers that satisfying the percent impervious requirements does not relieve them of responsibility for complying with the Design and Performance Standards for Stormwater Management Measures mentioned above and in N.J.A.C. 7:8-5.**

Master Plan Review

Remington Vernick Engineers of Haddonfield, NJ assisted by the Borough Planning Board, issued the current Master Plan in March 2000. The Municipal Land Use Act of 1975 requires a Master Plan. The Master Plan comprises a report of land use and development with maps and diagrams. It must show existing and proposed development and state the relationship of the development to the proposed zoning plan and ordinance. There are seven objectives of the Master Plan. Of the seven, preservation of recreational facilities, preservation and protection of open space and environmentally sensitive areas

for development, and control of development in adjacent lakes and stream corridors to assure water quality directly impact stormwater management.

The Conservation Element within the Master Plan provides "for preservation, conservation, and utilization of natural resources, including, to the extent appropriate, energy, open space, water supply, fisheries, endangered species, wildlife and other resources". Natural stands or forest are described as few, occurring adjacent to streams. Conservation is guaranteed through zoning measures but updates are recommended to the Land Development Ordinance to protect natural vegetation outside designated open space areas, particularly the Signal Hill Tract. Water resources are three sub-watersheds (HUC 14): Clementon Lake and the connecting feeder; Trout Run including Bottoms Lake, Silver Lake, Rowand Lake, and Watson Lake; and the Southwest feeder runs below Erial Road. Bottoms Lake and Silver Lake contain average to poor water quality for suspended solids with eutrophication ongoing. Rowand Lake is the State Wildlife Planning Area and a recommendation for sediment run-off control is offered. Development within 150 foot of wetlands within the Borough is to have an approval or waiver from the NJDEP. Topographic features in the Borough vary from flat land to rising slopes and elevations of approximately 200 feet above sea level. Clementon's soils derive from the Kirkwood formation and are loamy (northeast section) to sandy (southwest) (Figure 10). Drainage patterns are generally normal, however five (5) wet spots in higher areas are listed. Soil erosion hazards are severe due to steep slopes in these wet spots, and if development is planned, erosion control is mandated.

A Recreational Element is also part of the Master Plan and Clementon's open spaces are 15 various parks throughout the Borough. Future recreational development, which includes green corridors, will integrate the residents of the Borough with the undeveloped open lands in a passive manner. Trails or paths to be developed should be connected to other recreational areas within Clementon. Green corridors should respond to natural beauty while providing a reasonable system of bike and walking trails for the residents. Land use recommendation is for a bike path to connect Bottoms Lake with Silver Lake.

For its Recycling Element the Borough recycles paper, cans, plastics, leaves, tires, concrete, and tree matter from residents and commercial facilities and will continue this program.

The Municipal Land Use Law requires the inclusion of a Land Use Element in the Master Plan and is considered the most important element. The land use element is responsible for linking land use issues, policies, goals, and objectives into a comprehensive development program. The Borough of Clementon is a "developed, mature municipality with basic land use determinations made years ago". Signal Hill in the southwest section of the town is seen as a pristine area, heavily wooded with open spaces, scenic vistas, wetlands, steep slopes, and a wildlife habitat. Streams and lakes occupy the central areas of the town and include the above listed waterbodies. Land use recommendations are to establish a large lot zoning classification for Signal Hill or alternately pursue open space preservation measures to restrict development rights. To date Signal Hill is in litigation with possible Borough purchase. To protect various land parcels around the waterbodies,

reclassification to R-1 Residential is recommended. Recreational and Recycling future plans are discussed in above paragraphs. Further the Borough's intent to provide for recreational facilities are noted in the establishment of a Parkland Zoning District with municipally owned land, suitable for recreation, assigned to this zone.

Land Use/Build-Out Analysis

On performing the Land Use/Build-Out analysis for the Borough of Clementon the NJDEP Land Use 1995 GIS Map (Figure 14), the Hydrologic Unit Code Map (NJDEP GIS Figure 15), the Landscape Projects Map (NJDEP GIS Figure 11), the Zoning Map (Figure 16, Churchill Engineers 2004)), the Open Space Properties Map (Figure 17, Churchill Engineers 2004) and Vacant Land Map (Figure 18; Churchill Engineers 2004) were consulted and collectively reviewed. The Borough of Clementon's surface area is 1.99 square miles and has the following vacant land:

Table 1: Vacant Land in the Borough of Clementon (excluding Open Space)

Private Owned						
Locations	**Dimensions(ft)**	**Sq. ft.**	**Acre**	**Plate**	**Block**	**Lot**
Davis A.	100 x 150	15000	0.344	18	159	2
Cedar A.	200 x 182	36400	0.834	16	142	35-01
Audubon A.	221 x 200	44200	1.013	16	142	35-02
------	220 x 68	13600	0.311	16	142	35-03
Highland A.	110 x 50	5500	0.126	17	147	11-01
Stanert A.	100 x 50	5500	0.126	17	149	7
Clementon & Second A.	40 x100 (triangular)	2000	0.046	9	8	1
between Etlon & Delaware	50 x 22	1100	0.025	12	113	3-01
Borough Owned						
Locations	**Dimensions(ft)**	**Sq. ft.**	**Acre**	**Plate**	**Block**	**Lot**
near Clementon Gibbsboro Rd.	85 x 150	4250	0.097	4	33	22-022
Clementon A.	781 x 303.4		5	9	77	
New Freedom Rd.	650 x 275 (irregular)		4.4	9	77	6
between Mohawk &	145 x 284 (triangular)	20590	0.472	9	77	13

New Freedom						
Total Acreage:			**12.79**	**12.79/640 = 0.02 Square Miles**		

1 acre = 43,650 Sq.ft.; 1 square mile = 640 acres

As noted in the Master Plan review above, the Borough of Clementon is a "developed, mature municipality with basic land use determinations made years ago". This mature municipality is shown with the minimum of barren and vacant land and nearly completes development in urban areas. There are no significant agricultural lands in the Borough per the Zoning Ordinance or Open Space, and the Land-Use Map. Forests and wetlands abound around the waterways. Parkland is to be left in its natural state or improved as public parks and/or playgrounds. Open Space may be designated in Residential Zones (R-1, 2, 5) and Parkland (Zoning Ordinance). Open Space is classified in the Borough by ownership with five (5) designations: Borough Owned Parkland, Borough Owned Open Space, Private Owned Open Space, County Owned Open Space, and NJDEP Owned Open Space (Figure 17). Alternately Open Space may mean land with nondevelopment or minimum development types of uses such as golf courses, agricultural uses, parks, low density residential development; or land left undeveloped for aesthetic reason such as greenbelts, floodways, steep unstable slopes, or wetlands (Nevada Revised Statutes: Chapter 376A). In conclusion, Clementon has built-out most of its available land with 0.02 square miles of vacant land remaining. Other areas such as Parkland, wetlands, forests, and Open Spaces are restricted from development (environmentally constrained areas). Therefore the Borough of Clementon, showing less than one square mile of vacant land, is not required to do a build-out analysis (N.J.A.C. 4-2 (c) 10).

Mitigation Plans

This mitigation plan is provided for a proposed development that is granted a variance or exemption from the stormwater management design and performance standards. Presented is a hierarchy of options.

Mitigation Project Criteria

1. The mitigation project must be implemented in the same drainage area as the proposed development. The project must provide additional groundwater recharge benefits, or protection from stormwater runoff quality and quantity from previously developed property that does not currently meet the design and performance standards outlined in the Municipal Stormwater Management Plan. The developer must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 (Maintenance) and 9 (Structural Stormwater Management Measures) of the NJDEP Stormwater BMP Manual.

a. The applicant can select one of the following project areas listed to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information on the projects can be obtained from the

Borough representative and will be determined on a case-by-case basis. Listed below are project areas that can be used to address the mitigation requirement.

