BIRDSALL ENGINEERING, INC.
CONSULTING & ENVIRONMENTAL ENGINEERS

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MUNICIPAL STORMWATER MANAGEMENT PLAN

BOROUGH OF BRIELLE
MONMOUTH COUNTY, NEW JERSEY

BRIELLE PLANNING BOARD

APRIL 2006

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STORMWATER MANAGEMENT PLAN
BRIELLE BOROUGH

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1.0 INTRODUCTION

The Borough of Brielle has consulted with Birdsall Engineering, Inc. (BEI) to devise a Municipal Stormwater Management Plan (MSWMP) for the Borough. This MSWMP outlines a strategy for Brielle to alleviate the Borough's stormwater management problems through the incorporation of more stringent stormwater policies within their Land Use Regulaitons. The creation of this MSWMP is required by N.J.A.C. 7:14A-25 Municipal Stormwater Regulations, which were proposed in the New Jersey Registrar on January 6, 2003, and were made effective on February 2, 2004.

This plan also includes a Stormwater Control Ordinance (Appendix A). Following the adoption of this MSWMP, the Borough will be adopt a Stormwater Control Ordinance to apply the goals of this plan and the State's newly adopted stormwater management design and performance standards to include "Major Development" applications, which includes development or redevelopment projects that either disturb one or more acres of land, or propose to add ¼ acre or more of impervious surface. Also, this plan will incorporate all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules as well as the nine planning goals that should be addressed when devising municipal level stormwater management plans (N.J.A.C. 7:8-2.2). Further, the plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating the newly adopted stormwater design and performance standards for new development proposals. 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 to receiving water bodies. Also, to reduce the discharge of pollutants to the maximum extent practicable and protect water quality, the plan incorporates the six control measures outlined within the Phase II New Jersey Pollutant Discharge Elimination System Stormwater Regulation Program Rules (N.J.A.C. 7:14A).

To accomplish these ends, Birdsall Engineering has completed a review of the Borough's existing ordinances, the Brielle Master Plan, and other plans to ensure that nonstructural stormwater management techniques have been integrated into these documents to the maximum extent practicable. Also, a Mitigation Plan (Section 6.4) that allows Brielle, in limited circumstances, to waive the strict compliance of one or more of the performance standards where full compliance cannot be reasonably accommodated on site has also been included as Section 6.4 of this plan. As an analysis utilizing New Jersey Parcel Mapping (NJPM) software indicates that the Borough of Brielle contains under on quarter square miles of vacant land, and no agricultural lands, a Build-Out Analysis, pursuant to N.J.A.C. 7:8 4-2 has not been included in this MSWMP.

2.0 GOALS AND OBJECTIVES

To improve water quality, reduce the risk of flooding, and in turn improve the quality of life for residents of Brielle, the incorporation of more stringent stormwater management techniques has been identified as a priority by both state and local level government agencies. The new stormwater management requirements and best management practices will advance the goals and objectives of both the New Jersey Department of Environmental Protection, and the Borough of Brielle. A number of the goals and objectives stated within the Brielle Master Plan would be advanced by more stringent stormwater standards. For example, within the Borough's most recent Master Plan, which was adopted in August of 2000, the second stated objective is to "secure safety from fire, flood, panic and other natural and man-made disasters." In addition, the tenth objective identified by the Borough is to "promote the conservation and enhancement of open space and natural systems and resources, while preventing degradation of the natural and man-made environment through improper use of land." As the incorporation of more stringent stormwater management design standards is analogous to these goals, this MSWMP is consistent with the goals of the Borough of Brielle.

Further, the New Jersey Department of Environmental Protection (NJDEP) has established a minimum set of goals and objectives that all municipal stormwater management plans should follow, they include 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.

This Municipal Stormwater Management Plan will also incorporate the Goals and Objectives that have been established for municipalities within Watershed Management Area 12, which include:

- Providing healthy and naturally diverse habitats to support plants and wildlife that will enrich the lives of residents;
- Maintaining safe and plentiful drinking water supplies;

- Preserving the integrity of the freshwater and tidal benthic communities that support commercial and recreational water-related uses including boating, bathing, fishing and sightseeing;
- Development and redevelopment in Area 12 will be well-planned and environmentally responsible while maintaining, enhancing and integrating the historic, cultural, scenic, recreational and open space resources that define and strengthen the unique identities of each community.

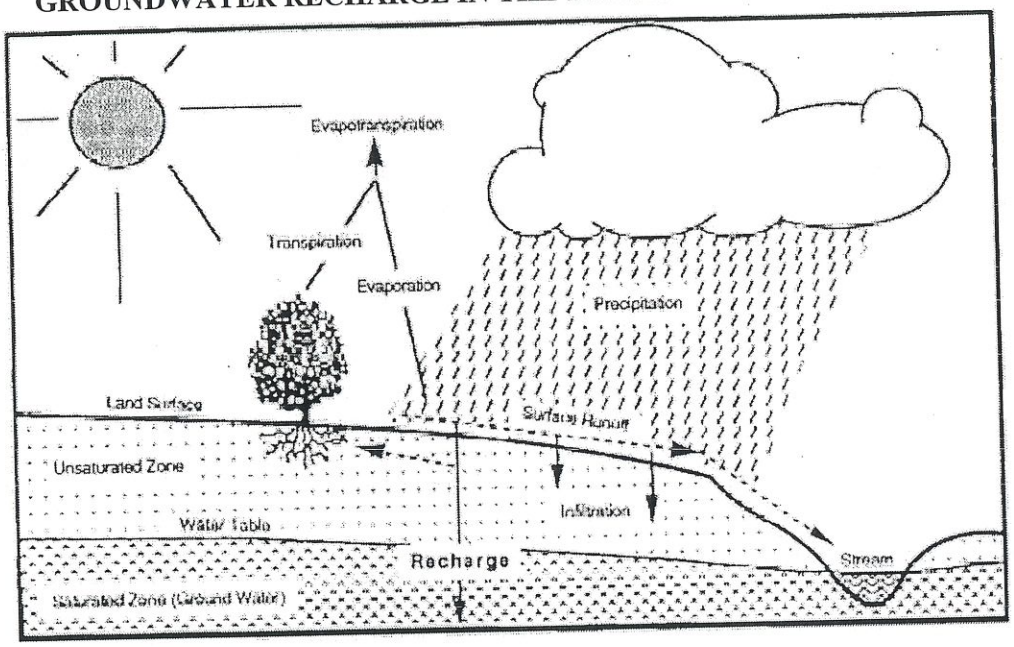
Source: Monmouth Coastal Watershed Partnerships website: http://www.shore.co.monmouth.nj.us/area12/, Accessed March 8, 2005.

To achieve these goals, this plan examines the most pressing stormwater related issues facing Brielle, and in turn proposes possible amendments to the Borough's design and performance standards to incorporate a more comprehensive code for managing stormwater. By examining the Borough's history, demographics, and current conditions concerning water quality, water quantity, and flooding issues, a clearer picture can be drawn in regards to what the stormwater management issues are at this time, and what type of policy amendments should be taken to improve them. This plan also calls for additional stormwater management regulations to be adopted by the Borough in order to ensure that preventative and corrective maintenance strategies have been formulated to ensure the long-term efficacy of stormwater management facilities.

3.0 EFFECTS OF STORMWATER RUNOFF

The hydrologic cycle is defined as the constant cyclical movement of water from the ground to the atmosphere and back to the ground. As illustrated by the figure below, this process includes evaporation, transpiration, evapotranspiration, condensation, transport, precipitation, infiltration, percolation, surface runoff, interflow, and groundwater flow. Land development has a dramatic effect on the natural function of this process.

GROUNDWATER RECHARGE IN THE HYDROLOGIC CYCLE



Source: New Jersey Geological Survey Report GSR-32.

Prior to development, native vegetation acts to both intercept falling precipitation, and return water that has infiltrated into the ground through evapotranspiration. By clearing vegetation, compacting soil, and replacing it with impervious cover, lawns, or landscaping, the development process serves to reduce the natural rate of water that may infiltrate into the soil, and in turn evapotranspiration.

In developed areas, following a precipitation event, both the volume and the rate of stormwater runoff will increase in proportion to the amount of additional impervious cover generated through a given development. Often gutters, channels and storm sewers, are the tools with which this additional stormwater is carried to local waterways. These man-made stormwater management tools transport water more quickly which causes the stormwater flows in downstream waterways to peak faster and higher than would be produced in a natural state. The increased peak flow during and shortly after a precipitation event produce greater fluctuations between normal and storm flow rates, which can increase channel erosion.

Table 1: The Effect of Impervious Cover on Runoff	
Share of Land With Impervious Cover	**Share of Rainwater that Becomes Runoff**
0% (natural state)	10 %
10-20%	20%
35-50%	30%
75-100%	75-100%
Source: NJDEP *Planning for Clean Water: The Municipal Guide* Trenton, NJ 2000.	

Not only does the development process increase the peak rate of stormwater flows, the addition of impervious cover also results in water pollution. Pollutants carried within stormwater runoff can take the form of nutrients such as nitrogen and phosphorous which encourage the growth of algae in downstream water ways, or trash and oils that accumulate on sidewalks and roadways between precipitation events. In locations where stormwater sewers discharge runoff directly into a stream, the aggregate accumulation of sediment and pollutants that are carried within it are dumped directly into local waterways. In addition to the chemical and physical contaminants, runoff from impervious systems also requires another form of pollution, heat. When rain falls on pavement that has collected heat through the day, the temperature of runoff can reach as high as 83 degrees Fahrenheit, which is sufficiently warm enough to damage sensitive plant and animal species. Table 2 below, includes a comprehensive list of the possible pollutants contained within untreated stormwater flows.

Table 2: Pollutants Carried in Stormwater
The following pollutants collected and carried in stormwater runoff can seriously degrade water quality in the community:
Nutrients- Include nitrogen and phosphorous, which plants need to grow. However, high levels can cause a health hazard in drinking water and stimulate excessive aquatic plant growth, which can ultimately lower dissolved oxygen levels in the water, causing fish and other aquatic life to smother. Algae blooms are examples of how excess nutrients pollute. Sources of excess nutrients include animal waste, fertilizers, septic systems, road salt applications and auto emissions. About half of the fertilizers applied to lawns in the New Jersey coastal zone enter streams and head to the bay and ocean.
Pathogens- Are disease causing bacteria and viruses associated with the presence of fecal matter. They affect human health directly when people contact contaminated water and consume shellfish. Sources include failing septic systems, animal waste, and boat sanitation facilities.
Sediment- Is fine particles of eroded soil or sand. Common origins are concentrated, excessive stormwater runoff from construction sites. Sediment smothers aquatic habitat, carries pollutants bound to soil particles, makes water cloudy and inhibits the breeding and movement of aquatic species.
Toxic Contaminants- Include pesticides as well as heavy metals such as copper, lead and zinc which are commonly found in old paint, tires, lawn chemicals and preservatives. They attach to sediments, resist breakdown, accumulate in organisms and represent threats to the food chain.
Debris- Consists of various items of trash, such as old tires, shopping carts and plastics. It comes from illegal dumping, street litter, and boating waste. It threatens aquatic life and detracts from recreational and aesthetic values.
Oil- Is one of the worst offenders. One gallon of oil dumped down a storm drain can create a slick up to 8 acres and may pollute up to 1 million gallons of water.
Thermal Stress- From elevated water temperatures reduces survival rates and disease resistance of valued native species and allows the spread of non-native (exotic) species. Water temperature rises because of increased pavement near streams, loss of vegetated stream buffers and stream channelization.
Source: Association of New Jersey Environmental Commissions (1998, Spring). ***ANJEC Report***

4.0 CURRENT CONDITONS

4.1 SETTING

In 1919, the Borough of Brielle was created from a portion of Wall Township. The Borough is situated in east-central New Jersey, at the southeastern tip of Monmouth County. It lies some fifty miles south of New York City, and approximately seventy miles east of Philadelphia. The boundaries of the Borough contain an area of 1.65 square miles. The Manasquan River serves as Brielle's southern boundary and to the east, north and west, the Borough borders Manasquan Borough and Wall Township.

Over the years, and particularly since World War II, the town has grown into a residential community with many of its citizens commuting to the New York metropolitan area. Its prime local industry is still connected with the waterfront with more than 200 commercial and charter fishing boats plus private pleasure craft. The Borough offers residents a number of amenities including; yacht clubs, marinas and recreational boating. Brielle also has substantial recreational facilities, which include including parks and a golf course.

Brielle has no ocean frontage but has almost 4 miles of frontage on the Manasquan River, Debbie's Creek and the Glimmer Glass. Very little vacant land remains. There are approximately 4,942 residents within the Borough's 1.65 square miles, which includes the eight acre Osborn Island. Brielle is situated in the region known as the Atlantic Coastal Plain, which features broad areas of lowlands. The hills found in the western portion of the Borough are a result of sedimentary soil deposits containing erosion resistant soils than are normally found in other deposits. The highest point in the Borough is 96 feet above sea level and is located on the western portion of the Manasquan River Golf Course.

4.2 DEMOGRAPHICS

The Borough of Brielle is small, having a land area of only 1.65 square miles, and contained 4,893 residents as of the 2000 Census. Over the past twenty-five years the borough has experienced a steady growth in population. Due to the limited amount of developable land remaining in Brielle, the majority of growth has been through redevelopment and infill. The Monmouth County Planning Board projects that Brielle will continue to grow slowly over the next fifteen years, reaching a projected population of 5,080 by the year 2020.

Table 3: Brielle Population Characteristics

Year	Population	% Change
1980	4,068	N/A
1990	4,406	7.7%
2000	4,893	11.0%
2004 (Projected)	4,942	1.0%

Source: Ocean County Department of Planning: *Cross Acceptance-Final Report*, February, 2005.
http://www.shore.co.monmouth.nj.us/03230planboard/AtAGlanceFiles/Brielle.pdf

4.3 W ATERWAYS

The most significant waterbody that flows through the Borough of Brielle is the Manasquan River. As the entire Borough lies within the Manasquan's watershed, all channeled and discharged stormwater finds its way back to the river. The Manasquan River subwatershed is contained within the larger framework of Watershed Management Area 12, known as the Monmouth Coastal Watersheds Partnership. The Manasquan River Subwatershed is the longest stream system within Watershed Management Area 12, and all lands within this region eventually drain to the Atlantic Ocean via the Manasquan River. Not only is the Manasquan one of the most heavily utilized recreational waterways on the East Coast, the river is a significant source of potable water for Monmouth and Ocean County residents. To protect the watershed's natural resources, recreational opportunities, and cultural heritage, in March of 2000, the Manasquan Watershed Management Group completed the Manasquan River Watershed Management Plan.

Other notable, less volumous water bodies within the Borough include Roberts Swamp Brook, Debbies Creek, and Judas Creek, which is more commonly known as Glimmer Glass. Combined these waterways offer the residents of Brielle over four miles of waterfront property. The incorporation of more stringent stormwater regulations will be a vital tool for the Borough of Brielle to protect these fragile coastal lands.

4.4 WATER QUALITY

To further these public goals, the New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. Currently, there are over 800 AMNET sites within the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. The data is used to generate a New Jersey Impairment Score (NJIS). According to these scores, the waterway is then classified as "non-impaired", "moderately impaired", or "severely impaired". These designations are determined by the following criteria:

Table 4: New Jersey Department of Environmental Protection AMNET Program Waterway Classification Criteria	
Non-Impaired	Benthic community comparable to other undisturbed streams within the region. A community characterized by a maximum taxa richness, balanced taxa groups and good representation of intolerant individuals.
Moderately Impaired	Macroinvertebrate richness is reduced, in particular EPT taxa. Taxa composition changes result in reduced community balance and intolerant taxa become absent.
Severely Impaired	A dramatic change in the benthic community has occurred. Macroinvertebrates are dominated by a few taxa that are very abundant. Tolerant taxa are the only individuals present.
Source: New Jersey Department of Environmental Protection Bureau of Freshwater and Biological Monitoring (NJDEP/BFBM): *http://www.state.nj.us/dep/wmm/bfbm/*. Accessed: March 30, 2005.	

The Manasquan River ranges from "non-impaired" to "severely impaired" according to AMNET parameters. The testing location at Squankum, which is in closest proximity to Brielle, has been allocated to Sublist 5, due to excessive phosphorous levels.

In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. 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. The integrated list is divided into five different sublists. The following table illustrates how those sublists were determined:

Table 5: New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d) Integrated List) Sublist Criteria	
Sublist 1	Attaining a water quality standard and no use is threatened.
Sublist 2	Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened.
Sublist 3	Insufficient or no data and information to determine if any designated use is attained.
Sublist 4	Impaired or threatened for one or more designated uses but does not require the development of a TMDL. (Three Categories). 1.TMDL has been completed. 2.Other enforceable pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future. 3. Impairment is not caused by a pollutant.
Sublist 5	The water quality standard is not attained. The waterbody is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL.
Source: New Jersey Department of Environmental Protection: http://www.state.nj.us/dep/wmm/sgwqt/wat/integratedlist/integratedlist2004.html.Accessed March 30, 2005	

Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more Total Daily Maximum Load (TMDL) 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 non-point sources, which interfere with 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 BMP's.

Both the estuarine and freshwater portions of the Manasquan River are listed on The New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(b)), which was issued in June of 2004. The results of water quality testing analysis indicate that the Manasquan River does not attain water quality standards for benthic macroinvertebrates and phosphorous. Also, the estuarine portion of the Manasquan does not meet water quality standards for the following pollutants: total coliform and dissolved oxygen. More in depth information relating to New Jerseys 2004 Integrated List is available in Appendix C of this report.

Currently, no sampling stations exist in Brielle and to date, with the exception of the Manasquan River, no streams have been deemed "impaired" through the AMNET program, or any other regulating governmental agency. Although the AMNET program has not conducted water quality testing in the Borough of Brielle, a group both public and private organizations have teamed up to conduct water quality testing along the Roberts Swamp Brook. The partnership, which involves Monmouth County Water Watch, Brookdale Community College, Monmouth University, Manasquan River Management Group, The Manasquan Environmental Commission and NJ Watershed Management Area 12 among others, have united to restore the Roberts Swamp Brook.