Groundwater Recharge:

To be determined

Water Quality:

To be determined

Water Quantity:

To be determined

2. If a suitable site cannot be located in the same drainage area as the proposed development, as discussed in Option 1, the mitigation project may provide mitigation that is not equivalent to the impacts for which the variance or exemption is sought, but that addresses the same issue. For example, if a variance is given because the 80 percent TSS requirement is not met, the selected project may address water quality impacts due to a fecal impairment. Listed below are specific projects (areas) that can be used to address the mitigation option. Coordination with the Borough representative on the selected area and specifics needs to be done by the developer or his engineer.

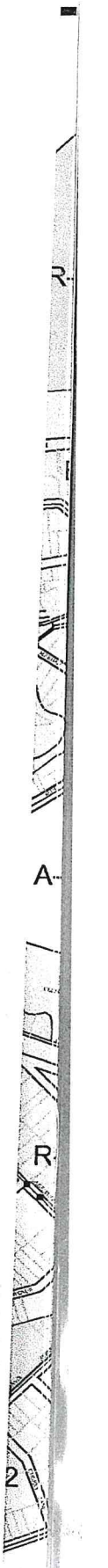
Water Quality

- Re-establish a vegetative buffer (minimum 50 foot wide)
  - Provide run-off control for sediment around (prior to) Rowand Lake the State Wildlife Preservation Area
  - Across from the Water Garage along Big Timber Creek to prevent erosion
- Provide goose and/or fowl management measures
  - Around Well #11
- Provide groundwater recharge
  - In five (5) elevated wet spots as listed in the Master Plan (Pine Hill Boy Scout Camp, Pawnee Ave., Palethorp Ave., Pierce Ave., and Signal Tract near Erial Rd.)
- Control flooding;
  - Park Blvd from Big Timber Creek, Clementon Lake, and Bottoms Lake
- Or control nonpoint source pollution;
  - From entering Bottoms Lake and/or Silver Lake

- Others to be determined

The Borough of Clementon shall be given sufficient information from the project engineer on each proposed project, including size of the project, permit requirements, land ownership, and estimated project costs (i.e., permitting fees, engineering costs, construction costs, and maintenance costs).

The Borough of Clementon may allow a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified in a Municipal Stormwater Management Plan. The funding must be equal to or greater than the cost to implement the mitigation outlined above, including costs associated with purchasing the property or easement for mitigation, and the cost associated with the long-term maintenance requirements of the mitigation measure.