The objectives for the project include:

- To improve water quality for sport fish in the Manasquan River Estuary by restoring the Roberts Swamp Brook;
- To provide environmental education to hundreds of Manasquan school children and involve them in direct service projects on the Roberts Swamp Brook
- To strengthen Manasquan communities surrounding the Roberts Swamp Brook by uniting a diversity of groups and people around the common goals of revitalizing Manasquan waterways.

These objectives were set in motion through the organization of two stream assessment events to determine both the health of the brook and area land use patterns. Participants in stream monitoring effort included: NJ Community Water Watch AmeriCorps members, and students from Brookdale Community College, Monmouth University, and Ocean County College, as well as community members and environmental leaders.

The first stream-walk, held on November 17, 2001, consisted of a 6-site visual assessment of Robert Swamp Brook according to the Natural Resource Conservation Service's Stream Visual Assessment Protocol. Volunteers monitored for the following assessment elements - channel condition, riparian zone, bank stability, water appearance, nutrient enrichment, barriers to fish movement, and in-stream fish cover. The assessment determined that Robert Swamp Brook became more impaired the further downstream you went. The sites furthest downstream received a "poor" rating on the assessment. However, upstream, water quality assessments of Robert Swamp Brook were consistently rating as "fair", and the Brook even received one "good" rating. Potential reasons for the changes in overall rating include new housing developments, some of which have been constructed within the last 5-10 years and some which are still being built right alongside the brook. In addition, stream width is much wider downstream of the new developments and stream bank erosion is one of the most significant impairment factors in these areas. Recently, a second stream monitoring event was held to gain a better understanding of the overall brook health, particularly biological indicators. Jim Burkitt, Watershed Area 12 representative of NJ Department of Environmental Protection Watershed Ambassador program, conducted the RATS and BATS assessment with a team of volunteers. The RATS (River Assessment Teams) analysis was fairly consistent with the previous NRCS Visual Assessment done in November.

However, the BATS (Biological Assessment Teams) analysis showed significant impairment as Robert Swamp Brook scored "poor" on the analysis. The only macro-invertebrates found at this site were midge fly larvae, aquatic worms, lung snails, and some scuds. With the exception of scuds, those organisms are very pollution tolerant, and the scuds were not found in great numbers. No pollution sensitive organisms were found. This is problematic as it is further evidence that fish populations are suffering due to poor water quality conditions. As illustrated through the Roberts Swamp Creek Restoration project, community involvement has been and will continue to be a key element in restoring and protecting the Brook. Educating the public about their local waterways and how they can help address the problems in their community can help local citizens prevent future waterway degradation.

In addition, as noted earlier, all streams within Brielle originate outside of Borough borders. Consequently, some degree of impairment is caused by regional factors and is not exclusive to the Borough of Brielle. As such, the incorporation of regionally based watershed management planning efforts will be essential to move towards restoring waterways both within and around Brielle.

4.5 WATER QUANTITY

Brielle Borough has exhibited water quantity problems including flooding, steam bank erosion, and many of the culverts associated with road crossings in the Borough are undersized. As such, the design of culverts has been cited as a contributor to both the frequency and the severity of stormwater flow flooding, which is experienced in several locations throughout the Borough. Brielle's most pressing stormwater quantity management issues are discussed in greater detail below in Section 4.6 *Flooding & Proposed Solutions.*

In regards to potable water supplies, potable water is supplied to the residents of Brielle through the Department of Public Works. Brielle's water supply sources consist of three underground wells and through interconnections with the New Jersey Water Supply Authority (NJWSA). In addition, the Borough has emergency connections with Wall Township and the Borough of Manasquan.

Potable water supplies for the Borough of Brielle and the Manasquan River Watershed in general have been a perplexing problem for many years. Population increases in the region in the 1960's and 1970's strained drinking water supplies and lowered aquifers to dangerous levels. Published in 2000, the Manasquan River Watershed Management Plan indicates that in less than 20 years aquifer levels dropped 140 feet, allowing saltwater to infiltrate into these underground formations and contaminate the region's drinking water. The growing concern about drinking water supplies then led to the construction and operation of the 770 acre Manasquan Reservoir System in July 1990. The reservoir is replenished by pumping water from the Manasquan River during periods of high river flow at an intake facility in Wall Township and was supplemented by rain events in the 3.2 square mile drainage area surrounding the facility. The reservoir has the capacity to store 4.7 billion gallons of water and can supply a safe yield of 30 million gallons per day even during drought conditions. The Manasquan Water Treatment Plant now provides 60% of the potable water consumed by the communities of Brielle, Sea Girt, Spring Lake, Spring Lake Heights, and Wall Township.

The Bureau of Safe Drinking Water's Water Supply Administration within the New Jersey Department of Environmental Protection administers the Source Water Assessment Program (SWAP). According to the 2004 Source Water Assessment Report for Brielle, the Borough receives potable water from one single water supply entity, the Brielle Water Department. This system serves residents of the Borough through three wells, two purchased groundwater sources, and two purchased surface water sources. The systems source water comes from the following aquifers: the Atlantic City "800 foot) sand aquifer, and the Englishtown aquifer system. The system also purchases water from the Manasquan Water Department, the Wall Township Water Department , and the New Jersey Water Supply Authority. Wellhead Protection Areas in the Borough of Brielle are illustrated through Figure 6-Wellhead Protection Areas Map. A Wellhead Protection Area is a map area calculated around a Public Community Water Supply (PCWS) well in New Jersey that delineates Tier designations according to the horizontal extent captured by groundwater at a specific rate: Tier 1 (2 years), Tier 2 (5 years), and Tier 3 (12 years).

In addition, independent water-quality laboratories regularly test water samples from around the Borough. The results of these water tests show no contaminants present that contain maximum contaminants levels (MCL's), as established by Federal and NJ State government agencies. Under Federal law, all water users now receive an annual report on the quality of their drinking water, listing only the contaminants that are detected in the water.

4.6 FLOODING & PROPOSED SOLUTIONS

To inform both public and private land use decision makers of areas that are subject to flooding, the Federal Emergency Management Agency has completed Flood Insurance Rate Maps (FIRM) for the Borough of Brielle. Due to its low relief and proximity to the estuary portion of the Manasquan River, areas along the river, and other water bodies are vulnerable to flooding, as several areas have been designated as an "A Flood Zone" by the FIRM maps. Other, additional lands within the Borough that have been determined as an "A Flood Zone" include areas immediately along the banks of Debbies Creek, Glimmer Glass, and Roberts Swamp Brook. Areas contained within an "A Flood Zone" designation represents that they have been found to lie within the 100-year floodplain, but specific base flood elevations have only been determined at a few selected points in the Borough. The specific points, along with the base flood elevation are listed below in Table 5. In addition, Figure 4, titled FEMA Flood Zone Map illustrated the areas of Brielle that have been delineated as resting within a flood zone.

Table 5: Elevation Reference Marks Within Brielle Borough

Elevation	Location
80.010 ft.	A standard NJCGS disk set in concrete on the southerly side of State Route 70. 4.15 miles northeast of the traffic circle at Laurelton and just northeast of the old back road to Manasquan.
61.592 ft.	Set in the concrete center strip of State Route 35 approximately .35 miles northwest of the centerline of the bridge over State Route 71 and about 0.5 miles southeast of the Brielle traffic circle, 35.11 feet southwest of a tack in pole JC68, 126.1 feet southeast of the center island and 5.81 feet northwest of X cut in a "Keep Right" sign.
13.969 ft.	On the westerly side of State 71 approximately 1050 feet north of the bridge carrying State Route 35 over the highway, 17.60 feet from the centerline of the highway opposite slab 348, 5.48 feet north of a drill hole in the curb, and 3.26 feet east of a drill hole in the concrete sidewalk.
41.983 ft.	Set in the concrete sidewalk on the northeasterly side of the bridge carrying State Route 35 over State Route 72, 23.1 feet from the centerline of Route 35 and opposite the end balustrade post of the bridge, 5.96 feet from the northwesterly corner and 4.46 feet from the southeasterly corner of the balustrade post.
	Set in the corner of a State Highway Department manhole on the westerly side of State Route 71 under the bridge carrying State Route 35 over the highway, 32.56 feet west of

Table 5: Elevation Reference Marks Within Brielle Borough	
Elevation	**Location**
20.485 ft.	the centerline of State Route 71, 15.36 feet south of the easterly corner of the bridge abutment, and 30.52 feet northwest of an inlet near the centerline of State Route 71.
22.511 ft.	On the easterly side of State Route 71 approximately 300 feet south of the bridge carrying State Route 35 over the highway, 43.61 feet north of a tack in pole 11BRE, 33.83 feet northeast of drill hole in concrete curb; 53.96 feet northeast, 45.61 feet south and 38.11 feet northwest of tacks in three 6 inch by 6 inch sign posts. The monument is within a triangular shaped island at the entrance to the ramp leading to State Route 35.
21.507 ft.	Set in concrete at the intersection of State Route 71 and State Route 35 and approximately .1 mile south of the bridge carrying State Route 35 over State Route 71, 26.26 feet northwest of a tack in pole JC7, 3.05 feet east of an x-cut on an inlet curb and 8.73 feet northwest of a drill hole in the concrete curb.
19.355 ft.	On the northeast side of State Route 35 north of New Manasquan River Bridge and between Riverview Drive and Ashley Avenue, 63.47 feet south of a tack in pole 96, 28.78 feet southwest of an x-cut in inlet curb, and 25.15 feet southwest of a drill hole in the concrete curb nosing at point of approach road.
43.768 ft.	Set in the concrete sidewalk on the northeasterly side of the Manasquan River Bridge. State Route 35, 21.9n feet from the centerline of north-bound roadway, 20.89 feet northwest of the northwest corner of the bridge tender's office and 3.66 feet southeast of the angel iron for the bridge gate.
Source: FEMA Flood Insurance Rate Map (FIRM) Brielle Borough, Monmouth County, New Jersey. Map Revise September 30, 1980.	

Finally, Brielle actively addresses drainage and flooding issues as they arise and are reported by residents. Each year Brielle includes drainage improvements as part of their Capital Improvement Program. As such, most of the reported flooding and drainage problems have been corrected. However, Brielle will continue to utilize this program, along with its Mitigation Plan, which is included within this report as Section 6.4, as tools to remediate the most pressing flooding and stormwater management issues that face the Borough.

5.0 STORMWATER MANAGEMENT

5.1 INFRASTRUCTURE

Brielle Borough receives nearly 44 inches of rain in an average year. To manage the public risk that flooding imposes on residents, a substantial stormwater management system has been developed. As illustrated earlier in Table 2, both the amount and condition of the stormwater that finds its way into local waterways is determined in large part by the amount of impervious cover the land contains. With less absorption of rainwater into the ground, the increased runoff moves faster and collects more pollutants from the surface, which promotes erosion, damages stream banks, and in turn deposits sediment into streambeds.

N.J.A.C. 7:8 spells out guidelines for how to manage stormwater more effectively and also how to incorporate best management practices into the planning stages of project design. These standards now require stormwater detention capacity to hold and slowly release the runoff from storms that have a likelihood of occurring once every two, ten and one hundred years. Some sites may be able to achieve these standards through vegetative swales, buffers, and landscaping to control non-point source pollution. Other sites may require the building of a structural stormwater management facility. In situations where the development of structural stormwater facilities is necessary, the NJDEP's Best Management Practice Manual should be consulted as it outlines alternatives and strategies to incorporate Best Management Practices into a projects site design. Possible alternatives include structures such as Infiltration Basins, Vegetative Filters, Pervious Paving Systems, and Sand Filters. These BMP's are strongly encouraged to be incorporated into the Borough's existing stormwater management infrastructure to enhance groundwater recharge, and reduce the velocity and amount of runoff that originates on site; thus improving the quality and reducing the quantity of stormwater that originates within Brielle.

5.2 STORM DRAINS

Brielle Borough has an annual Capital Improvement Program through which infrastructure improvements are designed and constructed. The construction or reconstruction of drainage best management practices, and stormwater management improvements, are included in this program.

Further, to inform the public of the presence of storm drains, Brielle has initiated a storm drain labeling program. The Borough's Public Works Department will complete the mapping, although volunteer groups may also participate in the labeling process, pending their availability. The initiative will label all storm drain inlets that are along municipal streets with sidewalks, and all storm drain inlets within plazas, parking areas, or maintenance yards that are operated by the Borough. Brielle is currently evaluating various label types and application methods. During the label application process, more than one label type may be utilized to ensure maximum durability in all locations. The Borough of Brielle will label a minimum of 50% of the storm drain inlets by April of 2007 and label all of the remaining storm drain inlets by April of 2009. During the annual catch basin cleaning program, the Borough will be checking to ensure that the labels are still visible. If not, they will be replaced as soon as possible.

Brielle has also initiated programs to more effectively maintain and manage its existing stormwater infrastructure. In accordance with the Sewage Infrastructure Improvement Act (SIAA) regulations, maps showing the location of the end of all MS4 outfall pipes that are operated by the Borough, and that discharge within the Borough's jurisdiction to a surface water body have been prepared by Birdsall Engineering, Inc., a consultant of the Borough. The maps show both the location and name of each outfall pipe, and have also been given an alphanumeric identifier that is noted on the map. In accordance with N.J.A.C. 7:22A-4.3, the scale of the maps is 1:1200 (one inch=100 ft.) These maps satisfy the minimum standard specified in Statewide Basic Requirement 6.a.i. Through the future, as new development and/or redevelopment changes the current storm sewer system through the creation of new outfalls, these maps will be updated accordingly.

Further, the Borough of Brielle will implement a stormwater facility maintenance program to insure that all stormwater facilities operated by the Borough are functioning properly. The Borough of Brielle will implement an annual catch basin cleaning program to maintain catch basin function and efficiency. All catch basins will be inspected once a year. If, at the time of inspection, no sediment, trash, or debris is observed in the catch basin, then that catch basin will not be cleaned. All catch basins within Brielle will be inspected annually, even if the had been found to be "clean" the previous year. At the time of cleaning, the catch basins will also be inspected for proper function, and maintenance will be performed on those facilities that are not operating to capacity. The catch basin cleaning and maintenance will be recorded through the " Stormwater Facility Inspection and Maintenance Log", which will be submitted to the NJDEP within the Borough's NJPDES annual report.

Brielle Borough will also investigate the storm drains for illicit connections and will check outfall pipes for signs of scouring. The Borough will begin performing the initial inspection of outfall pipes within 18 months of the EDPA (by October 1,2005) and will complete the initial physical inspection of all outfall pipes within 60 months of the EDPA (April 2009). The Borough will use the NJ Department of Environmental Protection (NJDEP) Illicit Connection Inspection Report Form to conduct these inspections, and each of these forms will be kept within the SPPP records. Outfall pipes that are found to have dry weather flow or evidence of an intermittent non-stormwater flow will be investigated to locate the illicit connection. If the Borough is able to locate the illicit connection (and the connection is located within Brielle), the responsible party will be cited, and the connection will be eliminated immediately. If an illicit connection is found to originate from another public entity, the Borough of Brielle will report the illicit connection to the NJDEP.

As part of its illicit connection elimination program, the Borough is also checking outfall points for signs of scouring. All sites where scouring is observed is will be placed on a prioritized list and repairs will be made in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey. Those repairs that do not need NJDEP permits for implementation may be done first. Each repair will be followed up to ensure that scouring has not resumed. This program will be implemented in conjunction with the illicit connection elimination program by October 1, 2005 (within 18 months of the EDPA).

5.3 STORMWATER BASINS

Most of the stormwater management system within Brielle Borough relies on storm drains. However, there are two types of stormwater basins and both are present in Brielle. First, "detention basins", which are designed to stay dry between storm events, detain stormwater for a period of time, while releasing water at a slow and controlled rate. A second type of basin that is designed to manage stormwater flows is a "retention basin". These basins are designed to stay wet by retaining a permanent pool so as to mimic a natural pond or lake.

As the number of subdivisions in the Borough has increased, so too have the number of stormwater basins. A number of the existing stormwater basins in Brielle are suited to be retrofitted to accommodate more volume, or to improve the quality of stormwater that is dispended into the basin. As flooding and/or drainage issues arise in the Borough, due to their ability to improve water quality, maintain water quantity, and provide groundwater recharge, the retrofitting of stormwater basins may be initiated by the Borough itself, or included within an adopted Mitigation Plan which would allow applicants who are not able to meet the stormwater design standards on site, to provide mitigation by means of retrofitting a proximate stormwater basin. Through mapping, maintenance, and retrofitting, these coordinated stormwater basin operation and maintenance programs will enable the Borough to improve the way stormwater is managed in Brielle.

5.4 WATERSHED

The Borough of Brielle is entirely contained within the Manasquan Valley Subwatershed Management Region. The Manasquan River Subwatershed is the longest stream system within Watershed Management Area 12. It is not only one of the most heavily utilized recreational waterways on the East Coast, but it is also a significant source of potable water for Monmouth and Ocean County residents. All land in this region drains to the Atlantic Ocean via the Manasquan River. Significant streams within the watershed include: Roberts Swamp Brook, Yellow Brook, Marsh Bog Brook, Timber Swamp Brook, Mingamahone Brook, Bear Swamp Brook, Squankum Brook, Mill Run, Sawmill Creek, Macs Pond Brook and Judas Creek. The Manasquan Reservoir, the Glimmer Glass, Stockton Lake, Brisbane Lake, the lake at Turkey Swamp, and the Bay Head-Manasquan Canal are also other significant water bodies in this region.

The United States Geological Service have developed a method for identifying and inventorying subwatersheds within this larger watershed network called the hydrologic unit code system. Through this system all U.S. watersheds have a name and a corresponding number, this number is called the hydrologic unit code (HUC) or watershed address.

The term "HUC-14" is from the hydrologic unit code system for delineating and identifying drainage areas. The system starts with the largest possible drainage area (basin) and progressively breaks it down into smaller subdivisions (subbasins, watersheds and subwatersheds respectively). These subdivisions are delineated and numbered in a nested fashion. A drainage area with a 14 numbered address, or HUC-14, is a subwatershed of a larger watershed with 11

numbers, or a HUC-11. There are 921 HUC-14 subwatersheds in New Jersey that average 8.5 square miles. There are 150 HUC-11 watersheds in New Jersey with an average size of 51.9 square miles. A statewide graphic depiction of the breakdown of these watershed areas is available at: http://www.nj.gov/dep/watershedmgt/hucmap.htm (Source: NJDEP – Division of Watershed Management).