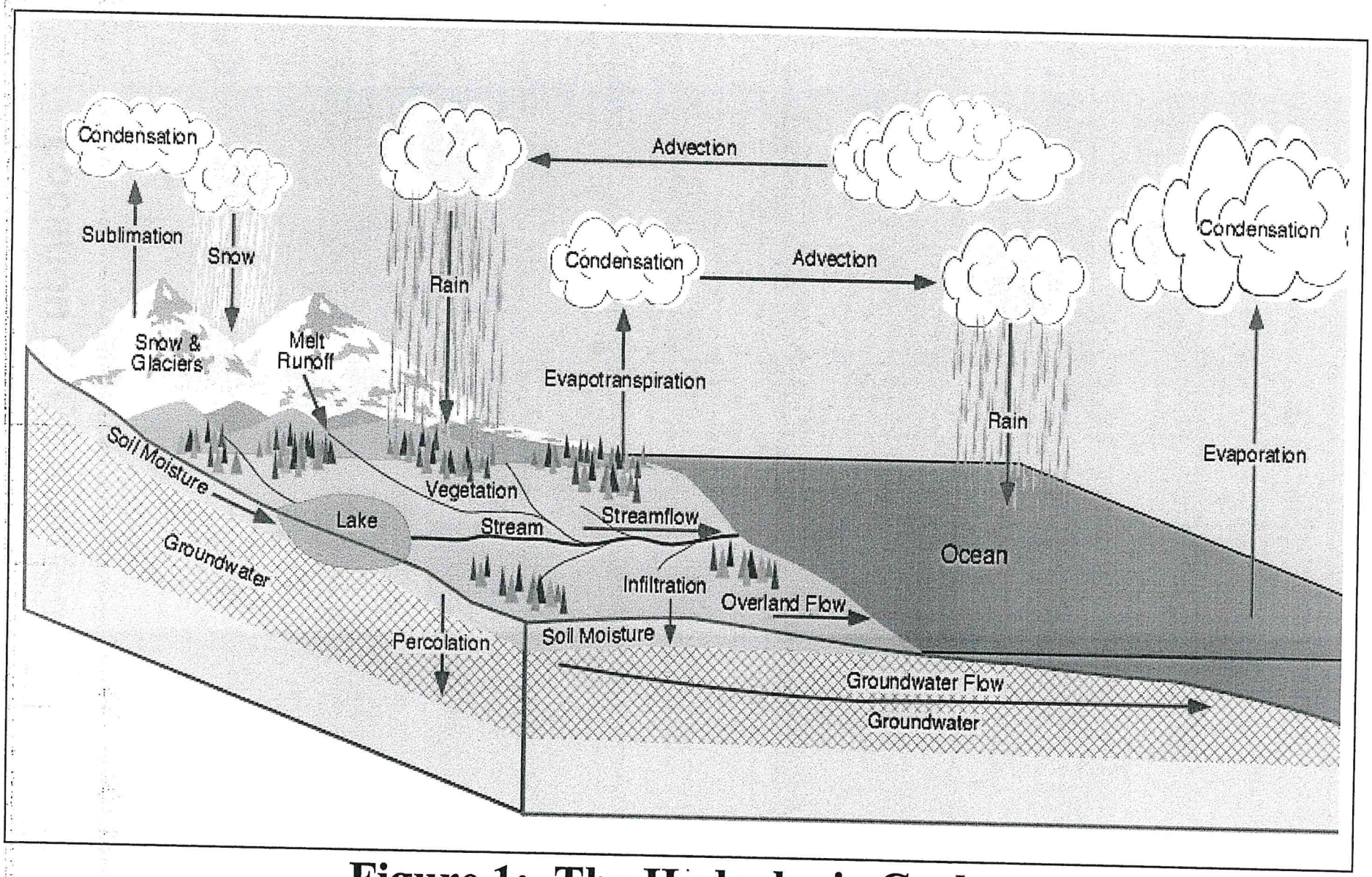


Figure 1: The Hydrologic Cycle

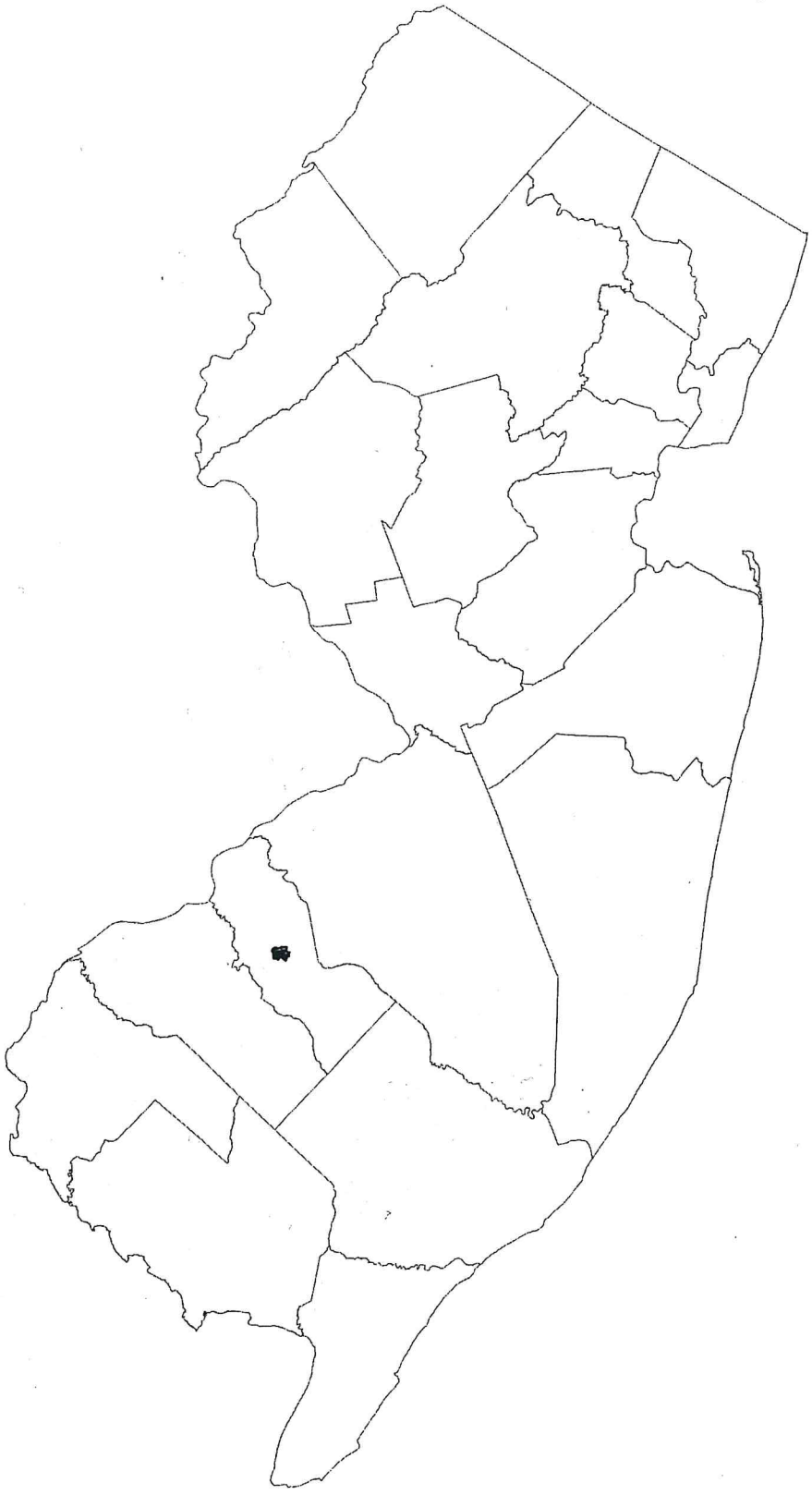
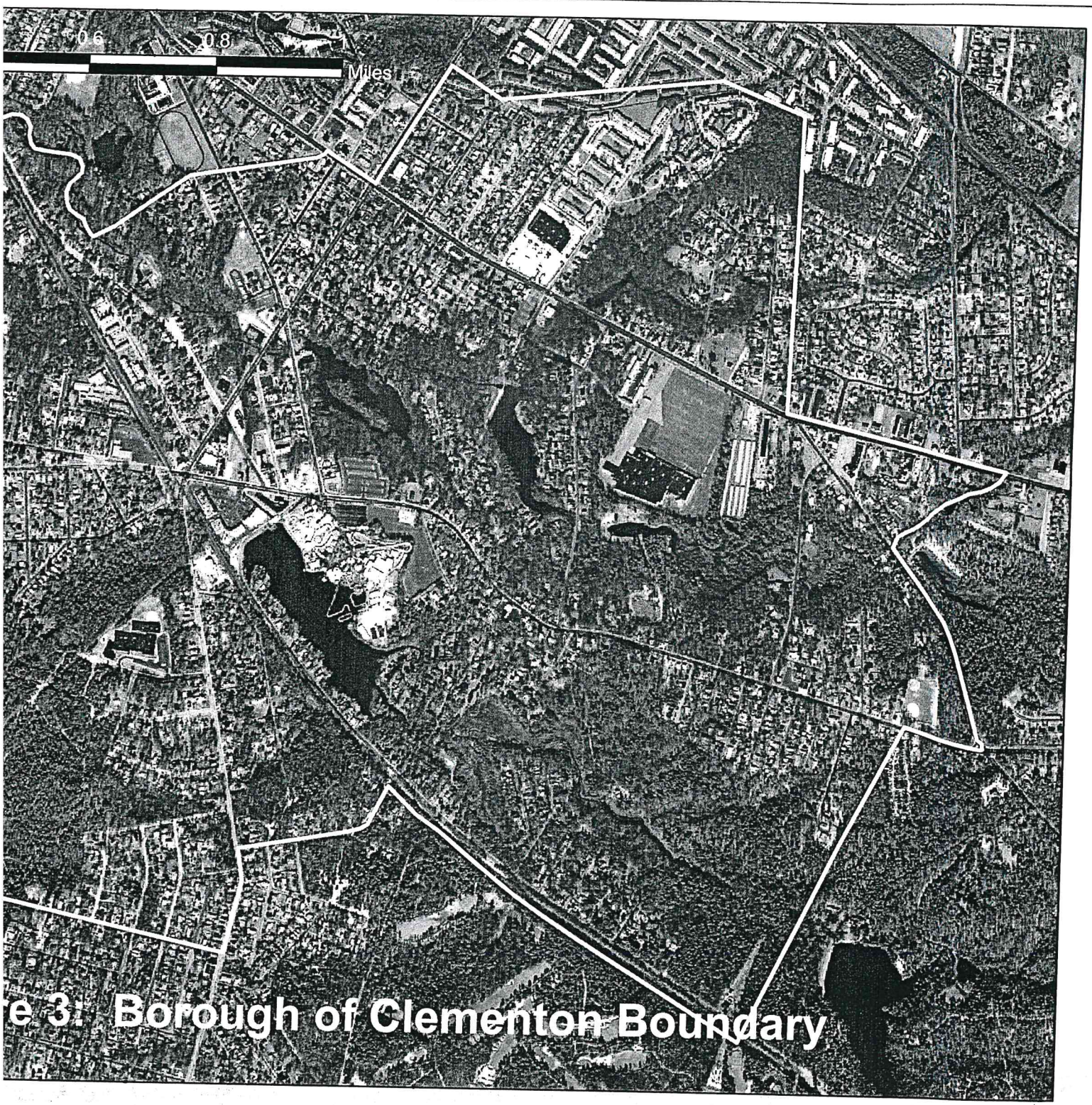


Figure 2:
Location of Clementon, NJ
within Camden County



e 3: Borough of Clementon Boundary

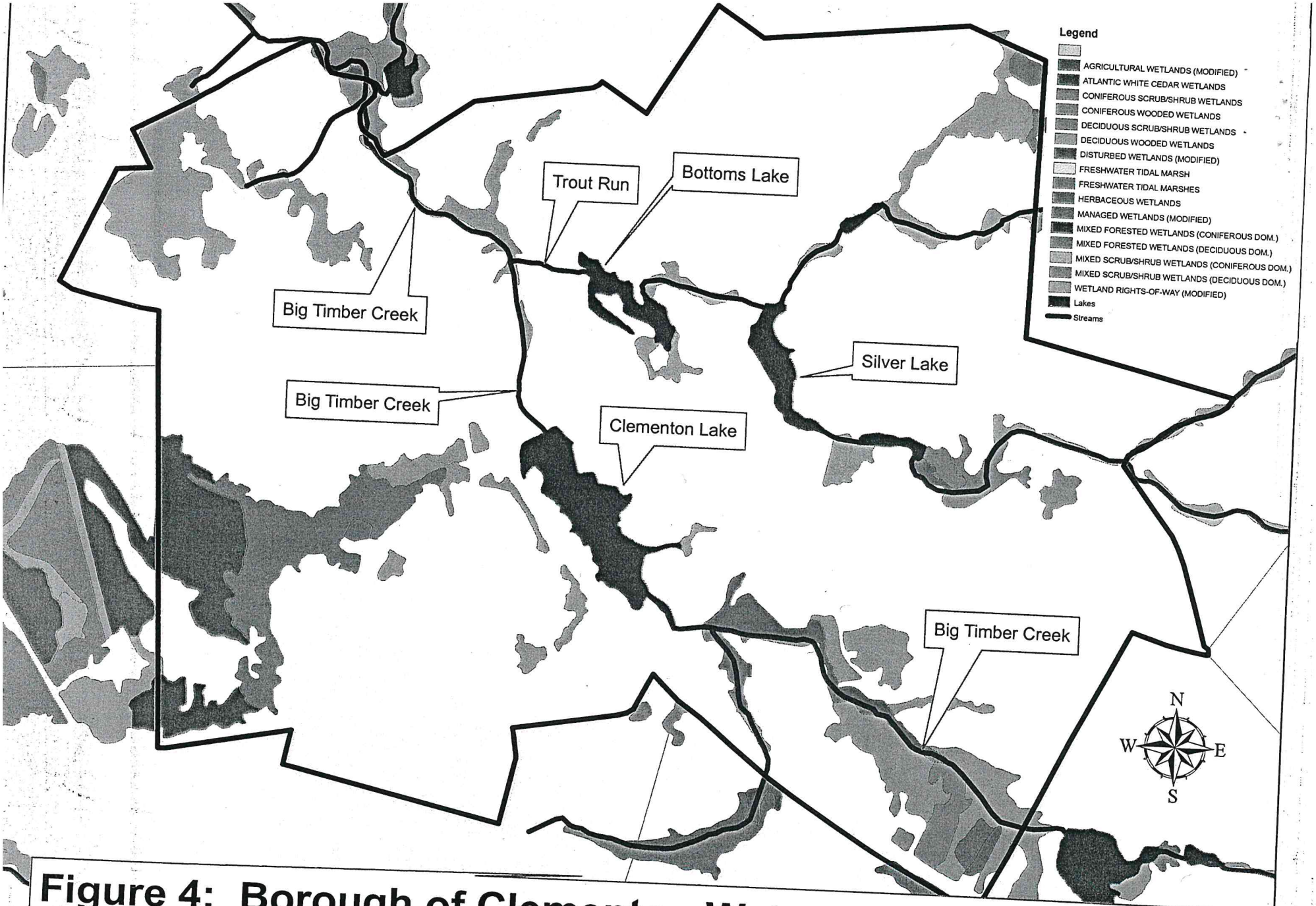


Figure 4: Borough of Clementon Waterways and Wetlands

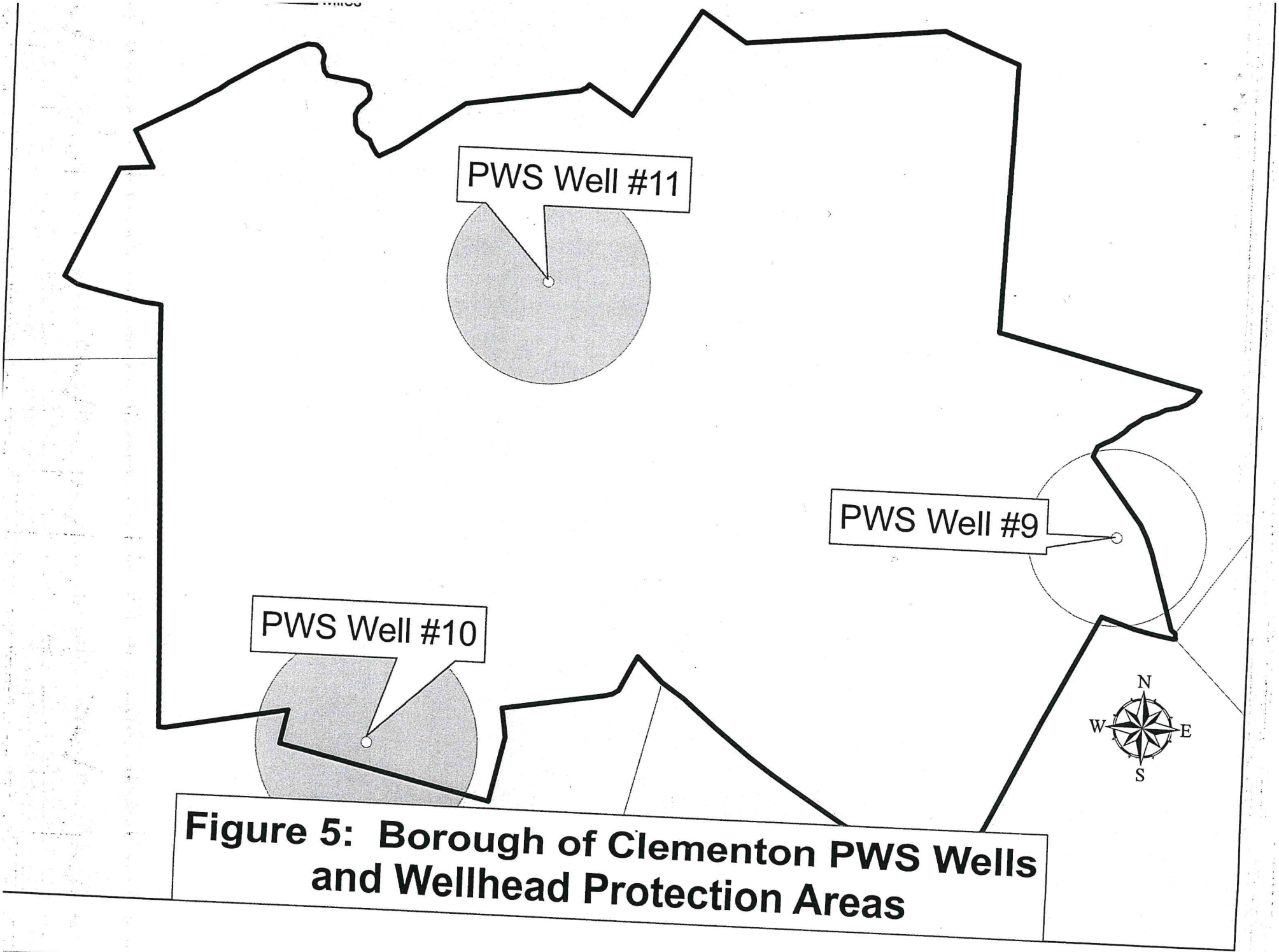


Figure 5: Borough of Clementon PWS Wells and Wellhead Protection Areas

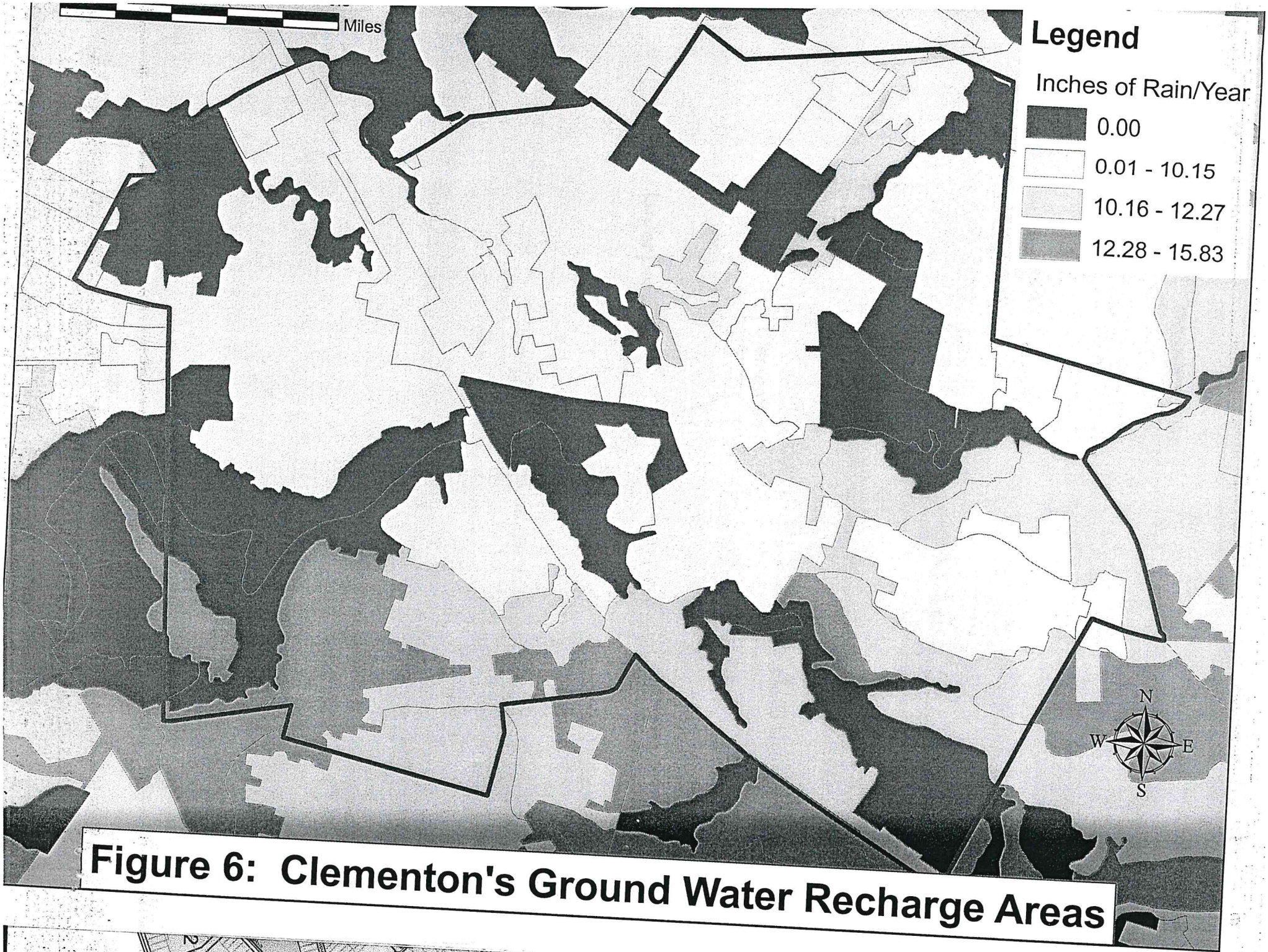


Figure 6: Clementon's Ground Water Recharge Areas

Figure 7: Watershed Management Area 18, The Lower Delaware