The Borough of Brielle is located almost entirely within the Manasquan HUC-14 subwatershed 02030104100100 (Manasquan River-below Route 70 bridge). However, a small portion of the south west corner of the Borough is contained within HUC-14 subwatershed 02030104100200 (Manasquan River (Route 70 bridge to 74 degrees 7 minutes and 30 seconds), these areas are illustrated on Figure 2-Wetlands Map.

6.0 DESIGN AND PERFORMANCE STANDARDS

To minimize the adverse impact of stormwater runoff on water quality, water quantity and the loss of groundwater recharge in receiving water bodies, the Borough will adopt design and performance standards that comply with the stormwater management measures as presented in N.J.A.C. 7:8. The design and performance standards include amended language for the inclusion of maintenance requirements, and safety standards consistent with N.J.A.C. 7:8-6. The ordinances will be submitted to the County for review and approval within 24 months of the effective date of permit authorization (EDPA).

Further, it is the intention of the Borough of Brielle to incorporate both structural and nonstructural stormwater management strategies as presented in N.J.A.C. 7:8-5 to the maximum extent practicable. Major developments must meet one of two standards for groundwater recharge (N.J.A.C. 7:8-5.4(a)2.): (1) maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site or (2) infiltrate the increase in the stormwater runoff volume from pre-construction to post-construction for the two-year storm. For water quality (N.J.A.C. 7:8-5.5), stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in the stormwater runoff generated by the water quality design storm by 80 percent of the anticipated load from the major development.

To control stormwater runoff quantity impacts (N.J.A.C. 7:8-5.4 3.), a major development must also meet one of three design standards: (1) demonstrate at no point in time that the post-construction runoff hydrograph exceed the pre-construction runoff hydrograph, (2) demonstrate there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2, 10, 100-year storm event and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site, and (3) demonstrate the postconstruction peak runoff rates for the 2, 10 and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction runoff rates. However, for stormwater water runoff quantity requirement (3), stream encroachment standards (N.J.A.C. 7:13-2.8) will require for the 100-year storm event 75 percent of the pre-construction peak runoff rates. Prior to adoption, these ordinances will all be submitted to the Monmouth County Planning Board for review and approval within 24 months of the EDPA.

Further, by amending their current Land Use Regulations, it is the intention of the Borough of Brielle to incorporate both structural and nonstructural stormwater management strategies as presented in N.J.A.C. 7:8-5 to the maximum extent practicable. So as to minimize the adverse impact on water quality which is imposed by stormwater runoff, the proposed amendments to the Borough's current development regulations include the incorporation of stricter stormwater management guidelines relating to water quantity, water quality, and groundwater recharge as identified in the design and performance standards as presented in N.J.A.C. 7:8-5. Prior to adoption, these ordinances will all be submitted to the Ocean County Planning Board for review and approval within 24 months of the EDPA.

The second set of applicable stormwater management regulations are the Phase II New Jersey Pollutant Discharge Elimination System Stormwater Regulation Program Rules (N.J.A.C. 7:14A). These Rules are intended to address and reduce pollutants associated with existing stormwater runoff. The Rules establish a regulatory program for existing stormwater discharges as required under the Federal Clean Water Act. These rules govern the issuance of permits to entities that own or operate "small" (those that serve a population of under 100,000) municipal separate storm sewer systems, known as MS4s. Under this program permits must be secured by municipalities, certain public complexes such as universities and hospitals, and State, interstate and Federal agencies that operate or maintain highways. The permit program establishes the Statewide Basic Requirements that must be implemented to reduce nonpoint source pollutant loads from these sources. The Statewide Basic Requirements include measures such as: the adoption of ordinances (litter control, pet waste, wildlife feeding, proper waste disposal, etc.); the development of a municipal stormwater management plan and implementing ordinance(s); requiring certain maintenance activities (such as street sweeping and catch basin cleaning); locating discharge points and stenciling catch basins; and a public education component

Owners or operators of small MS4s would be required to develop and implement a storm water management program designed to reduce the discharge of pollutants to the maximum extent practicable and protect water quality. Control measures are expected to include, at a minimum, the following components:

- Public education and outreach
- Public involvement and participation
- Illicit discharge detection and elimination
- Construction site storm water runoff control
- Post-construction storm water management in new development and redevelopment
- Pollution prevention/good housekeeping for municipal operations.

6.1 IMPLEMENTING NON-STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

The implementation of non-structural Best Management Practices are strongly encouraged to be added to the Borough's existing development regulations and applied to all new site design proposals. Whenever possible, the following nine strategies should be incorporated into site design:

- Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
- Minimize impervious surfaces and break up or disconnect the flow of runoff over
- impervious surfaces;
- Maximize the protection of natural drainage features and vegetation;
- Minimize the decrease in the "time of concentration" from pre-construction to post construction. "Time of Concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed;

- Minimize land disturbance including clearing and grading;
- Minimize soil compaction;
- Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;
- Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas; and
- Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff. These source controls include, but are not limited to:

  i. Site design features that help to prevent accumulation of trash and debris in drainage systems;

  ii. Site design features that help to prevent discharge of trash and debris from drainage systems;

  iii. Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and

  iv. When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act N.J.S.A. 4:24-39 et seq., and implementing rules.

Also, Chapter 20 "Land Use Procedures", Chapter 21 " Zoning", Chapter 23 "Site Plan Regulations, and Chapter 24 "Land Subdivisions" within the Borough's Land Use Procedure Code were reviewed to evaluate the extent to which non-structural stormwater management techniques have been implemented into the site deign of a proposed development. This review included, but was not limited to existing provisions for Curbs and Gutters, Driveways and Accessways, Off-Street Parking and Loading, Streets, and Sidewalks. A summary of the of the pertinent provisions is presented below:

Chapter 21, Section 9.25 (Unsuitable Lands) This section stipulates that no structure shall be erected on land which is unsuitable for improvement because it is subject to flooding or other hazards to life, health, or property, unless the owner agrees to take approved adequate measures to eliminate such hazards. The approval must be obtained from the Planning Board, unless otherwise required from the Board of Adjustment pursuant to the flood plain ordinance of the Borough. The Board shall make or instigate adequate investigation by a recognized, trained or licensed authority before granting approval and only after a public hearing thereon. Expenses incurred for such investigation must be paid for by the applicant and no certificate or permit shall be issued until payment in full is received. The exception to the above would apply to structures necessary for access and safety such as bridges, culverts, or protective walls and fences or for accessory agricultural structures, such as irrigation facilities, dependent upon access to water.

Chapter 21, Section 19.5 (Other Provisions and Requirements) All applications for development in the C2 and C2A Zone on properties abutting or contiguous with the Manasquan River and which require submission of a major site plan or preliminary subdivision will be accompanied by an Environmental Impact Statement (EIS). The EIS will include a project description that specifies both what is to be done and how it is to be done during construction and operation on site, and will also include a recital of alternative plans deemed practicable to achieve the objective. The EIS supplies to stormwater management by including air quality, water quality, water supply, hydrology, geology, soils and properties thereof, including capabilities and limitations, sewage systems, topography, slope, and vegetation in its inventory of existing environmental considered on site. The EIS also lists those adverse environmental impacts that can't be avoided, a statement of steps that have been taken to minimize adverse environmental impacts imposed by the project, and a statement of alternatives to the proposed project which might avoid some or all of the adverse environmental effects, including a non-action alternative. EIS must reference water quality standards as established by the DEP, may consider revising to implement NJAC 7:8.

Chapter 21, Section 31.11 (Location of Curb Cuts) At the intersection of streets, a curb cut, where required or installed, shall be set if not less than twenty five (25') feet from the intersection of two (3) curb lines in all zones. Between the curb cuts for any two (2) driveways serving the same property there shall be at least fifty (50) feet. Curb cuts shall be located at least five (5) feet from abutting property lines in all zones. As stated in Chapter 21, Section 17.2, all curb cuts for commercial zones shall be at least fifteen (15') feet but not more than thirty (30') feet in width, except on County roads where County Site Plan Requirements are established. This section may be revised to allow for curb cuts or flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas. These amendments would encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management

Chapter 21, Section 31.4 (Required Area for Each Parking Space) Each automobile parking space shall not be less than nine (9') feet nor less than eighteen (18) feet deep exclusive of passageways. In addition, there shall be provided adequate interior driveways to connect each parking space with a public right-of-way. In the case. of parallel parking, each space shall be not less than nine (9') feet wide and twenty-two (22') feet long. This section may be reviewed to determine that if a developer were able to determine whether it is feasible for pervious paving materials to be incorporated into a projects site design, and whether overflow parking, vertical parking structures, smaller parking stalls, and shared parking may be utilized to minimize site disturbance

Chapter 21, Section 31.5 (Drainage and Maintenance) All off-street parking, off-street loading, and service facilities shall be graded and drained so as to dispose of all surface water accommodation in a safe manner while preventing damage to abutting properties and or public streets. Except for single-family uses, they shall be surfaced with asphalt, bituminous cement or other properly bound pavement, which will assure a surface resistant to erosion. Such drainage and materials shall be installed as required by the Planning Board and as recommended by the Municipal Engineer. All such areas shall be at all times maintained at the expense of the owners

thereof, in a clean, orderly and dust-free condition. This ordinance may be amended to reference the DEP's BMP manual for the incorporation of Low Impact Development principles into the projects site design.

Chapter 21, Section 63.1 (Land Disturbance Permit) To control the disturbance of land and related changes in grades and elevation, the Borough has adopted an ordinance that requires a land disturbance permit. The permit stipulates that no land or land area shall be disturbed by any person, partnership, corporation, municipal corporation or other public agency in the borough unless they comply with the General Design Standards and the conditions of the Limit Disturbance Permit. The general design standards indicate that all soil disturbance is undertaken in a manner that will minimize erosion, retain and protect natural vegetation wherever feasible, that drainage provisions shall accommodate increased runoff resulting from modified soil and surface conditions during and after development or disturbance, and that water runoff should be minimized and retained on site whenever possible to facilitate groundwater recharge. The Borough's Construction Official who shall either personally inspect, or require the inspection of all work shall enforce these standards.

Chapter 21, Section 31.10 (Size of Driveways) A driveway exclusive of curb return radii shall be not less than ten (10') feet in width in all residential zones, and not less than fifteen (15) feet in all other zones. A curb return radius for a driveway at its entrance to a public street shall be a minimum of five (5') feet for single-family residential lots and a minimum of fifteen (15') feet for all other uses. The maximum width of a driveway exclusive of curb return radii shall not exceed thirty (30') feet. This ordinance may be amended to incorporate the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

Chapter 21, Section 31.15 (Reductions of Off Street Parking) Required off street parking area shall not be reduced. No off-street parking area shall be reduced in size or encroached upon by building, vehicle storage, loading or unloading, or any other use where such reduction or encroachment will reduce the off street parking and loading spaces that are required by these regulations. Subsection 17 (Joint Parking Facilities) of the off-street parking requirements, which discusses joint parking facilities stipulates that the off street parking requirements for two (2) or more neighboring uses may be satisfied by the allocation of the required number of spaces for each use in a common parking facility, provided that the number of off-street parking spaces is not less than the sum of individual requirements; and provided further, that there be compliance with all other provisions of these regulations.

In addition, subsection 15 *(Sharing of Parking Facilities*) Off-street parking facilities for one use shall not be considered as providing the required facilities for any other use; except that one-half (1/2) of the off-street parking space required by any use whose peak attendance will be at night or on Sundays, such as churches, theaters, and assembly halls, may be assigned to a use which will be closed at night or on Sundays…subject to approval by the municipal agency.

Chapter 21, Section 32 (Landscaping) This section of the Borough ordinance outlines vegetative screening and buffers requirements that have been established by the Borough. However, these

features are utilized for aesthetic purposes, rather than as potential stormwater filtration/management facilities.

Chapter 23, Section 1.5 (General Requirements and Conditions) When submitting a site plan an applicant must demonstrate that: There shall be no intrusion or elimination of any existing buffer area or area designated for that purpose on a previously approved site plan. Also the applicant must demonstrate that there will be no significant alteration of the existing drainage.

Chapter 24, Section 8.6 (Maintenance Guarantee) The maintenance of on and offsite improvements by an applicant are subjected to provisions for a maintenance guarantee. These maintenance guarantees are be posted with the Governing Body for a period not to exceed two (2) years after final acceptance of the improvement, in an amount not to exceed fifteen (15%) percent of the cost of the improvement. In the event that other governmental agencies or public utilities automatically will own the utilities to be installed or the improvements are covered by a maintenance guarantee to another governmental agency, no maintenance guarantee shall be required by the municipality for such utilities or improvements.

Chapter 24, Section 8.7 (Required Improvements) Storm drains and culverts where storm drains or culverts are required on-site or off-site, all streets shall be provided with sufficient catch basins, storm sewers, culverts water detention basins and other drainage appurtenances for the proper drainage of the area in the light of existing and future conditions. All such facilities shall be constructed in accordance with the standards and requirements of good engineering practice or such other specifications as may be required by the Municipal Engineer where special circumstances so require.

Chapter 24, Section 8.7 (Required Improvements) Topsoil which shall be removed in the course of regrading a subdivision shall not be used as soil. No top soil be removed from the subdivision site until such top soil shall be redistributed as to provide at least six (6") inches of cover on areas to be used as building sites from which top soil was removed and shaI1 be stabilized by seeding or planting. Any excess topsoil may be removed from the site only with the written approval of the Municipal Engineer.

Also, subsection F, the Borough's Shade Tree Ordinance states that the removal of existing trees shall not be permitted in any subdivision except in the location of structures or unless it can be shown that grading or construction requires removal. The developer shall plant, and maintain for one (I) year, and replace (where necessary) all shade trees. Trees shall be selected from the following list and spaced as specified (A list of 25 acceptable species is also provided in the ordinance). This ordinance recognizes that the preservation of mature trees and forested areas is a key strategy in the management of environmental resources, particularly watershed management, air quality, and ambient heating and cooling. By protecting shade trees, the Borough is also protecting the objectives of the new stormwater management rules, which are to improve water quantity stormwater quantity, and improve groundwater recharge.

Chapter 24, Section 9.5 (Design Standards-Public Use and Service Areas) This section outlines provisions that have been established by the Borough for Public Use and Service Areas. Subsection B Drainage Easements indicates that when there is a subdivision that is traversed by a watercourse, drainage way, channel, or street there shall be provided a storm water easement or drainage right-of-way conforming substantially with the lines of such watercourse and such further width or the construction of both, as will be adequate for the purpose. Subsection C Natural Features states that natural features such as trees, brooks, hilltops and views shall be preserved whenever possible in designing any subdivision containing such features.

Also, a public drainage way shall mean the land reserved or dedicated for the installation of stormwater sewers or drainage ditches, or required along a natural stream or watercourse for preserving the biological as well as drainage function of the channel and providing for the flow of water to safeguard the public against flood damage, sedimentation, and erosion and to assure the adequacy of existing and proposed culverts and bridges, to induce water recharge into the ground where practical, and to lessen nonpoint pollution.

Chapter 21, Section 31.7 (Provide Walks Adjacent to Business Buildings) A walkway, if provided it is adjacent to a business building, shall not be less than four (4') feet in width and shall be constructed in addition to other requirements. In all locations where parked automobiles may overhang such adjacent sidewalk, a minimum wall a width of six (6') feet shall be provided. This section and other sections within the Borough's ordinance may be reviewed with respect to whether setting a minimum sidewalk width may be undertaken so as to reduce the amount of impervious cover that is produced by new development. Also, language may be incorporated in order ordinance which would require developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, or use permeable paving materials where appropriate. Additional language requiring developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, or use permeable paving materials where appropriate may be considered for additional into this section.

As illustrated above, Brielle has adopted a number of provisions to incorporate nonstructural stormwater management into their Land Development Regulations. However, several sections of the existing ordinance may be examined to determine if it is practicable to incorporate additional nonstructural stormwater management regulations into the Borough's existing design standards. For example, the Borough may consider revising its landscaping provisions to require the planting of native vegetation (which requires less fertilization and watering than non-native species) on site. Further, the Borough may examine the feasibility of amending their current design standards to incorporate language encouraging vegetated open swale conveyance as opposed to standard curb and gutter conveyance. Also, whenever feasible the design standards may be amended to encourage pervious paving materials to be used in the construction of sidewalks and driveways. Also applicants should be required to disconnect impervious surfaces, where practical, to promote pollutant removal and groundwater recharge. Although, additional amendments may be made, the Borough's existing provisions have been found to be compatible with N.JA.C. 7:8-5.3 (Nonstructural Stormwater Management Strategies).

In addition, Appendix A provides a model ordinance that has been provided by the NJDEP to assist municipalities in drafting stormwater control ordinances that comply with the State's newly adopted stormwater management design and performance standards. Following the adoption of this plan a new Stormwater Management Control Ordinance per the NJDEP's new Stormwater Management Rules will be prepared and adopted by the Borough. A number of additional provisions relating to stormwater basin fees and maintenance, design standards, pertaining to both structural and non structural methods that must be incorporated into a projects design, safety standards for stormwater basins, and maintenance and repair fees and responsibility will all be included within the amended ordinance. Upon completion, the ordinances will then be sent to the Monmouth County Stormwater Technical Advisory Committee for review and approval within 24 months of the EDPA.

6.2 IMPLEMENTING STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

As mentioned earlier, the NJDEP has implemented more rigid regulations regarding the volume, rate, and quality of stormwater originating on a new development site. Some sites may be able to achieve these standards through vegetative swales, buffers, and landscaping to control non-point source pollution. Other sites may require the building of a stormwater basin. In these cases, where the development of structural stormwater facilities is necessary, the New Jersey Department of Environmental Protection's BMP guide should be consulted. The structural BMP's utilized in low impact development concentrate on the following practices to be utilized in site development in conjunction with the non-structural methods described above:

- Bio-retention Systems – A bioretention system consists of a soil bed planted with native vegetation located above and underdrained sand layer. It can be configured either as a basin or a swale.
- Constructed Stormwater Wetlands – Constructed wetlands are wetlands systems designed to maximize the removal of pollutants from stormwater runoff through settling and both uptake and filtering by the vegetation.
- Dry Wells - A dry well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs and structures. Discharge of the accumulated stormwater from a dry well occurs through infiltration into the surrounding soils.
- Extended Detention Basins - An extended detention basin is a facility constructed through excavation or embankments that provides temporary storage of stormwater runoff. It has an outlet structure that detains runoff inflow and allows for controlled outflow to aid in mitigating stormwater flows from development. Usually this type of structure is utilized to provide both water quantity and water quality mitigation.
- Infiltrative Basins – Infiltration Basins are similar to detention basins in that they both temporarily store stormwater runoff generated from development project. The principal outlet to this type of basin is not a constructed outlet structure, but rather the highly permeable soils allowing for infiltration into the surrounding subsoils.
- Manufactured Treatment Devices – A manufactured treatment device is a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive materials, vortex

separation, vegetative components, and/or other appropriate technology to remove pollutants from stormwater runoff.