Figure 8: Parcel Percent Impervious Cover in Clementon

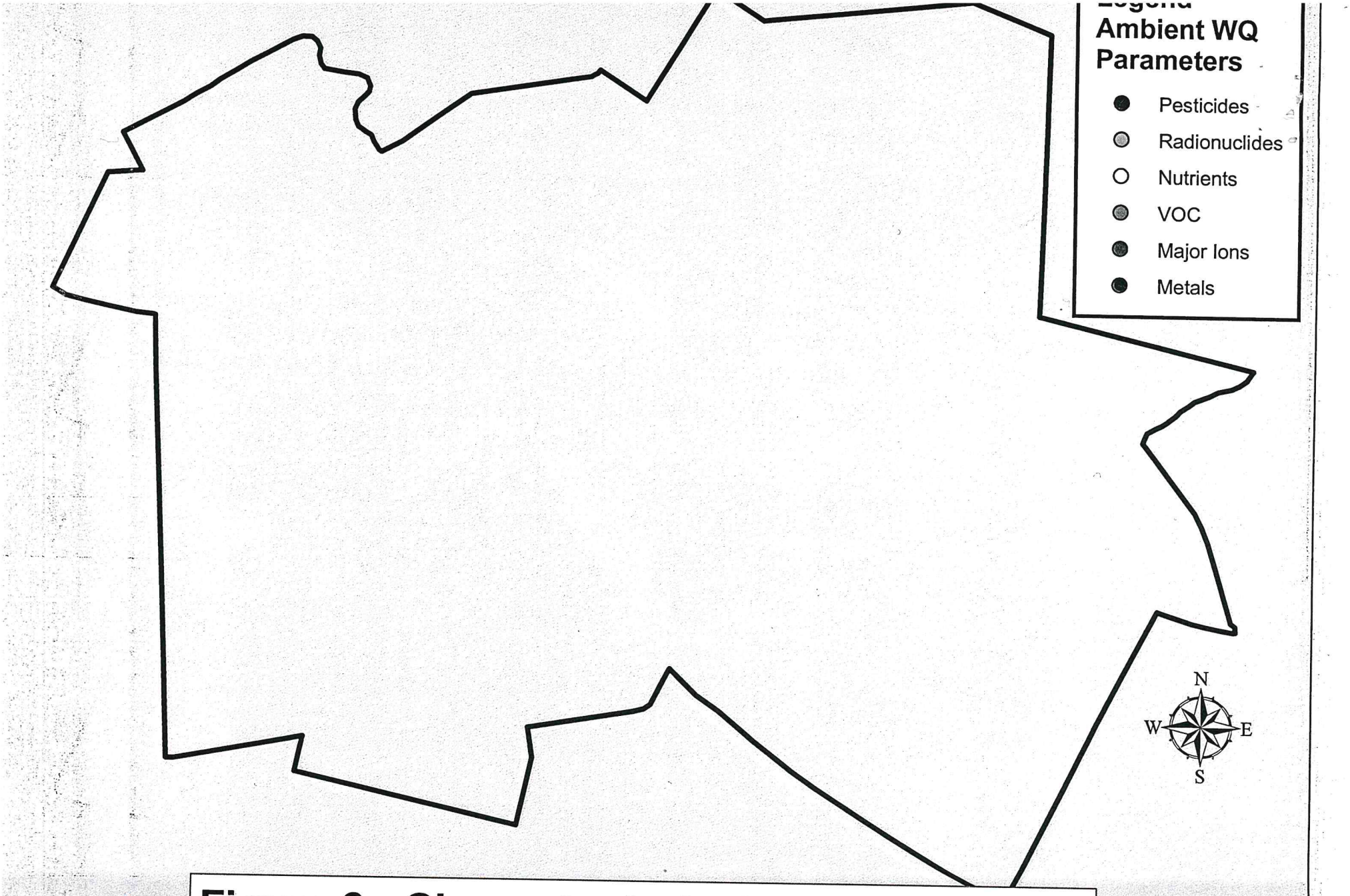


Figure 9: Clementon's Ambient Parameters

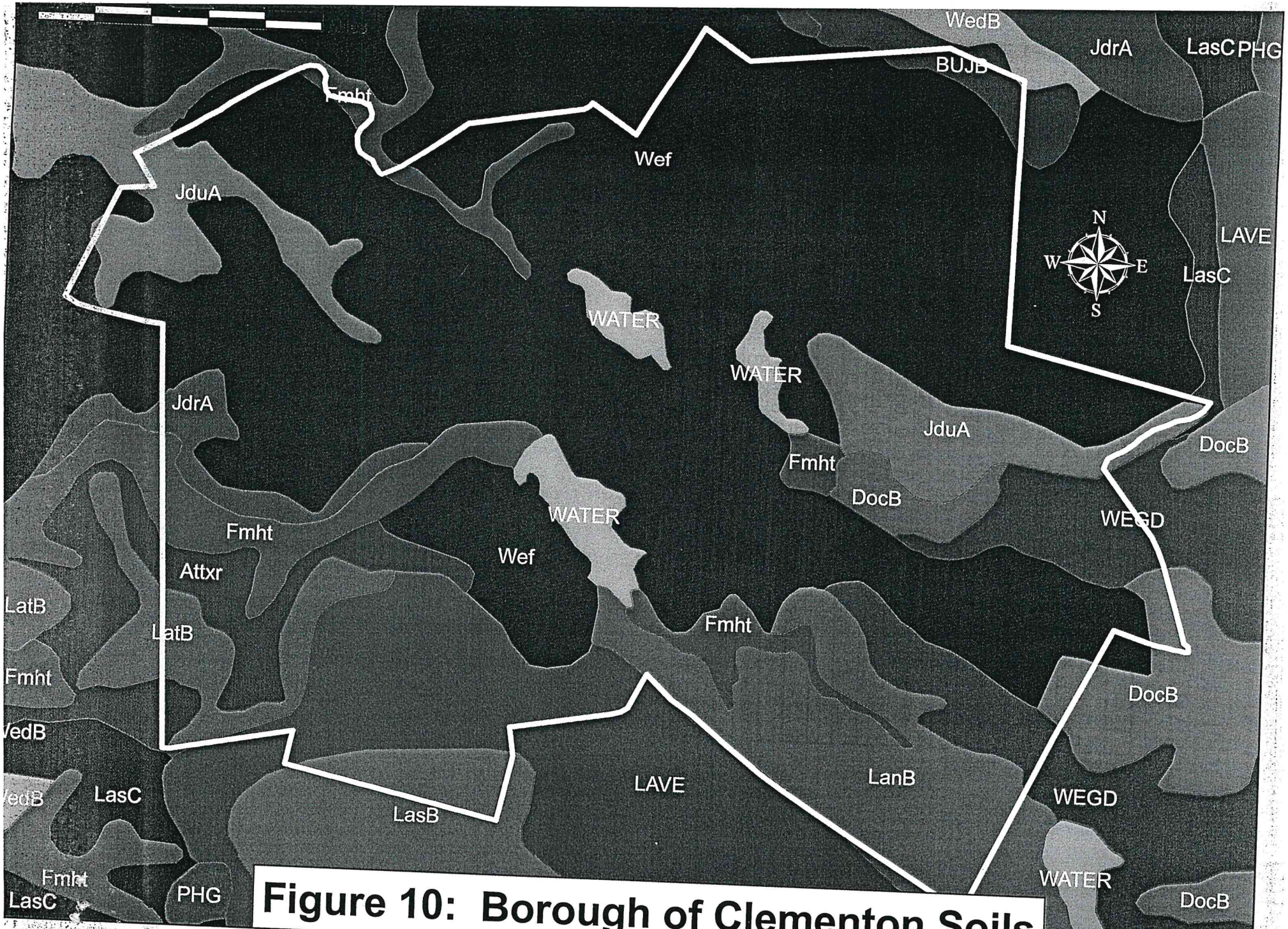


Figure 10: Borough of Clementon Soils

Figure 10: Borough of Clementon Soils Legend

SYMBOL	NAME
Attxr	Atsion-Berryland sands, rarely flooded
BUJB	Buddtown and Barclay loamy fine sands, 0 to 5 percent slopes
DocB	Downer loamy sand, 0 to 5 percent slopes
Fmht	Fluvaquents, loamy, frequently flooded
JdrA	Jade Run fine sandy loam
JduA	Jade Run-Weeksville-Urban land complex
LAVE	Lakewood and Evesboro sands, 10 to 30 percent slopes
LanB	Lakehurst-Lakewood sands, 0 to 5 percent slopes
LasB	Lakewood sand, 0 to 5 percent slopes
LasC	Lakewood sand, 5 to 10 percent slopes
LatB	Lakewood fine sand, 0 to 5 percent slopes
WATER	Water
WEGD	Westphalia soils, 10 to 15 percent slopes
WedB	Westphalia loamy fine sand, 2 to 5 percent slopes
Wef	Westphalia-Buddtown-Urban land complex

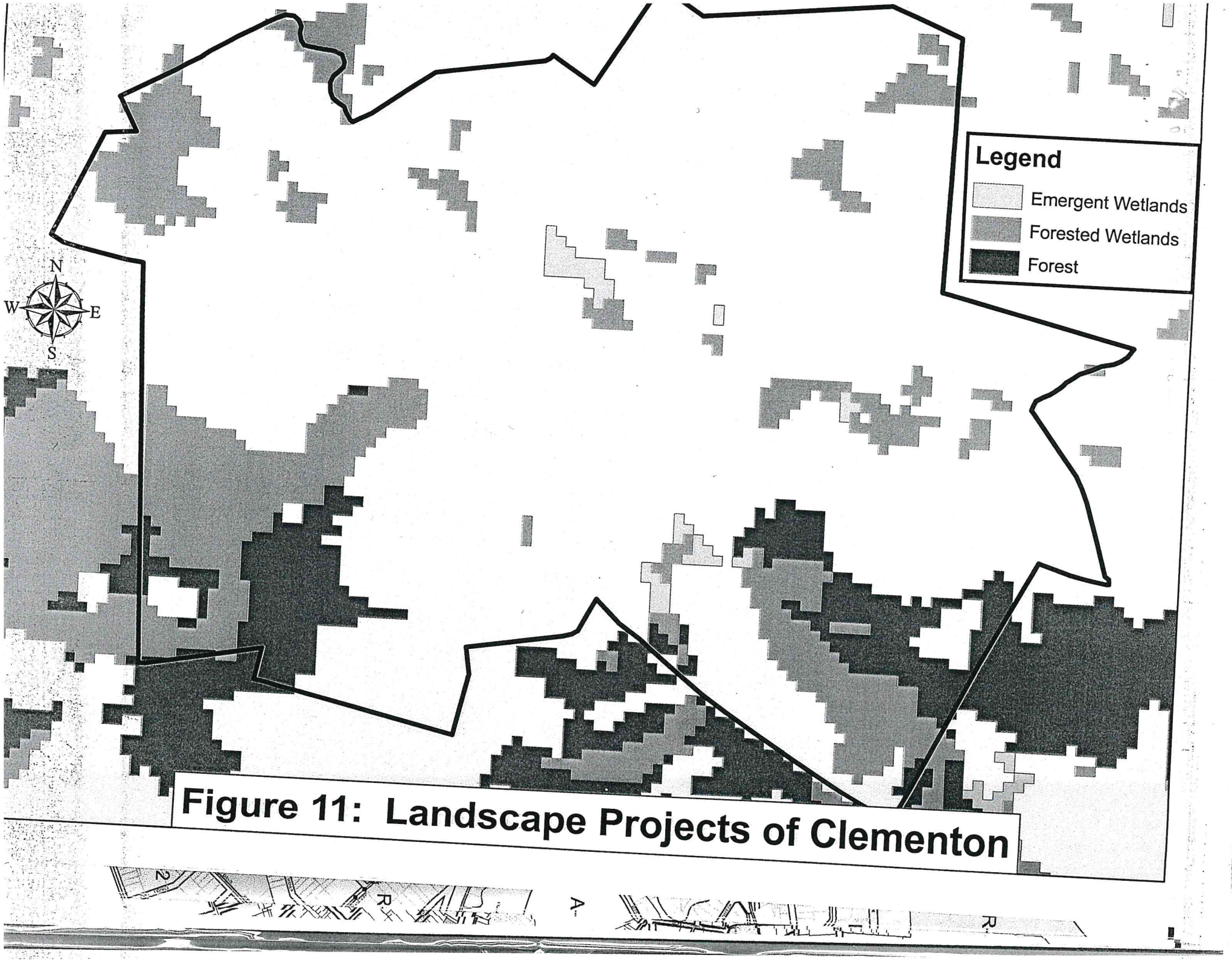


Figure 11: Landscape Projects of Clementon

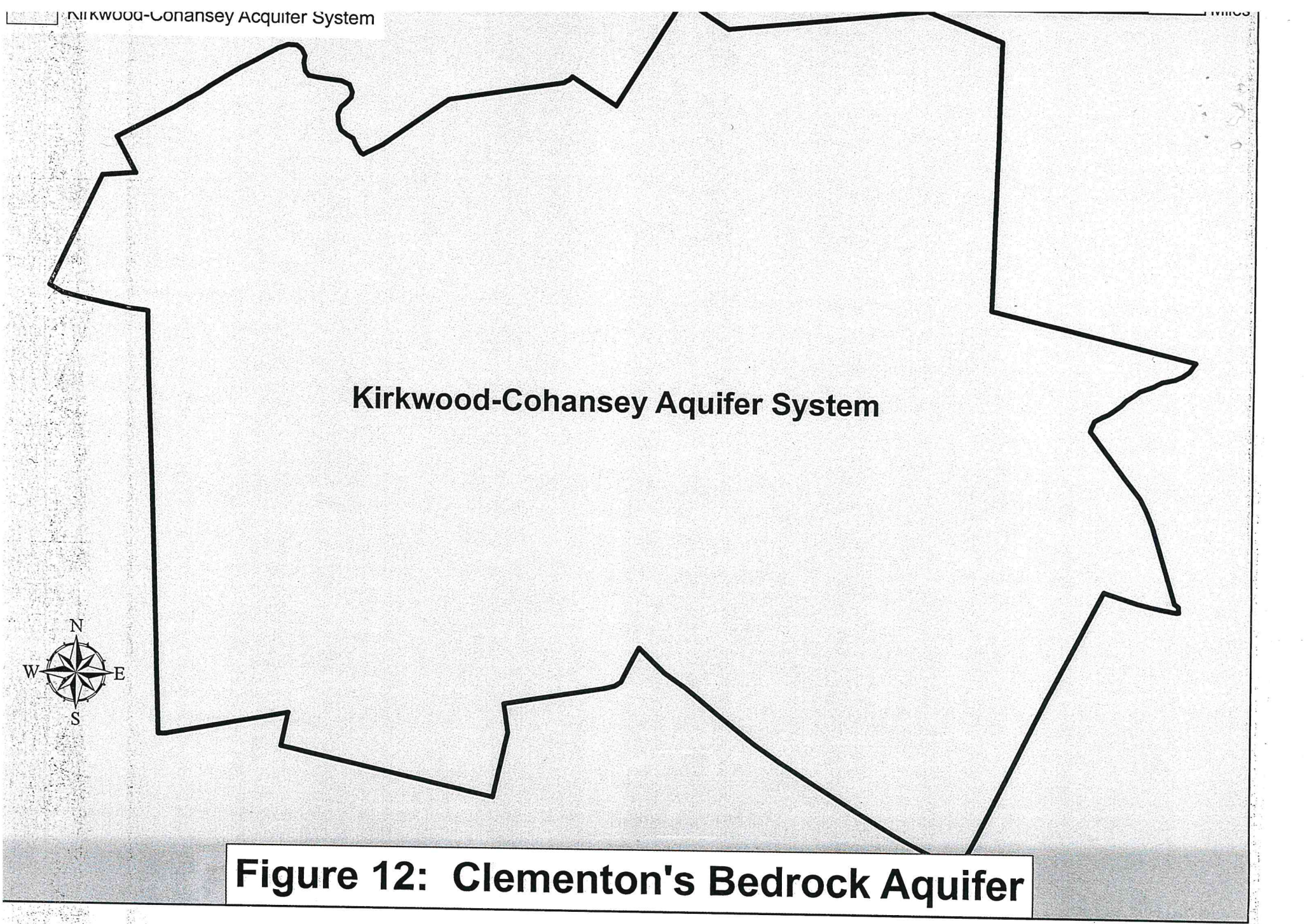


Figure 12: Clementon's Bedrock Aquifer

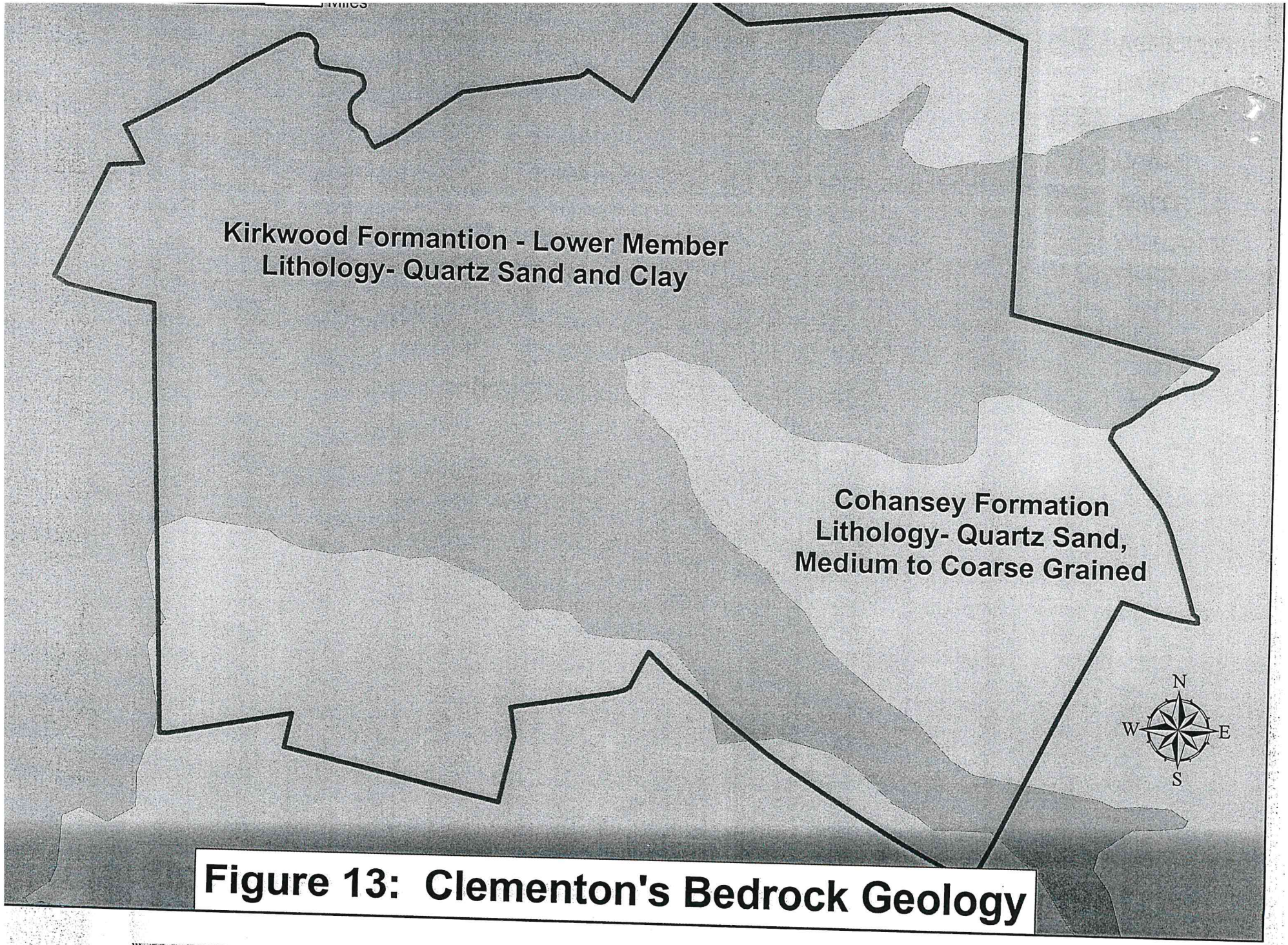