- Pervious Paving Systems – Pervious pavement utilizes paving material which allows for stormwater to infiltrate through the pavement rather than accumulate as is the case with standard paving material. Pervious pavement utilizes void areas within the paving material to provide for this permeable feature.
- Sand Filters – A sand filter consists of a forebay and an underdrained sand bed. Runoff entering the sand filter is conveyed first through the forebay, which removes trash, debris and coarse sediments, and then infiltrates through the sand bed to an outlet pipe at the bottom of said filter.
- Vegetative Filters – A vegetative filter is an area designed to remove suspended solids and other pollutants from stormwater runoff flowing through a length of vegetation, called a vegetative filter strip. The vegetation in a filter strip can range from turf grass to woody vegetation.
- Wet Ponds - A wet pond is a facility constructed through excavation or embankments that provides both permanent and temporary storage of stormwater runoff. It has an outlet structure that creates a permanent pool and detains and attenuates runoff inflows promoting the settlement of pollutants.

Further, all structural stormwater management measures (structural BMP's) shall be designed according to the following conditions:

- They should to take into account the existing site conditions, including, for example, environmentally critical areas, wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).
- They should be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate, and shall be parallel bars with one-inch (1") spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the parallel bars at the outlet structure shall be spaced no greater than one-third (1/3) the width of the diameter of the orifice or one-third (1/3) the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. In addition, the design of trash racks must comply with the requirements of N.J.A.C. 7:8-7.D.
- They should be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvements Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.
- At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.
- Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section N.J.A.C. 7:8-7.
- Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be

utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, groundwater recharge and water quality design and performance standards established by this subchapter.

- Manufactured treatment devices may be used to meet the requirements of this subchapter, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the Department.
- In order to ensure adequate long term operation as well as preventative and corrective maintenance of stormwater management measures and structural BMP's, the designers of such facilities should submit to the municipality a *Maintenance Plan* indicating specific maintenance tasks and schedules as indicated in N.J.A.C. 7:8-5.8 "Maintenance Requirements". This maintenance plan will require the ultimate user of said structural BMP's to provide an annual certification that the stormwater management measures approved are functioning as designed and that the proper maintenance and inspection of said measures have been performed. Random spot inspections by the municipality will be conducted to ensure compliance along with appropriate enforcement actions such as fines to be levied should non-compliance result.

By adhering to the State's newly adopted design standards, the BMP's engineered for each proposed development project will serve to improve stormwater quality, enhance groundwater recharge, and reduce stormwater runoff. Combined, these methods will serve to improve the environment and protect the public interest by minimizing the risk of flooding and maintain the Borough's water supply through the future.

6.3 PLAN CONSISTENCY

Currently, no land within Brielle is contained within the bounds of an adopted a Regional Stormwater Management Plan (RSWMP) and no Total Daily Maximum Loads (TDML's) have been developed for waters within the Borough. Therefore, at this time, it is not necessary for the amendments proposed in this plan to adhere to standards developed through the adoption of a Regional Stormwater Management Plan.

Also, this Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) N.J.A.C. 5:21, and the Borough will utilize the most current update of the RSIS in the stormwater management review of residential areas. The Borough's Stormwater Management Ordinance requires all new development and redevelopment plans to comply when necessary applications will be submitted to the Freehold Soil Conservation District to ensure that that proposed project is consistent with New Jersey's Soil Erosion and Sediment Control Standards. Further, upon adoption, the Borough's amended Stormwater Control Ordinance will ensure compliance with the Safety Standards for Stormwater Management Basins within N.J.A.C. 7:8-6.

6.4 MITIGATION PLAN

OVERVIEW

A municipal mitigation plan is an element of the Municipal Stormwater Management Plan that allows municipalities to grant a waiver from the design and performance standards for stormwater runoff quality, stormwater runoff quantity, and groundwater recharge established in N.J.A.C. 7:8-5, and adopted into the municipal stormwater control ordinance. The existence of a mitigation plan does not preclude the requirement that an applicant meet the design and performance standards for any one of the three key stormwater requirements, namely maintaining pre-development recharge, stormwater runoff quantity reduction and stormwater runoff quality. Instead, this mitigation plan, once it has been approved by the Monmouth County Planning Board's Stormwater Technical Advisory Committee (STAC), will serve to enable the Borough of Brielle, in limited circumstances to waive the strict compliance with one or more of the performance standards where full compliance cannot be reasonably accommodated on site. In addition, approval of a waiver or exemption from one of the three criteria outlined above provides no guarantee that, if requested, an exemption or waiver will be granted for either or both of the remaining criteria. However, under no circumstances shall Brielle waive the Special Resources Protection Area (SRPA) established under the Stormwater Management Rules at N.J.A.C. 7:8-5.5 (h).

Supporting evidence for an exemption or waiver shall be prepared in the form of a "stormwater management report" which will be signed and sealed by a New Jersey licensed professional engineer. The report shall include at a minimum:

- Detailed hydrologic and hydraulic calculations identifying the sizing criteria for each BMP and the stormwater collection system based upon the anticipated peak flow and/or volume.

- A map of the planned project showing existing conditions with drainage boundaries and land features, including delineated wetlands, proposed improvements, including all BMPs, grading, utilities, impervious features, and landscaping.

- Construction details for each BMP with appropriate contact information.

When applying for a waiver, the applicants professional engineer must first demonstrate that on-site compliance is either a) not possible, or b) possible but would result in tangible negative environmental or structural impacts. Such impacts may include:

- If the strict application of the regulations would result in a reduction of open space and/or undisturbed buffer areas. It is important to note that in this situation, the applicant must demonstrate that such reductions are caused by compliance with State and local regulations and not an attempt to maximize buildable area.

- The degradation of groundwater quality due to the infiltration of poor quality runoff. For example, if runoff from a shopping plaza with heavy traffic volume will be directed to a protected water supply aquifer to achieve compliance, alternative recharge locations may be more practical and environmentally sound.

- The modification to the elevation of the groundwater table due to rapid infiltration of stormwater will have demonstrable negative impacts on local structures and/or local groundwater quality. For example, rapid infiltration in a highly pervious soil near a basement may cause flooding and settlement; and also

- Flooding due to changes in the time of peak for a storm attenuated in compliance with *N.J.A.C. 7:8* and the *New Jersey Stormwater Best Management Practices Manual.* Despite the requirement for peak reductions to be applied to the 2-year, 10-year and 100-year events, peak runoff from a sub-basin of a HUC-14 may actually experience increases due to changes to peak timing.

An applicant may also propose a mitigation project on a site that has not been identified in this mitigation plan. However, in each circumstance the selection of a mitigation project must incorporate the following requirements:

- The project must be within the same area that would contribute to the receptor impacted by that project. If there is no specific sensitive receptor impacted, then the location of the mitigation project may be located anywhere within the municipality, preferably at a location that would provide the greatest benefit.

- Legal authorization must be obtained to construct the project at the location selected. This includes the maintenance and any access needs for the project throughout its operation.

- The mitigation project should be located close to the original development project. If possible, the mitigation project should be located at a similar distance from the identified sensitive receptor. This distance should not be based on actual location, but on a similar hydraulic distance to the sensitive receptor. For example, if a project for which a waiver is obtained discharges to a tributary, but the closest location discharges to the main branch of a waterway, it may be more beneficial to identify a location discharging to the same tributary.

- It is preferable to have one location that addresses any and all of the performance standards waived, rather than one location for each performance standard.

- The project location must demonstrate no adverse impacts to other properties.

- For projects addressing the groundwater recharge performance standard, a mitigation project site upstream of the location of the actual project site is preferable to a downstream location.

- Mitigation projects that address stormwater runoff quantity can choose to provide storage for proposed increases in runoff volume, as opposed to a direct peak flow reduction.

- Mitigation projects that address stormwater runoff quality can choose to address another pollutant other than TSS, which has been demonstrated to be of particular concern, such as streams that have been listed as an impaired waterbody for other pollutants. However, care must be taken to ensure that waivers that are granted for the TSS requirements do not result in the impairment of an existing unimpaired area.

All mitigation plans and reviews should consider the location of the mitigation project in relation to the property where the projected damage will occur. For example, if a project were unable to achieve the stormwater quantity performance standards upstream of an inadequate culvert, a mitigation project downstream of that culvert would not offer similar protection. Or, if the groundwater recharge is the major contributor to a wetlands area, the new project should continue to provide recharge to the wetlands area.

Also, in environmentally critical areas, the quality of stormwater that is being directed to infiltration facilities should be assessed. If the quality of stormwater that would be infiltrated following development poses a threat to groundwater supplies, off-site mitigation should be considered. Off-site mitigation should also be undertaken when on-site recharge is precluded by site conditions, or when stormwater quality assessments indicate that on-site stormwater infiltration will degrade ambient groundwater quality in environmentally sensitive areas. Environmentally critical areas include locations where groundwater is classified by the State as holding either special ecological significance, wellhead protection areas, areas of known groundwater contamination, or areas of on-going groundwater remediation. Groundwater recharge is of particular concern in areas discharging to Category 1 (C1) groundwater or in wellhead protection areas. Options for off-site groundwater recharge include:

- Retrofitting an existing stormwater basin
- Reducing the amount of impervious cover on site by adding vegetation or incorporating pervious paving materials
- Splitting flows to isolate high quality runoff and constructing infiltration basins to receive only the high quality runoff
- Acquiring upland recharge areas

SENSITIVE RECEPTORS

Within Figure 7, entitled Sensitive Receptor Map, Brielle has indicated the sensitive receptor areas within the Borough that are especially susceptible to stormwater changes. As many of the mitigation measures that will be employed to these sensitive receptor areas are in the planning stage, when appropriate, Brielle will allow developers to fund studies to plan and engineer the most suitable mitigation measure for each project site, and each performance standard. An applicant may also provide compensatory mitigation through the contribution of funds when, due

to the small amount of the waiver given for the performance standard, it is not practical to provide a full mitigation project. In these circumstances, the receipt of financial contributions shall be considered the completion of mandatory mitigation for that project. However, in these instances, the Borough of Brielle itself would be responsible to ensure that mitigation occurs based on the collection of these funds. If such a situation were to arise, a detailed description of the circumstances, funding amount and performance standard that was mitigated will be provided in Brielle's annual NJPDES report.

MITIGATION CRITERIA

The mitigation requirements listed below offer a hierarchy of options that are intended to offset the effect on groundwater recharge, stormwater quantity control, and/or stormwater quality control to an equal or greater extent than was created by the granting of a waiver or exemption from the stormwater management requirements.

The mitigation criteria are listed below in order of preference:

1) **Identify, design, and implement a compensating measure to mitigate impacts-** The preferred option is to identify and develop a compensating mitigation project in the same drainage area as the proposed development. In these cases, the applicant will address the same issue within the design and performance standards for which the variance or exemption is being sought, and demonstrate that the proposed mitigating measures provide equal or greater compensation to offset the non-complying aspect of the stormwater management system on site. The developer must also ensure the long-term maintenance of the project as outlined in Chapters 8 and 9 of the NJDEP Stormwater BMP Manual. If the Borough agrees to control a new stormwater management facility, arrangement in the form of an escrow account will be made to stipulate the payment amount, schedule, and long term responsibilities of the facility to ensure that it functions to capacity.

2) **Complete a project identified by the municipality as equivalent to the environmental impact created by the exemption or variance-** 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 measures that are not directly equivalent to the impacts for which the variance or exemption is being sought, but that addresses the same issue to an equal or greater extent. For example if a variance is given because the 80% TSS requirement has not been met, the selected project may address water quality impacts that increase the siltation of a waterbody within the applicable HUC 14 subwatershed.

   It shall be the responsibility of the applicant that is requesting hardship to identify, quantity, and complete a compensatory mitigation alternative that will compensate for the relief that is being sought form the stormwater design and performance standards to an equal or greater extent.

First and foremost, the applicant is encouraged to identify and propose a compensatory mitigation project within the confines of the drainage area within which the proposed project is located. However, an appropriate mitigation measure may take place within the larger confines of a proposed projects HUC-14 subwatershed area, or another portion of the Borough, rather than the contributing area if the Brielle Planning Board or Zoning Board of Adjustment finds that the mitigation will equally protect public health, safety and welfare, the environment, and public and private property.

3) **Provide funding for municipal projects that would address existing stormwater impacts-** The third and least preferable stormwater mitigation option is for the applicant to provide funding or partial funding for an environmental enhancement project that has been identified in the Municipal Stormwater Management Plan, or towards the development of a Regional Stormwater Management Plan. The contributed funds must be equal or greater than the cost to implement the required on-site stormwater measure for which relief is requested including the cost of land, easements, engineering design, and long-term maintenance. However, with this option, the Borough, and not the applicant is ultimately responsible for the design, property acquisition, construction, construction management, maintenance (short-term and long-term) and follow-up study, unless that project and its prospective costs have been outlined within this Mitigation Plan.

REQUIREMENTS FOR MITIGATION PROJECTS

Whether the applicant is proposing the mitigation project, or Brielle has identified the project within this Mitigation Plan, the following requirements for mitigation must be included in the project submission.

- **Impact from noncompliance-** The applicant must provide a table to show the required values, and the values provided in the project, and include an alternatives analysis that demonstrates that on-site compliance was maximized to the greatest extent practicable.

- **Sensitive Receptor-** Identify the sensitive receptor related to the performance standard for which a waiver is sought. Demonstrate that the mitigation site contributes to the same sensitive receptor.

- **Narrative and Supporting Information Regarding the Need for the Waiver-** The waiver cannot be granted for a condition that was created by the applicant. If the applicant can provide compliance with the stormwater rules through a reduction in the scope of the project, the applicant has created the condition and a waiver cannot be issued. The applicant must provide a discussion and supporting information of the site conditions that would not allow the construction of a stormwater management facility to provide compliance with these requirements, and/or if the denial of the application would impose an extraordinary hardship on the applicant brought about by circumstances peculiar to the subject property. The site conditions to be considered are soil type, the presence of limestone, acidic soils, a high groundwater table, any other unique conditions that would create an unsafe design, as well as conditions that may provide a detrimental impact to public health, welfare, and safety.

- **Design of the Mitigation Project**- Provide the design details of the mitigation project. This includes, but is not limited to, drawings, calculations, and other information needed to evaluate the mitigation project.

- **Responsible Party**- The mitigation project submission must list the party or parties responsible for the construction or maintenance of the mitigation project. Documentation must be provided to demonstrate that the responsible party is aware of, has authority to perform, and accepts the responsibility for the construction and the maintenance of the mitigation project. Under no circumstances shall the responsible party be an individual single-family homeowner.

- **Maintenance**- The applicant must include a maintenance plan that addresses the maintenance criteria at N.J.A.C. 7:8-5 as part of a mitigation plan. In addition, if the maintenance responsibility is being transferred to Keansburg, or another entity, the entity responsible for the cost of the maintenance must be identified. Brielle provides applicants with the option of conveying the mitigation project to the Borough, provided that the applicant funds the cost of long-term maintenance of the facility in perpetuity.

- **Permits**- The applicant is solely responsible to obtain any and all necessary local, State, or other applicable permits for the identified mitigation project or measure. The applicable permits must be obtained prior to the municipal approval of the project for which the mitigation is being sought.

- **Construction**- The applicant must demonstrate that the construction of the mitigation project coincides with the construction of the proposed project. A certificate of occupancy or final approval by the municipality for the application permit cannot be issued until the mitigation project or measure receives final approval. Any mitigation projects proposed by the municipality to offset the stormwater impacts of the Borough's own projects must be completed within six months of the completion of the municipal project, in order to remain in compliance with Brielle's NJPDES General Permit.

FIGURES

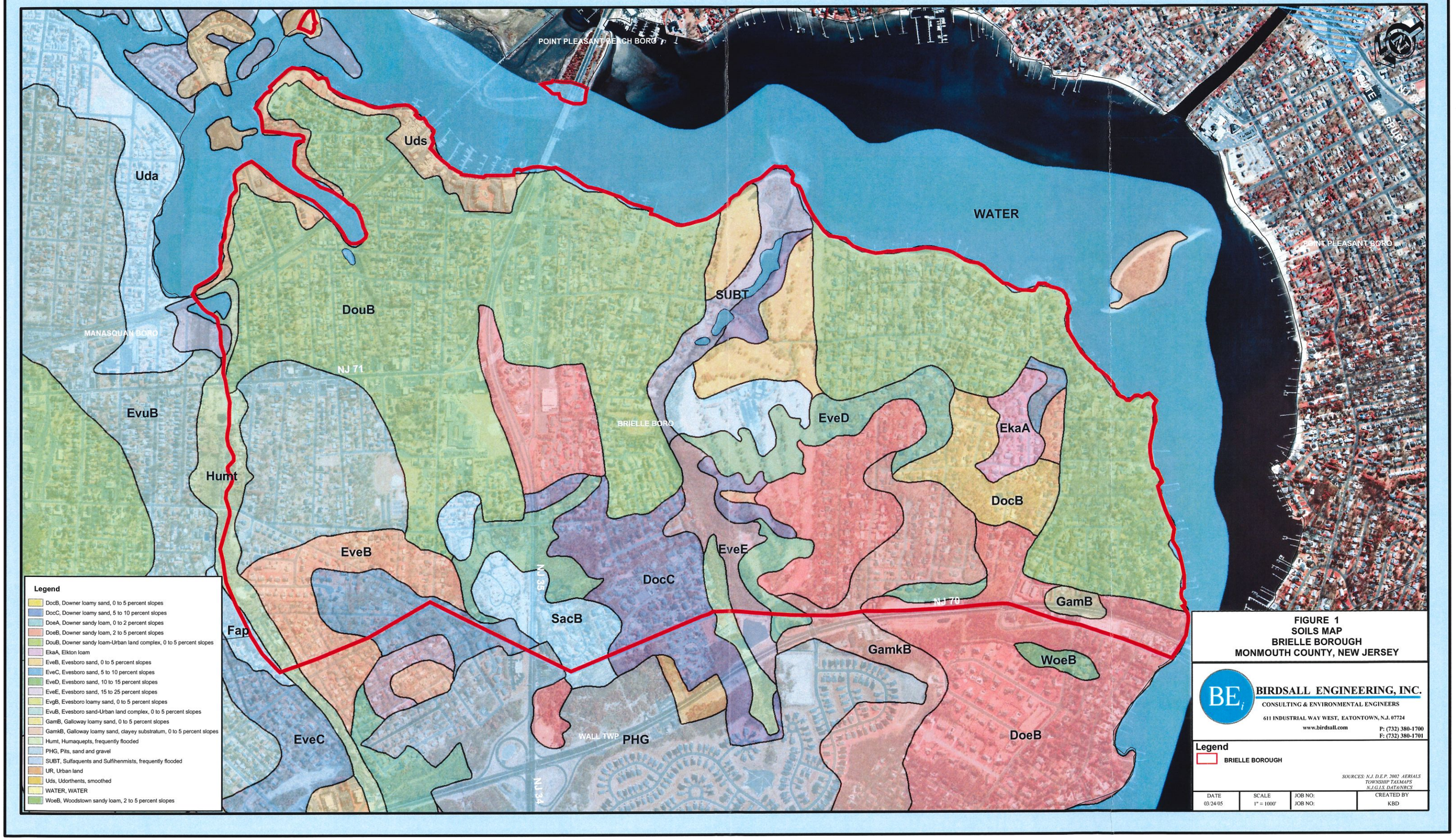


FIGURE 1
SOILS MAP
BRIELLE BOROUGH
MONMOUTH COUNTY, NEW JERSEY

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F: (732) 380-1701

Legend

BRIELLE BOROUGH

SOURCES: N.J. D.E.P. 2002 AERIALS
TOWNSHIP TAXMAPS
N.J.G.I.S. DATA/NRCS

DATE	SCALE	JOB NO:	CREATED BY
03/24/05	1" = 1000'	JOB NO:	KBD


Metedeconk R (below Beaverdam Creek) 0204030104
Beaverdam Creek 0204030104001
POINT PLEASANT BORO
MANASQUAN RIVER
WATSON CREEK
JUDAS CREEK (GLIMMER GLASS)
DEBBIES CREEK
NJ 35
Manasquan River
Osborn Island
Manasquan River (below Rt 70 bridge) 0203010410010
BRIELLE BORO
MANASQUAN BORO
MANASQUAN RIVER 58112
UNT TO 58112 @ I-90
NJ 70
ROBERTS SWAMP BROOK
WALL TWP
Manasquan R (Rt 70 br to 74d07m30s) 0203010
FIGURE 2
WETLANDS MAP
BRIELLE BOROUGH
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BRIELLE BOROUGH
FRESHWATER WETLANDS
STREAMS
N.J.D.E.P. STORMWATER RULE AREAS AFFECTED BY 300 FOOT BUFFERS
TIDAL WATER, LAKES
SOURCES: N.J. D.E.P. 2002 AERIALS
TOWNSHIP TAXMAPS
N.J.G.I.S. DATA
DATE 03/24/05
SCALE 1" = 1000'
JOB NO:
JOB NO:
CREATED BY KBD

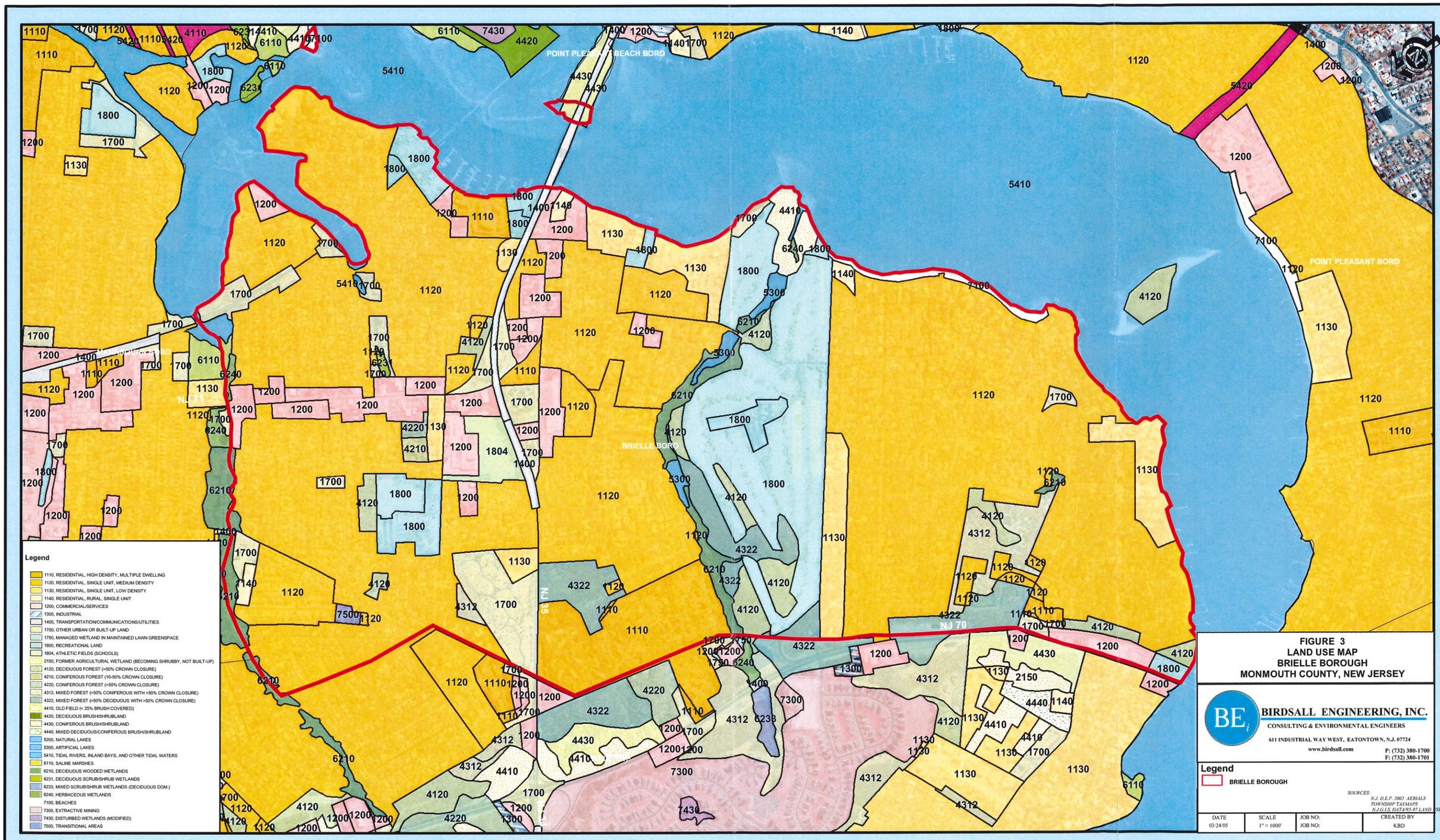

FIGURE 3
LAND USE MAP
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MONMOUTH COUNTY, NEW JERSEY

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BRIELLE BOROUGH

SOURCES:
N.J. D.E.P. 2002 AERIALS
TOWNSHIP TAXMAPS
N.J.G.I.S. DATA/95-97 LAND USE

DATE	SCALE	JOB NO:	CREATED BY
03/24/05	1" = 1000'	JOB NO:	KBD

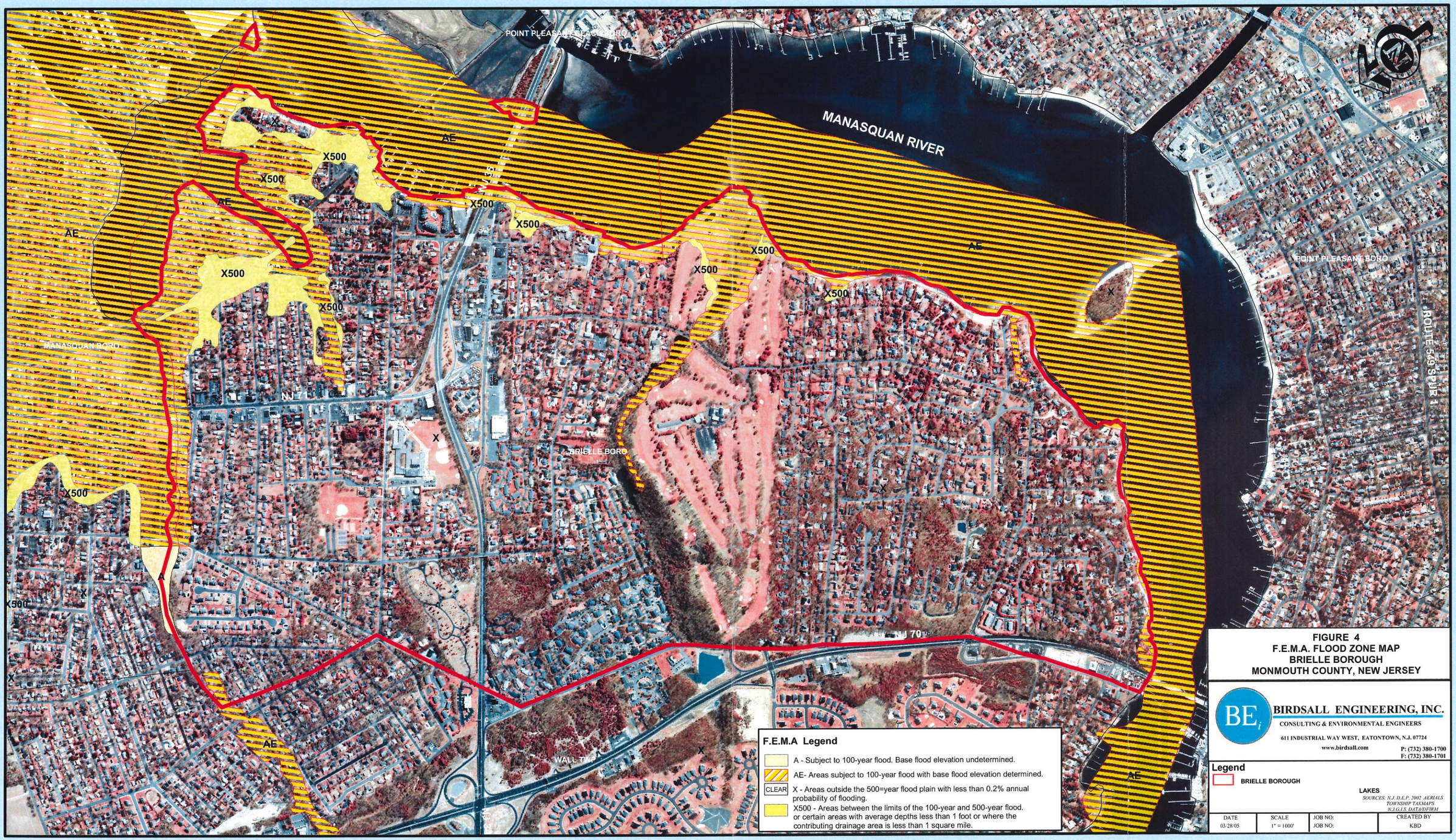

FIGURE 4
F.E.M.A. FLOOD ZONE MAP
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MONMOUTH COUNTY, NEW JERSEY

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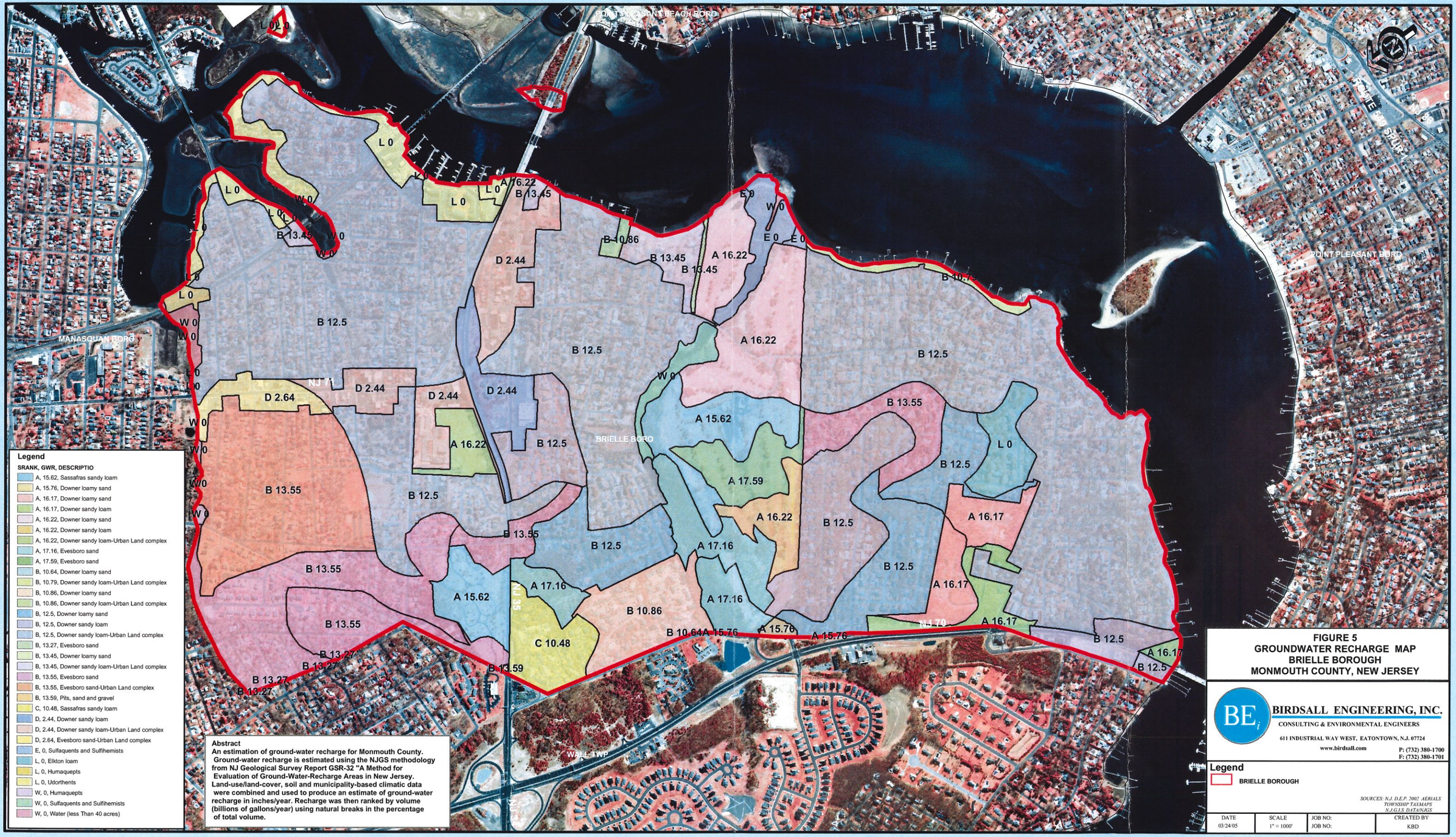
Legend

BRIELLE BOROUGH

LAKES

SOURCES: *N.J. D.E.P. 2002 AERIALS*
TOWNSHIP TAXMAPS
N.J.G.I.S. DATA/DFIRM

DATE	SCALE	JOB NO:	CREATED BY
03/28/05	1" = 1000'	JOB NO:	KBD



Legend

SRANK, GWR, DESCRIPTIO

- A, 15.62, Sassafras sandy loam
- A, 15.76, Downer loamy sand
- A, 16.17, Downer loamy sand
- A, 16.17, Downer sandy loam
- A, 16.22, Downer loamy sand
- A, 16.22, Downer sandy loam
- A, 16.22, Downer sandy loam-Urban Land complex
- A, 17.16, Evesboro sand
- A, 17.59, Evesboro sand
- B, 10.64, Downer loamy sand
- B, 10.79, Downer sandy loam-Urban Land complex
- B, 10.86, Downer loamy sand
- B, 10.86, Downer sandy loam-Urban Land complex
- B, 12.5, Downer loamy sand
- B, 12.5, Downer sandy loam
- B, 12.5, Downer sandy loam-Urban Land complex
- B, 13.27, Evesboro sand
- B, 13.45, Downer loamy sand
- B, 13.45, Downer sandy loam-Urban Land complex
- B, 13.55, Evesboro sand
- B, 13.55, Evesboro sand-Urban Land complex
- B, 13.59, Pits, sand and gravel
- C, 10.48, Sassafras sandy loam
- D, 2.44, Downer sandy loam
- D, 2.44, Downer sandy loam-Urban Land complex
- D, 2.64, Evesboro sand-Urban Land complex
- E, 0, Sulfaquents and Sulfihemists
- L, 0, Elkton loam
- L, 0, Humaquepts
- L, 0, Udorthents
- W, 0, Humaquepts
- W, 0, Sulfaquents and Sulfihemists
- W, 0, Water (less Than 40 acres)

Abstract

An estimation of ground-water recharge for Monmouth County. Ground-water recharge is estimated using the NJGS methodology from NJ Geological Survey Report GSR-32 "A Method for Evaluation of Ground-Water-Recharge Areas in New Jersey. Land-use/land-cover, soil and municipality-based climatic data were combined and used to produce an estimate of ground-water recharge in inches/year. Recharge was then ranked by volume (billions of gallons/year) using natural breaks in the percentage of total volume.