Figure 13: Clementon's Bedrock Geology

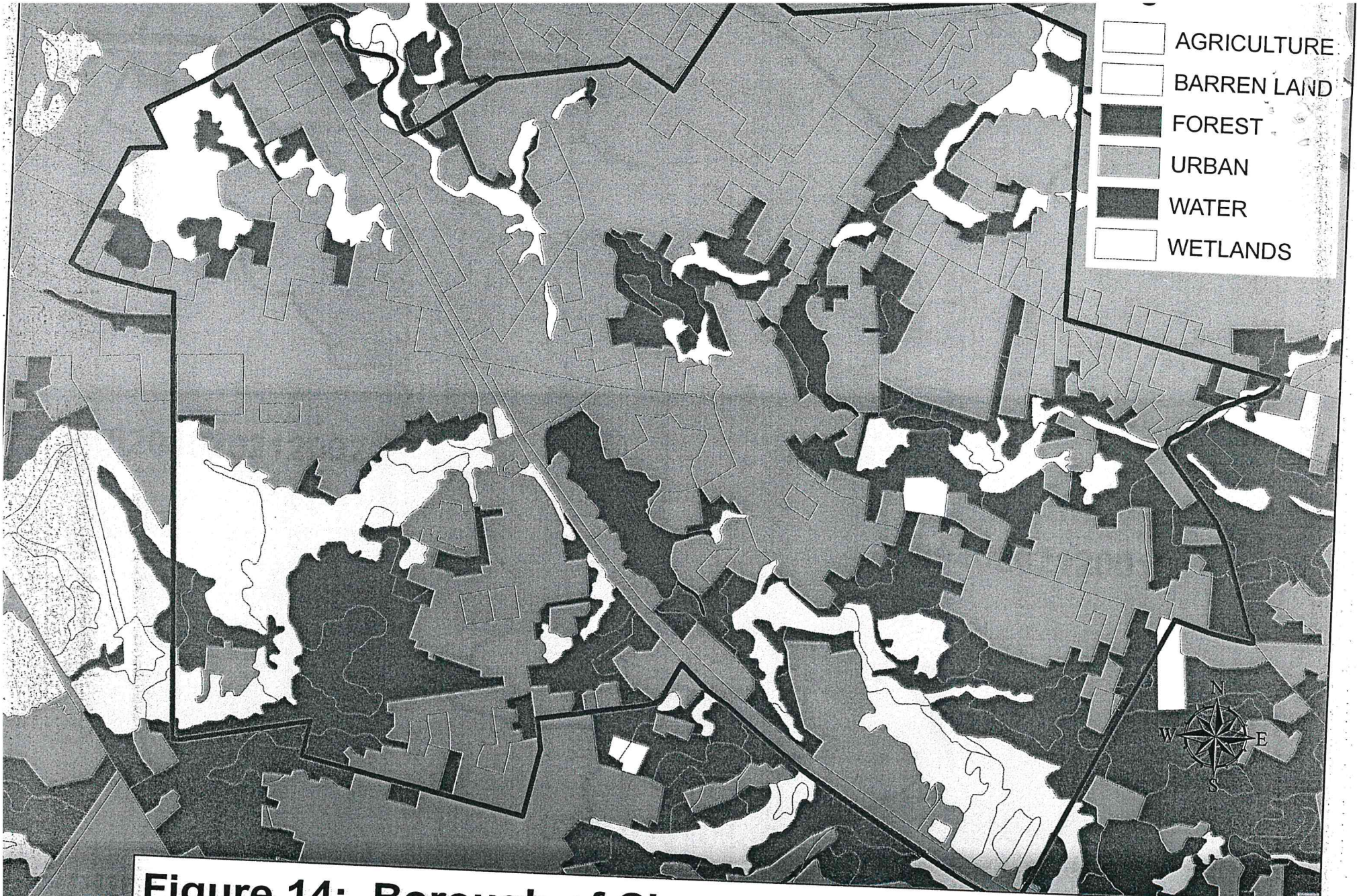


Figure 14: Borough of Clementon Land-Use 1995

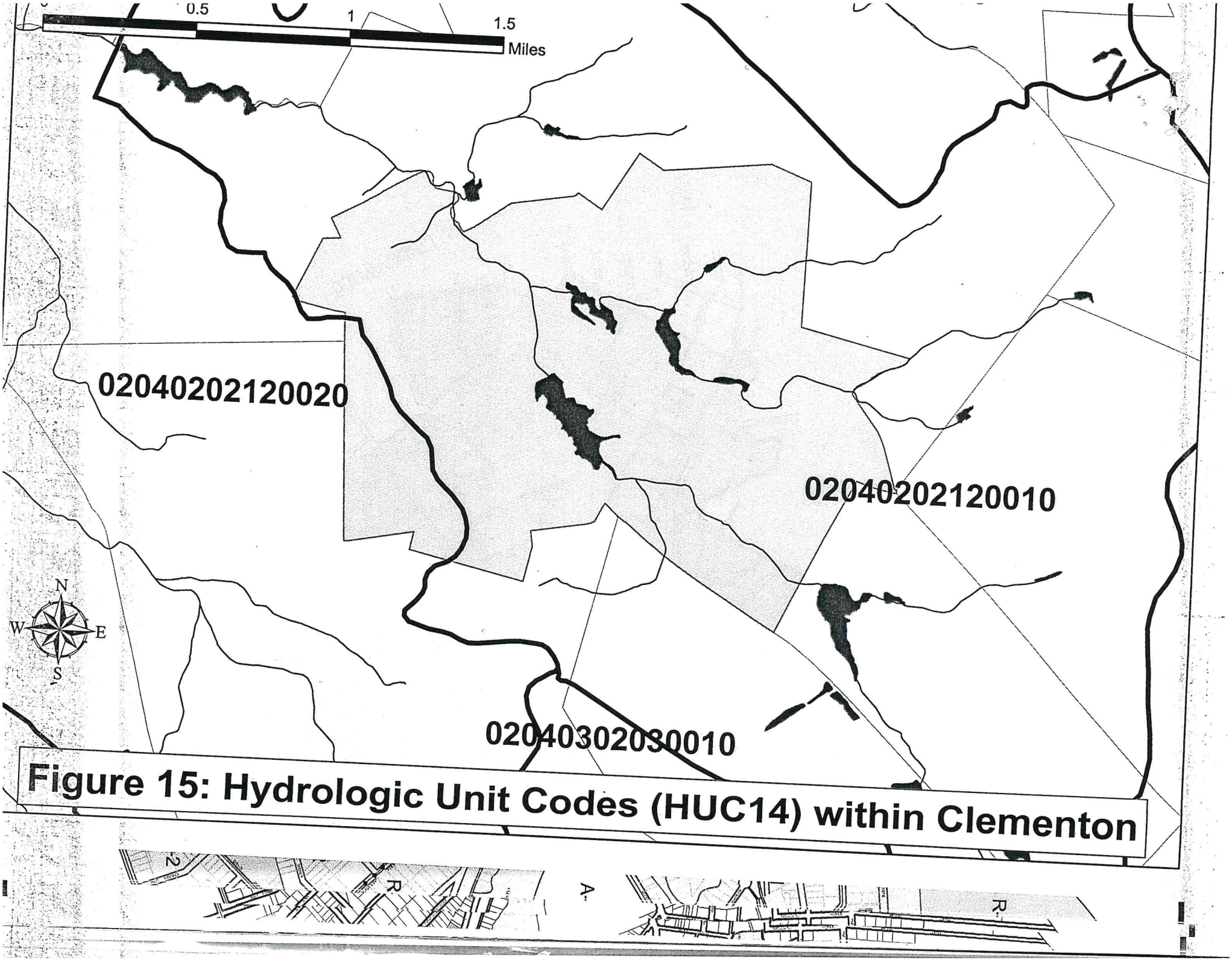


Figure 15: Hydrologic Unit Codes (HUC14) within Clementon