FIGURE 5
GROUNDWATER RECHARGE MAP
BRIELLE BOROUGH
MONMOUTH COUNTY, NEW JERSEY

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Legend

BRIELLE BOROUGH

SOURCES: N.J. D.E.P. 2002 AERIALS
TOWNSHIP TAXMAPS
N.J.G.I.S. DATA/NJGS

DATE	SCALE	JOB NO:	CREATED BY
03/24/05	1" = 1000'	JOB NO:	KBD


POINT PLEASANT BORO
Point Pleasant Water Dept
NJ 35
POINT PLEASANT BORO
MANASQUAN BORO
NJ 71
BRIELLE BORO
Brielle Water Dept
Brielle Water Dept
Manasquan Water Dept
Manasquan Water Dept
Manasquan Water Dept
Manasquan Water Dept
Brielle Water Dept
NJ 70
WALL TWP
A Well Head Protection Area (WHPA) in New Jersey is a map area calculated around a Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of ground water captured by a well pumping at a specific rate over a two-, five-, and twelve-year period of time for confined wells. The area of capture over two-, five-, and twelve-years is defined using line boundaries and polygon areas generated with the ARC/INFO Geographic Information System (GIS).
FIGURE 6
WELLHEAD PROTECTED AREAS MAP
BRIELLE BOROUGH
MONMOUTH COUNTY, NEW JERSEY
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Legend
BRIELLE BOROUGH
PUBLIC SUPPLY WELLS
WELLHEAD PROTECTED AREAS -TIER 1- 2 YEAR
SOURCES: N.J. D.E.P. 2002 AERIALS
TOWNSHIP TAX MAPS
N.J.G.I.S. DATA
DATE 03/24/05
SCALE 1" = 1000'
JOB NO: JOB NO:
CREATED BY KBD

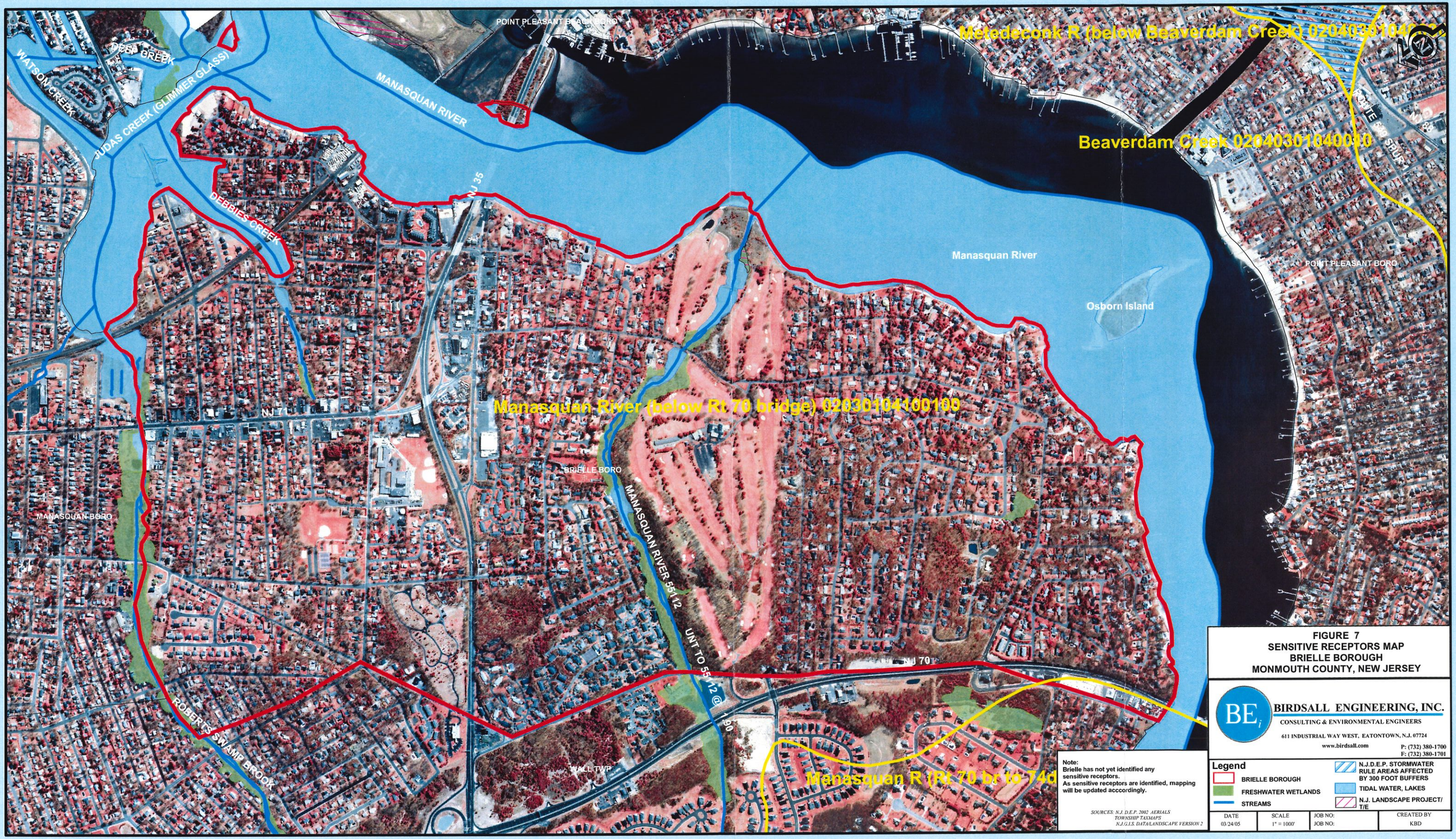

FIGURE 7
SENSITIVE RECEPTORS MAP
BRIELLE BOROUGH
MONMOUTH COUNTY, NEW JERSEY

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F: (732) 380-1701

Note:
Brielle has not yet identified any sensitive receptors. As sensitive receptors are identified, mapping will be updated acccordingly.

SOURCES: N.J. D.E.P. 2002 AERIALS
TOWNSHIP TAXMAPS
N.J.G.I.S. DATA/LANDSCAPE VERSION 2

Legend

- BRIELLE BOROUGH
- FRESHWATER WETLANDS
- STREAMS
- N.J.D.E.P. STORMWATER RULE AREAS AFFECTED BY 300 FOOT BUFFERS
- TIDAL WATER, LAKES
- N.J. LANDSCAPE PROJECT/ T/E

DATE	SCALE	JOB NO:	CREATED BY
03/24/05	1" = 1000'	JOB NO:	KBD

APPENDIX A

NJDEP MODEL STORMWATER CONTROL ORDINANCE

Section 1: Scope and Purpose

A. Policy Statement

Flood control, groundwater recharge, and pollutant reduction through nonstructural or low impact techniques shall be explored before relying on structural BMPs. Structural BMPs should be integrated with nonstructural stormwater management strategies and proper maintenance plans. Nonstructural strategies include both environmentally sensitive site design and source controls that prevent pollutants from being placed on the site or from being exposed to stormwater. Source control plans should be developed based upon physical site conditions and the origin, nature, and the anticipated quantity or amount of potential pollutants. Multiple stormwater management BMPs may be necessary to achieve the established performance standards for water quality, quantity, and groundwater recharge.

B. Purpose

It is the purpose of this ordinance to establish minimum stormwater management requirements and controls for "major development," as defined in Section 2.

C. Applicability

1. This ordinance shall be applicable to all site plans and subdivisions for the following major developments that require preliminary or final site plan or subdivision review:

   a. Non-residential major developments; and

   b. Aspects of residential major developments that are not pre-empted by the Residential Site Improvement Standards at N.J.A.C. 5:21.

2. This ordinance shall also be applicable to all major developments undertaken by said municipality.

D. Compatibility with Other Permit and Ordinance Requirements

Development approvals issued for subdivisions and site plans pursuant to this ordinance are to be considered an integral part of development approvals under the subdivision and site plan review process and do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance. In their interpretation and application, the provisions of this ordinance shall be held to be the minimum requirements for the promotion of the public health, safety, and general welfare. This ordinance is not intended to interfere with, abrogate, or annul any other ordinances, rule or regulation, statute, or other provision of law except that, where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, the more restrictive provisions or higher standards shall control.

Section 2: Definitions

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application. The definitions below are the same as or based on the corresponding definitions in the Stormwater Management Rules at N.J.A.C. 7:8-1.2.

"CAFRA Planning Map" means the geographic depiction of the boundaries for Coastal Planning Areas, CAFRA Centers, CAFRA Cores and CAFRA Nodes pursuant to N.J.A.C. 7:7E-5B.3.

"CAFRA Centers, Cores or Nodes" means those areas within boundaries accepted by the Department pursuant to N.J.A.C. 7:8E-5B.

"Compaction" means the increase in soil bulk density.

"Core" means a pedestrian-oriented area of commercial and civic uses serving the surrounding municipality, generally including housing and access to public transportation.

"County review agency" means an agency designated by the County Board of Chosen Freeholders to review municipal stormwater management plans and implementing ordinance(s). The county review agency may either be:

A county planning agency; or

A county water resource association created under N.J.S.A 58:16A-55.5, if the ordinance or resolution delegates authority to approve, conditionally approve, or disapprove municipal stormwater management plans and implementing ordinances.

"Department" means the New Jersey Department of Environmental Protection.

"Designated Center" means a State Development and Redevelopment Plan Center as designated by the State Planning Commission such as urban, regional, town, village, or hamlet.

"Design engineer" means a person professionally qualified and duly licensed in New Jersey to perform engineering services that may include, but not necessarily be limited to, development of project requirements, creation and development of project design and preparation of drawings and specifications.

"Development" means the division of a parcel of land into two or more parcels, the construction, reconstruction, conversion, structural alteration, relocation or enlargement of any building or structure, any mining excavation or landfill, and any use or change in the use of any building or other structure, or land or extension of use of land, by any person, for which permission is required under the Municipal Land Use Law , N.J.S.A. 40:55D-1 et seq. In the case of development of agricultural lands, development means: any activity that requires a State permit; any activity reviewed by the County Agricultural Board (CAB) and the State Agricultural Development Committee (SADC), and municipal review of any activity not exempted by the Right to Farm Act , N.J.S.A 4:1C-1 et seq.

"Drainage area" means a geographic area within which stormwater, sediments, or dissolved materials drain to a particular receiving waterbody or to a particular point along a receiving waterbody.

"Environmentally critical areas" means an area or feature which is of significant environmental value, including but not limited to: stream corridors; natural heritage priority sites; habitat of endangered or threatened species; large areas of contiguous open space or upland forest; steep slopes; and well head protection and groundwater recharge areas. Habitats of endangered or threatened species are

identified using the Department's Landscape Project as approved by the Department's Endangered and Nongame Species Program.

"Empowerment Neighborhood" means a neighborhood designated by the Urban Coordinating Council "in consultation and conjunction with" the New Jersey Redevelopment Authority pursuant to N.J.S.A 55:19-69.

"Erosion" means the detachment and movement of soil or rock fragments by water, wind, ice or gravity.

"Impervious surface" means a surface that has been covered with a layer of material so that it is highly resistant to infiltration by water.

"Infiltration" is the process by which water seeps into the soil from precipitation.

"Major development" means any "development" that provides for ultimately disturbing one or more acres of land. Disturbance for the purpose of this rule is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing of vegetation.

"Municipality" means any city, borough, town, township, or village.

"Node" means an area designated by the State Planning Commission concentrating facilities and activities which are not organized in a compact form.

"Nutrient" means a chemical element or compound, such as nitrogen or phosphorus, which is essential to and promotes the development of organisms.

"Person" means any individual, corporation, company, partnership, firm, association, [*insert name of municipality*], or political subdivision of this State subject to municipal jurisdiction pursuant to the Municipal Land Use Law , N.J.S.A. 40:55D-1 et seq.

"Pollutant" means any dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, refuse, oil, grease, sewage sludge, munitions, chemical wastes, biological materials, medical wastes, radioactive substance (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), thermal waste, wrecked or discarded equipment, rock, sand, cellar dirt, industrial, municipal, agricultural, and construction waste or runoff, or other residue discharged directly or indirectly to the land, ground waters or surface waters of the State, or to a domestic treatment works. "Pollutant" includes both hazardous and nonhazardous pollutants.

"Recharge" means the amount of water from precipitation that infiltrates into the ground and is not evapotranspired.

"Sediment" means solid material, mineral or organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water or gravity as a product of erosion.

"Site" means the lot or lots upon which a major development is to occur or has occurred.

"Soil" means all unconsolidated mineral and organic material of any origin.

"State Development and Redevelopment Plan Metropolitan Planning Area (PA1)" means an area delineated on the State Plan Policy Map and adopted by the State Planning Commission that is intended to be the focus for much of the state's future redevelopment and revitalization efforts.

"State Plan Policy Map" is defined as the geographic application of the State Development and Redevelopment Plan's goals and statewide policies, and the official map of these goals and policies.

"Stormwater" means water resulting from precipitation (including rain and snow) that runs off the land's surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewage or drainage facilities, or conveyed by snow removal equipment.

"Stormwater runoff" means water flow on the surface of the ground or in storm sewers, resulting from precipitation.

"Stormwater management basin" means an excavation or embankment and related areas designed to retain stormwater runoff. A stormwater management basin may either be normally dry (that is, a detention basin or infiltration basin), retain water in a permanent pool (a retention basin), or be planted mainly with wetland vegetation (most constructed stormwater wetlands).

"Stormwater management measure" means any structural or nonstructural strategy, practice, technology, process, program, or other method intended to control or reduce stormwater runoff and associated pollutants, or to induce or control the infiltration or groundwater recharge of stormwater or to eliminate illicit or illegal non-stormwater discharges into stormwater conveyances.

"Tidal Flood Hazard Area" means a flood hazard area, which may be influenced by stormwater runoff from inland areas, but which is primarily caused by the Atlantic Ocean.

"Urban Coordinating Council Empowerment Neighborhood" means a neighborhood given priority access to State resources through the New Jersey Redevelopment Authority.

"Urban Enterprise Zones" means a zone designated by the New Jersey Enterprise Zone Authority pursuant to the New Jersey Urban Enterprise Zones Act, N.J.S.A. 52:27H-60 et. seq.

"Urban Redevelopment Area" is defined as previously developed portions of areas:

(1) Delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), Designated Centers, Cores or Nodes;

(2) Designated as CAFRA Centers, Cores or Nodes;

(3) Designated as Urban Enterprise Zones; and

(4) Designated as Urban Coordinating Council Empowerment Neighborhoods.

"Waters of the State" means the ocean and its estuaries, all springs, streams, wetlands, and bodies of surface or ground water, whether natural or artificial, within the boundaries of the State of New Jersey or subject to its jurisdiction.

"Wetlands" or "wetland" means an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.

Section 3: General Standards

A. Design and Performance Standards for Stormwater Management Measures

1. Stormwater management measures for major development shall be developed to meet the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater runoff quality standards in Section 4. To the maximum extent practicable, these standards shall be met by incorporating nonstructural stormwater management strategies into the design. If these strategies alone are not sufficient to meet these standards, structural stormwater management measures necessary to meet these standards shall be incorporated into the design.

2. The standards in this ordinance apply only to new major development and are intended to minimize the impact of stormwater runoff on water quality and water quantity in receiving water bodies and maintain groundwater recharge. The standards do not apply to new major development to the extent that alternative design and performance standards are applicable under a regional stormwater management plan or Water Quality Management Plan adopted in accordance with Department rules.

Section 4: Stormwater Management Requirements for Major Development

A. The development shall incorporate a maintenance plan for the stormwater management measures incorporated into the design of a major development in accordance with Section 10.

B. Stormwater management measures shall avoid adverse impacts of concentrated flow on habitat for threatened and endangered species as documented in the Department' Landscape Project or Natural Heritage Database established under N.J.S.A. 13:1B-15.147 through 15.150.

C. The following linear development projects are exempt from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 4.F and 4.G:

1. The construction of an underground utility line provided that the disturbed areas are revegetated upon completion;

2. The construction of an aboveground utility line provided that the existing conditions are maintained to the maximum extent practicable; and

3. The construction of a public pedestrian access, such as a sidewalk or trail with a maximum width of 14 feet, provided that the access is made of permeable material.

D. A waiver from strict compliance from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 4.F and 4.G may be obtained for the enlargement of an existing public roadway or railroad; or the construction or enlargement of a public pedestrian access, provided that the following conditions are met:

1. The applicant demonstrates that there is a public need for the project that cannot be accomplished by any other means;

2. The applicant demonstrates through an alternatives analysis, that through the use of nonstructural and structural stormwater management strategies and measures, the option selected complies with the requirements of Sections 4.F and 4.G to the maximum extent practicable;

3. The applicant demonstrates that, in order to meet the requirements of Sections 4.F and 4.G, existing structures currently in use, such as homes and buildings, would need to be condemned; and

4. The applicant demonstrates that it does not own or have other rights to areas, including the potential to obtain through condemnation lands not falling under D.3 above within the upstream drainage area of the receiving stream, that would provide additional opportunities to mitigate the requirements of Sections 4.F and 4.G that were not achievable on-site.

E. Nonstructural Stormwater Management Strategies

1. To the maximum extent practicable, the standards in Sections 4.F and 4.G shall be met by incorporating nonstructural stormwater management strategies set forth at Section 4.E into the design. The applicant shall identify the nonstructural measures incorporated into the design of the project. If the applicant contends that it is not feasible for engineering, environmental, or safety reasons to incorporate any nonstructural stormwater management measures identified in Paragraph 2 below into the design of a particular project, the applicant shall identify the strategy considered and provide a basis for the contention.

2. Nonstructural stormwater management strategies incorporated into site design shall:

a. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;

b. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;

c. Maximize the protection of natural drainage features and vegetation;

d. Minimize the decrease in the "time of concentration" from pre-construction to post construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the watershed to the point of interest within a watershed;

e. Minimize land disturbance including clearing and grading;

f. Minimize soil compaction;

g. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;

h. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas;

i. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site, in order to prevent or minimize the release of those pollutants into stormwater runoff. Such source controls include, but are not limited to:

(1) Site design features that help to prevent accumulation of trash and debris in drainage systems, including features that satisfy Section 4.E.3. below;

(2) Site design features that help to prevent discharge of trash and debris from drainage systems;

(3) Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and

(4) When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules.

3. Site design features identified under Section 4.E.2.i.(2) above shall comply with the following standard to control passage of solid and floatable materials through storm drain inlets. For purposes of this paragraph, "solid and floatable materials" means sediment, debris, trash, and other floating, suspended, or settleable solids. For exemptions to this standard see Section 4.E.3.c below.

a. Design engineers shall use either of the following grates whenever they use a grate in pavement or another ground surface to collect stormwater from that surface into a storm drain or surface water body under that grate:

(1) The New Jersey Department of Transportation (NJDOT) bicycle safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (April 1996); or

(2) A different grate, if each individual clear space in that grate has an area of no more than seven (7.0) square inches, or is no greater than 0.5 inches across the smallest dimension.

Examples of grates subject to this standard include grates in grate inlets, the grate portion (non-curb-opening portion) of combination inlets, grates on storm sewer manholes, ditch grates, trench grates, and grates of spacer bars in slotted drains. Examples of ground surfaces include surfaces of roads (including bridges), driveways, parking areas, bikeways, plazas, sidewalks, lawns, fields, open channels, and stormwater basin floors.

b. Whenever design engineers use a curb-opening inlet, the clear space in that curb opening (or each individual clear space, if the curb opening has two or more clear spaces) shall have an area of no more than seven (7.0) square inches, or be no greater than two (2.0) inches across the smallest dimension.

c. This standard does not apply:

(1) Where the review agency determines that this standard would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets that meet these standards;

(2) Where flows from the water quality design storm as specified in Section 4.G.1 are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:

(a) A rectangular space four and five-eighths inches long and one and one-half inches wide (this option does not apply for outfall netting facilities); or

(b) A bar screen having a bar spacing of 0.5 inches.

(3) Where flows are conveyed through a trash rack that has parallel bars with one-inch (1") spacing between the bars, to the elevation of the water quality design storm as specified in Section 4.G.1; or

(4) Where the New Jersey Department of Environmental Protection determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet this standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.

4. Any land area used as a nonstructural stormwater management measure to meet the performance standards in Sections 4.F and 4.G shall be dedicated to a government agency, subjected to a conservation restriction filed with the appropriate County Clerk's office, or subject to an approved equivalent restriction that ensures that measure or an equivalent stormwater management measure approved by the reviewing agency is maintained in perpetuity.

5. Guidance for nonstructural stormwater management strategies is available in the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 7, or found on the Department's website at www.njstormwater.org.

F. Erosion Control, Groundwater Recharge and Runoff Quantity Standards

1. This subsection contains minimum design and performance standards to control erosion, encourage and control infiltration and groundwater recharge, and control stormwater runoff quantity impacts of major development.

a. The minimum design and performance standards for erosion control are those established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.

b. The minimum design and performance standards for groundwater recharge are as follows:

(1) The design engineer shall, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at Section 5, either:

(a) Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site; or

(b) Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated.

(2) This groundwater recharge requirement does not apply to projects within the "urban redevelopment area," or to projects subject to (3) below.

(3) The following types of stormwater shall not be recharged:

(a) Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than "reportable quantities" as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4; areas where recharge would be inconsistent with Department approved remedial action work plan or landfill closure plan and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities; and

(b) Industrial stormwater exposed to "source material." "Source material" means any material(s) or machinery, located at an industrial facility, that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials; intermediate products; final products; waste materials; by-products; industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

(4) The design engineer shall assess the hydraulic impact on the groundwater table and design the site so as to avoid adverse hydraulic impacts. Potential adverse hydraulic impacts include, but are not limited to, exacerbating a naturally or seasonally high water table so as to cause surficial ponding, flooding of basements, or interference with the proper operation of subsurface sewage disposal systems and other subsurface structures in the vicinity or downgradient of the groundwater recharge area.

c. In order to control stormwater runoff quantity impacts, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at Section 5, complete one of the following:

(1) Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two, 10, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;

(2) Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area;

(3) Design stormwater management measures so that the post-construction peak runoff rates for the 2, 10 and 100 year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed. The percentages shall not be applied to post-

construction stormwater runoff into tidal flood hazard areas if the increased volume of stormwater runoff will not increase flood damages below the point of discharge; or

(4) In tidal flood hazard areas, stormwater runoff quantity analysis in accordance with (1), (2) and (3) above shall only be applied if the increased volume of stormwater runoff could increase flood damages below the point of discharge.

2. Any application for a new agricultural development that meets the definition of major development at Section 2 shall be submitted to the appropriate Soil Conservation District for review and approval in accordance with the requirements of this section and any applicable Soil Conservation District guidelines for stormwater runoff quantity and erosion control. For the purposes of this section, "agricultural development" means land uses normally associated with the production of food, fiber and livestock for sale. Such uses do not include the development of land for the processing or sale of food and the manufacturing of agriculturally related products.

G. Stormwater Runoff Quality Standards

1. Stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff by 80 percent of the anticipated load from the developed site, expressed as an annual average. Stormwater management measures shall only be required for water quality control if an additional 1/4 acre of impervious surface is being proposed on a development site. The requirement to reduce TSS does not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the New Jersey Pollution Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A, or in a discharge specifically exempt under a NJPDES permit from this requirement. The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm, as reflected in Table 1. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures.

Table 1: Water Quality Design Storm Distribution

Time (Minutes)	Cumulative Rainfall (Inches)	Time (Minutes)	Cumulative Rainfall (Inches)
0	0.0000	65	0.8917
5	0.0083	70	0.9917
10	0.0166	75	1.0500
15	0.0250	80	1.0840
20	0.0500	85	1.1170
25	0.0750	90	1.1500
30	0.1000	95	1.1750
35	0.1330	100	1.2000

40	0.1660	105	1.2250
45	0.2000	110	1.2334
50	0.2583	115	1.2417
55	0.3583	120	1.2500
60	0.6250		

2. For purposes of TSS reduction calculations, Table 2 below presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 7, or found on the Department's website at www.njstormwater.org. The BMP Manual and other sources of technical guidance are listed in Section 7. TSS reduction shall be calculated based on the removal rates for the BMPs in Table 2 below. Alternative removal rates and methods of calculating removal rates may be used if the design engineer provides documentation demonstrating the capability of these alternative rates and methods to the review agency. A copy of any approved alternative rate or method of calculating the removal rate shall be provided to the Department at the following address: Division of Watershed Management, New Jersey Department of Environmental Protection, PO Box 418 Trenton, New Jersey, 08625-0418.

3. If more than one BMP in series is necessary to achieve the required 80 percent TSS reduction for a site, the applicant shall utilize the following formula to calculate TSS reduction:

   $R = A + B - (AXB)/100$

   Where

   R = total TSS percent load removal from application of both BMPs, and

   A = the TSS percent removal rate applicable to the first BMP

   B = the TSS percent removal rate applicable to the second BMP

Table 2: TSS Removal Rates for BMPs

Best Management Practice	TSS Percent Removal Rate
Bioretention Systems	90
Constructed Stormwater Wetland	90
Extended Detention Basin	40-60
Infiltration Structure	80
Manufactured Treatment Device	See Section 6.C
Sand Filter	80
Vegetative Filter Strip	60-80
Wet Pond	50-90

4. If there is more than one onsite drainage area, the 80 percent TSS removal rate shall apply to each drainage area, unless the runoff from the subareas converge on site in which case the removal rate can be demonstrated through a calculation using a weighted average.

5. Stormwater management measures shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load of the anticipated load from the developed site in stormwater runoff generated from the water quality design storm. In achieving reduction of nutrients to the maximum extent feasible, the design of the site shall include nonstructural strategies and structural measures that optimize nutrient removal while still achieving the performance standards in Sections 4.F and 4.G.

6. Additional information and examples are contained in the New Jersey Stormwater Best Management Practices Manual, which may be obtained from the address identified in Section 7.

7. In accordance with the definition of FW1 at N.J.A.C. 7:9B-1.4, stormwater management measures shall be designed to prevent any increase in stormwater runoff to waters classified as FW1.

8. Special water resource protection areas shall be established along all waters designated Category One at N.J.A.C. 7:9B, and perennial or intermittent streams that drain into or upstream of the Category One waters as shown on the USGS Quadrangle Maps or in the County Soil Surveys, within the associated HUC14 drainage area. These areas shall be established for the protection of water quality, aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, and exceptional fisheries significance of those established Category One waters. These areas shall be designated and protected as follows:

   a. The applicant shall preserve and maintain a special water resource protection area in accordance with one of the following:

      (1) A 300-foot special water resource protection area shall be provided on each side of the waterway, measured perpendicular to the waterway from the top of the bank outwards or from the centerline of the waterway where the bank is not defined, consisting of existing vegetation or vegetation allowed to follow natural succession is provided. (2) Encroachment within the designated special water resource protection area under Subsection (1) above shall only be allowed where previous development or disturbance has occurred (for example, active agricultural use, parking area or maintained lawn area). The encroachment shall only be allowed where applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable. In no case shall the remaining special water resource protection area be reduced to less than 150 feet as measured perpendicular to the top of bank of the waterway or centerline of the waterway where the bank is undefined. All encroachments proposed under this subparagraph shall be subject to review and approval by the Department.

   b. All stormwater shall be discharged outside of and flow through the special water resource protection area and shall comply with the Standard for Off-Site Stability in the "Standards For Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act , N.J.S.A. 4:24-39 et seq.

   c. If stormwater discharged outside of and flowing through the special water resource protection area cannot comply with the Standard For Off-Site Stability in the "Standards for Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control

Act , N.J.S.A. 4:24-39 et seq., then the stabilization measures in accordance with the requirements of the above standards may be placed within the special water resource protection area, provided that:

(1) Stabilization measures shall not be placed within 150 feet of the Category One waterway;

(2) Stormwater associated with discharges allowed by this section shall achieve a 95 percent TSS post-construction removal rate;

(3) Temperature shall be addressed to ensure no impact on the receiving waterway;

(4) The encroachment shall only be allowed where the applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable;

(5) A conceptual project design meeting shall be held with the appropriate Department staff and Soil Conservation District staff to identify necessary stabilization measures; and

(6) All encroachments proposed under this section shall be subject to review and approval by the Department.

d. A stream corridor protection plan may be developed by a regional stormwater management planning committee as an element of a regional stormwater management plan, or by a municipality through an adopted municipal stormwater management plan. If a stream corridor protection plan for a waterway subject to Section 4.G(8) has been approved by the Department of Environmental Protection, then the provisions of the plan shall be the applicable special water resource protection area requirements for that waterway. A stream corridor protection plan for a waterway subject to G.8 shall maintain or enhance the current functional value and overall condition of the special water resource protection area as defined in G.8.a.(1) above. In no case shall a stream corridor protection plan allow the reduction of the Special Water Resource Protection Area to less than 150 feet as measured perpendicular to the waterway subject to this subsection.

e. Paragraph G.8 does not apply to the construction of one individual single family dwelling that is not part of a larger development on a lot receiving preliminary or final subdivision approval on or before February 2, 2004 , provided that the construction begins on or before February 2, 2009.

Section 5: Calculation of Stormwater Runoff and Groundwater Recharge

A. Stormwater runoff shall be calculated in accordance with the following:

1. The design engineer shall calculate runoff using one of the following methods:

a. The USDA Natural Resources Conservation Service (NRCS) methodology, including the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in the NRCS National Engineering Handbook Section 4 – Hydrology and Technical Release 55 – Urban Hydrology for Small Watersheds; or

b. The Rational Method for peak flow and the Modified Rational Method for hydrograph computations.

2. For the purpose of calculating runoff coefficients and groundwater recharge, there is a presumption that the pre-construction condition of a site or portion thereof is a wooded land use

with good hydrologic condition. The term "runoff coefficient" applies to both the NRCS methodology at Section 5.A.1.a and the Rational and Modified Rational Methods at Section 5.A.1.b. A runoff coefficient or a groundwater recharge land cover for an existing condition may be used on all or a portion of the site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site for at least five years without interruption prior to the time of application. If more than one land cover have existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land use type is pasture, lawn, or park), with good cover (if the land use type is woods), or with good hydrologic condition and conservation treatment (if the land use type is cultivation).

3. In computing pre-construction stormwater runoff, the design engineer shall account for all significant land features and structures, such as ponds, wetlands, depressions, hedgerows, or culverts, that may reduce pre-construction stormwater runoff rates and volumes.

4. In computing stormwater runoff from all design storms, the design engineer shall consider the relative stormwater runoff rates and/or volumes of pervious and impervious surfaces separately to accurately compute the rates and volume of stormwater runoff from the site. To calculate runoff from unconnected impervious cover, urban impervious area modifications as described in the NRCS Technical Release 55 – Urban Hydrology for Small Watersheds and other methods may be employed.

5. If the invert of the outlet structure of a stormwater management measure is below the flood hazard design flood elevation as defined at N.J.A.C. 7:13, the design engineer shall take into account the effects of tailwater in the design of structural stormwater management measures.

B. Groundwater recharge may be calculated in accordance with the following:

1. The New Jersey Geological Survey Report GSR-32 A Method for Evaluating Ground-Water Recharge Areas in New Jersey, incorporated herein by reference as amended and supplemented. Information regarding the methodology is available from the New Jersey Stormwater Best Management Practices Manual; at http://www.state.nj.us/dep/njgs/; or at New Jersey Geological Survey, 29 Arctic Parkway, P.O. Box 427 Trenton, New Jersey 08625-0427; (609) 984-6587.

Section 6: Standards for Structural Stormwater Management Measures

A. Standards for structural stormwater management measures are as follows:

1. Structural stormwater management measures shall be designed to take into account the existing site conditions, including, for example, environmentally critical areas, wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).

2. Structural stormwater management measures shall be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate, and shall have parallel bars with one-inch (1") spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the parallel bars at the outlet structure shall be spaced no greater than

one-third (1/3) the width of the diameter of the orifice or one-third (1/3) the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. In addition, the design of trash racks must comply with the requirements of Section 8.D.

3. Structural stormwater management measures shall be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvement Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.

4. At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.

5. Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section 8.

B. Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, groundwater recharge and water quality design and performance standards established by Section 4 of this ordinance.

C. Manufactured treatment devices may be used to meet the requirements of Section 4 of this ordinance, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the Department.

Section 7: Sources for Technical Guidance

A. Technical guidance for stormwater management measures can be found in the documents listed at 1 and 2 below, which are available from Maps and Publications, New Jersey Department of Environmental Protection, 428 East State Street, P.O. Box 420, Trenton, New Jersey, 08625; telephone (609) 777-1038.

1. Guidelines for stormwater management measures are contained in the New Jersey Stormwater Best Management Practices Manual, as amended. Information is provided on stormwater management measures such as: bioretention systems, constructed stormwater wetlands, dry wells, extended detention basins, infiltration structures, manufactured treatment devices, pervious paving, sand filters, vegetative filter strips, and wet ponds.

2. The New Jersey Department of Environmental Protection Stormwater Management Facilities Maintenance Manual, as amended.

B. Additional technical guidance for stormwater management measures can be obtained from the following:

1. The "Standards for Soil Erosion and Sediment Control in New Jersey" promulgated by the State Soil Conservation Committee and incorporated into N.J.A.C. 2:90. Copies of these standards may be obtained by contacting the State Soil Conservation Committee or any of the Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil

Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey 08625; (609) 292-5540;

2. The Rutgers Cooperative Extension Service, 732-932-9306; and

3. The Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey, 08625, (609) 292-5540.

Section 8: Safety Standards for Stormwater Management Basins

A. This section sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This section applies to any new stormwater management basin.

Note: The provisions of this section are not intended to preempt more stringent municipal or county safety requirements for new or existing stormwater management basins. Municipal and county stormwater management plans and ordinances may, pursuant to their authority, require existing stormwater management basins to be retrofitted to meet one or more of the safety standards in Sections 8.B.1, 8.B.2, and 8.B.3 for trash racks, overflow grates, and escape provisions at outlet structures.

B. Requirements for Trash Racks, Overflow Grates and Escape Provisions

1. A trash rack is a device designed to catch trash and debris and prevent the clogging of outlet structures. Trash racks shall be installed at the intake to the outlet from the stormwater management basin to ensure proper functioning of the basin outlets in accordance with the following:

   a. The trash rack shall have parallel bars, with no greater than six inch spacing between the bars.

   b. The trash rack shall be designed so as not to adversely affect the hydraulic performance of the outlet pipe or structure.

   c. The average velocity of flow through a clean trash rack is not to exceed 2.5 feet per second under the full range of stage and discharge. Velocity is to be computed on the basis of the net area of opening through the rack.

   d. The trash rack shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs/ft sq.

2. An overflow grate is designed to prevent obstruction of the overflow structure. If an outlet structure has an overflow grate, such grate shall meet the following requirements:

   a. The overflow grate shall be secured to the outlet structure but removable for emergencies and maintenance.

   b. The overflow grate spacing shall be no less than two inches across the smallest dimension.

   c. The overflow grate shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs./ft sq.

3. For purposes of this paragraph 3, escape provisions means the permanent installation of ladders, steps, rungs, or other features that provide easily accessible means of egress from stormwater management basins. Stormwater management basins shall include escape provisions as follows:

   a. If a stormwater management basin has an outlet structure, escape provisions shall be incorporated in or on the structure. With the prior approval of the reviewing agency identified in Section 8.C a free-standing outlet structure may be exempted from this requirement.

   b. Safety ledges shall be constructed on the slopes of all new stormwater management basins having a permanent pool of water deeper than two and one-half feet. Such safety ledges shall be comprised of two steps. Each step shall be four to six feet in width. One step shall be located

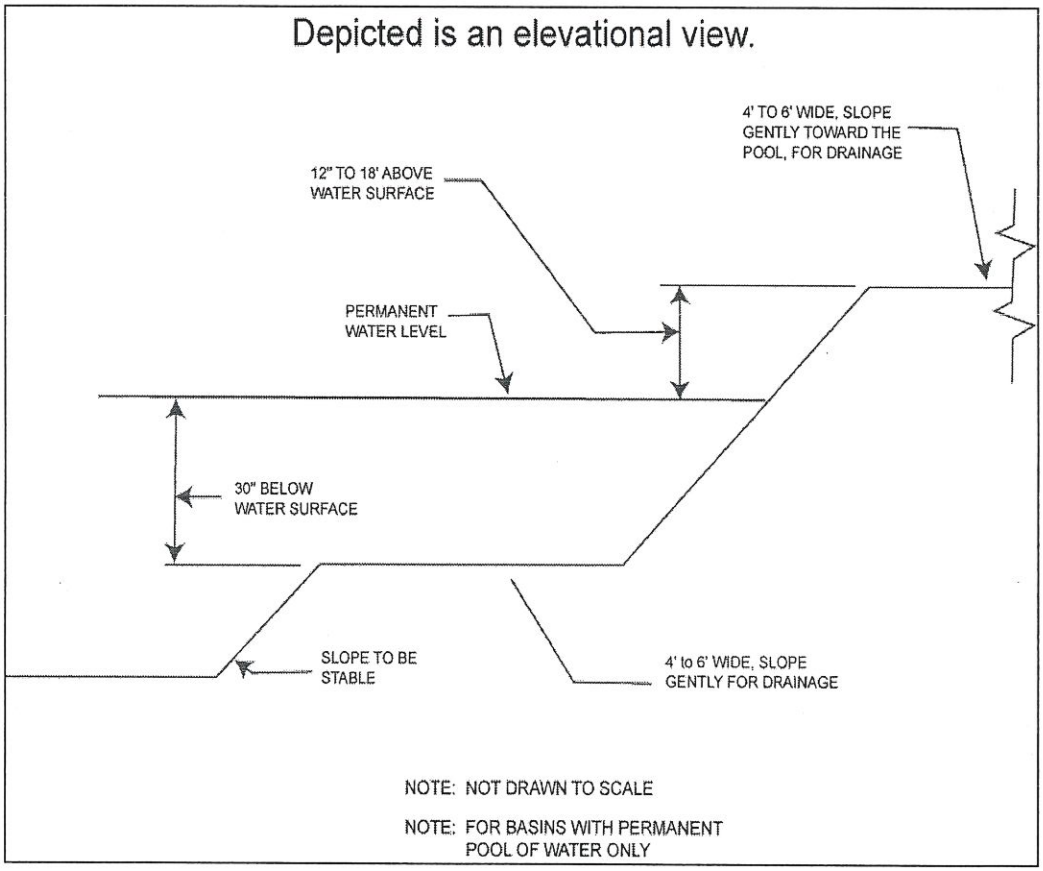
approximately two and one-half feet below the permanent water surface, and the second step shall be located one to one and one-half feet above the permanent water surface. See Section 8.D for an illustration of safety ledges in a stormwater management basin.

c. In new stormwater management basins, the maximum interior slope for an earthen dam, embankment, or berm shall not be steeper than 3 horizontal to 1 vertical.

C. Variance or Exemption from Safety Standards

1. A variance or exemption from the safety standards for stormwater management basins may be granted only upon a written finding by the appropriate reviewing agency (municipality, county or Department) that the variance or exemption will not constitute a threat to public safety.

D. Illustration of Safety Ledges in a New Stormwater Management Basin



Section 9: Requirements for a Site Development Stormwater Plan

A. Submission of Site Development Stormwater Plan

1. Whenever an applicant seeks municipal approval of a development subject to this ordinance, the applicant shall submit all of the required components of the Checklist for the Site Development Stormwater Plan at Section 9.C below as part of the submission of the applicant's application for subdivision or site plan approval.

2. The applicant shall demonstrate that the project meets the standards set forth in this ordinance.

3. The applicant shall submit [*specify number*] copies of the materials listed in the checklist for site development stormwater plans in accordance with Section 9.C of this ordinance.

B. Site Development Stormwater Plan Approval

The applicant's Site Development project shall be reviewed as a part of the subdivision or site plan review process by the municipal board or official from which municipal approval is sought. That municipal board or official shall consult the engineer retained by the Planning and/or Zoning Board (as appropriate) to determine if all of the checklist requirements have been satisfied and to determine if the project meets the standards set forth in this ordinance.

C. Checklist Requirements

The following information shall be required:

1. Topographic Base Map

The reviewing engineer may require upstream tributary drainage system information as necessary. It is recommended that the topographic base map of the site be submitted which extends a minimum of 200 feet beyond the limits of the proposed development, at a scale of 1"=200' or greater, showing 2-foot contour intervals. The map as appropriate may indicate the following: existing surface water drainage, shorelines, steep slopes, soils, erodible soils, perennial or intermittent streams that drain into or upstream of the Category One waters, wetlands and flood plains along with their appropriate buffer strips, marshlands and other wetlands, pervious or vegetative surfaces, existing man-made structures, roads, bearing and distances of property lines, and significant natural and manmade features not otherwise shown.

2. Environmental Site Analysis

A written and graphic description of the natural and man-made features of the site and its environs. This description should include a discussion of soil conditions, slopes, wetlands, waterways and vegetation on the site. Particular attention should be given to unique, unusual, or environmentally sensitive features and to those that provide particular opportunities or constraints for development.

3. Project Description and Site Plan(s)

A map (or maps) at the scale of the topographical base map indicating the location of existing and proposed buildings, roads, parking areas, utilities, structural facilities for stormwater management and sediment control, and other permanent structures. The map(s) shall also clearly show areas where alterations occur in the natural terrain and cover, including lawns and other landscaping, and seasonal high ground water elevations. A written description of the site plan and justification of proposed changes in natural conditions may also be provided.

4. Land Use Planning and Source Control Plan

This plan shall provide a demonstration of how the goals and standards of Sections 3 through 6 are being met. The focus of this plan shall be to describe how the site is being developed to meet the

objective of controlling groundwater recharge, stormwater quality and stormwater quantity problems at the source by land management and source controls whenever possible.

5. Stormwater Management Facilities Map

The following information, illustrated on a map of the same scale as the topographic base map, shall be included:

a. Total area to be paved or built upon, proposed surface contours, land area to be occupied by the stormwater management facilities and the type of vegetation thereon, and details of the proposed plan to control and dispose of stormwater.

b. Details of all stormwater management facility designs, during and after construction, including discharge provisions, discharge capacity for each outlet at different levels of detention and emergency spillway provisions with maximum discharge capacity of each spillway.

6. Calculations

a. Comprehensive hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in Section 4 of this ordinance.

b. When the proposed stormwater management control measures (e.g., infiltration basins) depends on the hydrologic properties of soils, then a soils report shall be submitted. The soils report shall be based on onsite boring logs or soil pit profiles. The number and location of required soil borings or soil pits shall be determined based on what is needed to determine the suitability and distribution of soils present at the location of the control measure.

7. Maintenance and Repair Plan

The design and planning of the stormwater management facility shall meet the maintenance requirements of Section 10.

8. Waiver from Submission Requirements

The municipal official or board reviewing an application under this ordinance may, in consultation with the municipal engineer, waive submission of any of the requirements in Sections 9.C.1 through 9.C.6 of this ordinance when it can be demonstrated that the information requested is impossible to obtain or it would create a hardship on the applicant to obtain and its absence will not materially affect the review process.

Section 10: Maintenance and Repair

A. Applicability

1. Projects subject to review as in Section 1.C of this ordinance shall comply with the requirements of Sections 10.B and 10.C.

B. General Maintenance

1. The design engineer shall prepare a maintenance plan for the stormwater management measures incorporated into the design of a major development.

2. The maintenance plan shall contain specific preventative maintenance tasks and schedules; cost estimates, including estimated cost of sediment, debris, or trash removal; and the name, address, and telephone number of the person or persons responsible for preventative and corrective maintenance (including replacement). Maintenance guidelines for stormwater management measures are available in the New Jersey Stormwater Best Management Practices Manual. If the maintenance plan identifies a person other than the developer (for example, a public agency or homeowners' association) as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or of the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.

3. Responsibility for maintenance shall not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project.

4. If the person responsible for maintenance identified under Section 10.B.2 above is not a public agency, the maintenance plan and any future revisions based on Section 10.B.7 below shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.

5. Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of nonvegetated linings.

6. The person responsible for maintenance identified under Section 10.B.2 above shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

7. The person responsible for maintenance identified under Section 10.B.2 above shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

8. The person responsible for maintenance identified under Section 10.B.2 above shall retain and make available, upon request by any public entity with administrative, health, environmental, or safety authority over the site, the maintenance plan and the documentation required by Sections 10.B.6 and 10.B.7 above.

9. The requirements of Sections 10.B.3 and 10.B.4 do not apply to stormwater management facilities that are dedicated to and accepted by the municipality or another governmental agency.

Note: It may be appropriate to delete requirements in the maintenance and repair plan that are not applicable if the ordinance requires the facility to be dedicated to the municipality. If the municipality does not want to take this responsibility, the ordinance should require the posting of a two year maintenance guarantee in accordance with N.J.S.A. 40:55D-53. Guidelines for developing a maintenance and inspection program are provided in the New Jersey Stormwater Best Management Practices Manual and the NJDEP Ocean County Demonstration Study, Stormwater Management Facilities Maintenance Manual, dated June 1989 available from the NJDEP, Watershed Management Program.

10. In the event that the stormwater management facility becomes a danger to public safety or public health, or if it is in need of maintenance or repair, the municipality shall so notify the responsible person in writing. Upon receipt of that notice, the responsible person shall have fourteen (14) days to effect maintenance and repair of the facility in a manner that is approved by the municipal engineer or his designee. The municipality, in its discretion, may extend the time allowed for effecting maintenance and repair for good cause. If the responsible person fails or refuses to perform such maintenance and repair, the municipality or County may immediately proceed to do so and shall bill the cost thereof to the responsible person.

B. Nothing in this section shall preclude the municipality in which the major development is located from requiring the posting of a performance or maintenance guarantee in accordance with N.J.S.A. 40:55D-53.

Section 11: Penalties

Any person who erects, constructs, alters, repairs, converts, maintains, or uses any building, structure or land in violation of this ordinance shall be subject to the following penalties: [*Municipality to specify*].

Section 12: Effective Date

This ordinance shall take effect immediately upon the approval by the county review agency, or sixty (60) days from the receipt of the ordinance by the county review agency if the county review agency should fail to act.

Section 13: Severability

If the provisions of any section, subsection, paragraph, subdivision, or clause of this ordinance shall be judged invalid by a court of competent jurisdiction, such order of judgment shall not affect or invalidate the remainder of any section, subsection, paragraph, subdivision, or clause of this ordinance.

APPENDIX B

MCHD RAPID BIOASSESMENT WATER QUALITY RESULTS

Biological Assessment	NJIS Score	Habitat Assessement	Habitat Score
Non-impaired	24-30	Optimal	16-20
Moderately Impaired	9-21	Suboptimal	11-15
Severly Impaired	0-6	Marginal	6-10
		Poor	0-5

Rapid Bioassessment Sites	Sample Date	NJIS Score	Habitat Assessment Score
Manasquan River, 101 Bergerville Road @ Manasquan Water Shed Site Code:MRBERG	6/8/2001	**18**	**15.4**
Manasquan River, 101 Bergerville Road @ Manasquan Water Shed Site Code:MRBERG	10/9/2001	**18**	**15.2**
Manasquan River, Lone Pine Landfill @ Manasquan Water Shed Site Code:MRTRIB1000	6/7/2001	**24**	**15.7**

APPENDIX C

2004 NEW JERSEY INTEGRATED WATERS

Waterways in Brielle Borough Included in New Jersey's 2004 Integrated List of Waterbodies

Sublist	Watershed Region	WMA	Station Name/Waterbody	Site ID	Parameters	Data Source
3	Atlantic Coast	12	Manasquan River at off Turkey Swamp Rd in Freehold	AN0485	Benthic Macroinvertebrates	NJDEP AMNET
5	Atlantic Coast	12	Manasquan River at Rt 547 in Howell	AN0493	Benthic Macroinvertebrates	NJDEP AMNET
5	Atlantic Coast	12	Manasquan River at Rt 9 in Howell	AN0489	Benthic Macroinvertebrates	NJDEP AMNET
3	Atlantic Coast	12	Manasquan River at Squankum	01408000, EWQ0489, 12-MA-1, 12-MA-2, 12-MA-3	Arsenic, Cadmium, Mercury, Silver	NJDEP/USGS Data, EWQ, Metal Recon
1	Atlantic Coast	12	Manasquan River at Squankum	01408000, EWQ0489, 12-MA-1, 12-MA-2, 12-MA-3	Temperature, pH, Dissolved Oxygen, Nitrate, Dissolved Solids, Total Suspended Solids, Unionized Ammonia, Chromium, Copper, Nickel, Selinium, Zinc	NJDEP/USGS Data, EWQ, Metal Recon
4	Atlantic Coast	12	Manasquan River at Squankum	01408000, EWQ0489, 12-MA-1, 12-MA-2, 12-MA-3	Fecal Coliform	NJDEP/USGS Data, EWQ, Metal Recon
5	Atlantic Coast	12	Manasquan River at Squankum	01408000, EWQ0489, 12-MA-1, 12-MA-2, 12-MA-3	Phosphorus	NJDEP/USGS Data, EWQ, Metal Recon
5	Atlantic Coast	12	Manasquan River at W Farms Rd in Howell	AN0490	Benthic Macroinvertebrates	NJDEP AMNET
5	Atlantic Coast	12	Manasquan River Estuary	Manasquan River Estuary-1 thru 3	Total Coliform	NJDEP Coastal Monitoring, Shellfish Monitoring
1	Atlantic Coast	12	Manasquan River Estuary	Manasquan River Estuary-3	Fecal Coliform	NJDEP Coastal Monitoring, Shellfish Monitoring
5	Atlantic Coast	12	Manasquan River Estuary	Manasquan River Estuary-3	Dissolved Oxygen	NJDEP Coastal Monitoring, Shellfish Monitoring
1	Atlantic Coast	12	Manasquan River Estuary	R07; Upper Manasquan River Estuary-1; Manasquan River Estuary-2	Dissolved Oxygen, Fecal Coliform	NJDEP Coastal Monitoring, Shellfish Monitoring

APPENDIX D

AMNET PROGRAM WATER QUALITY TESTING RESULTS

Station: AN0485
Manasquan River Headwaters, Turkey Swamp Road, Monmouth County
Adelphia USGS Quadrangle
Date Sampled: 10/05/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Sphaeriidae	8	37
Lumbriculidae	8	9
Tubificidae	10	7
Tipulidae	3	4
Asellidae	8	2
Tabanidae	6	2
Dytiscidae	5	1
Chironomidae	6	1
Gammaridae	4	1
Hydrophilidae	5	1
Sialidae	4	1

Statistical Analysis

Number of Taxa: 11
Total Number of Individuals: 66
% Contribution of Dominant Family: 56.06 % (Sphaeriidae)
Family Biotic Index: 7.61
Scraper/Filterer Collector Ratio: 0.00
Shredder/Total Ratio: 0.09
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 0
% EPT: 0.00
EPT/C: 0.00
NJIS Rating: 9
Biological Condition: Moderately Impaired
Habitat Analysis: 163
Deficiency(s) noted: Significant Organic Pollution - Paucity of Clean Water Organisms

Observations

Streamwater: Clear....Flow: Moderate....Width/Depth (ft): 1.5'/6.0'
Substrate: Gravel/Sand, Snags....StreamBank Vegetation/Stability: trees/Good
Canopy: Mostly Closed....Other: Forested, weather:cold, overcast, some rain; Frogs present.
Water temp. 14.1C / pH 3.5SU / DO 5.8mg/L / Cond. 278umhos;

Station: AN0488
Unt To Manasquan River (Killtime Bk), Strickland Rd., Monmouth County
Adelphia USGS Quadrangle
Date Sampled: 9/23/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Lumbriculidae	8	39
Tubificidae	10	16
Naididae	7	6
BloodRed Chironomidae	8	4
Tipulidae	3	4
Chironomidae	6	4
Coenagrionidae	9	3
Planorbidae	6	2
Sphaeriidae	8	2
Viviparidae	6	1
Lumbricidae	10	1
Physidae	7	1

Statistical Analysis

Number of Taxa: 12
Total Number of Individuals: 83
% Contribution of Dominant Family: 46.99 % (Lumbriculidae)
Family Biotic Index: 7.95
Scraper/Filterer Collector Ratio: 1.50
Shredder/Total Ratio: 0.10
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 0
% EPT: 0.00
EPT/C: 0.00
NJIS Rating: 9
Biological Condition: Moderately Impaired
Habitat Analysis: 128
Deficiency(s) noted: Significant Organic Pollution - Paucity of Clean Water Organisms

Observations

Streamwater: Turbid....Flow: Moderate....Width/Depth (ft): 6-8/1
Substrate: Gravel/Sand....StreamBank Vegetation/Stability: Trees, Shrubs/Poor
Canopy: Mostly Open....Other: Suburban; Water temp. 12.7C / pH 6.0SU / DO 9.0mg/L / Cond. 208umhos

Station: AN0489
Manasquan River, Rt. 9, Monmouth County
Adelphia USGS Quadrangle
Date Sampled: 09/23/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Tubificidae	10	33
Gammaridae	4	21
Calopterygidae	5	10
Coenagrionidae	9	5
Chironomidae	6	5
Hydropsychidae	4	4
Veliidae	9	4
Aeshnidae	3	3
Tipulidae	3	3
Elmidae	4	2
Asellidae	8	2
Lumbriculidae	8	2
Corixidae	9	1
Libellulidae	9	1
Notonectidae	9	1
Haliplidae	5	1
Physidae	7	1
Sialidae	4	1

Statistical Analysis

Number of Taxa: 18
Total Number of Individuals: 100
% Contribution of Dominant Family: 33.00 % (Tubificidae)
Family Biotic Index: 6.92
Scraper/Filterer Collector Ratio: 0.11
Shredder/Total Ratio: 0.06
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 1
% EPT: 4.00
EPT/C: 0.80
NJIS Rating: 15
Biological Condition: Moderately Impaired
Habitat Analysis: 126
Deficiency(s) noted: Paucity of Clean Water Organisms

Observations

Streamwater: Slightly turbid....Flow: Moderate....Width/Depth (ft): 20'-25' / 1'-2'
Substrate: gravel/Sand, Mud, Silt....StreamBank Vegetation/Stability: Trees and shrubs/Poor
Canopy: Partly Open....Other: Urban (Rt. 9 commercialized), Forested; Storm sewers draining into stream.
Minnows and frogs present.; Water Temp. 13.4C / pH 6.0SU / DO 9.0mg/L / Cond. 217umhos

Station: AN0490
Manasquan River, West Farms Road, Howell Twp., Monmouth
Farmingdale USGS Quadrangle
Date Sampled: 08/18/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Hydropsychidae	4	49
Lumbriculidae	8	7
Chironomidae	6	7
Gammaridae	4	6
Corixidae	9	5
Empididae	6	4
Naididae	7	4
Enchytraeidae	10	2
Corydalidae	0	2
Brachycentridae	1	1
Tipulidae	3	1
Elmidae	4	1
BloodRed Chironomidae	8	1

Statistical Analysis

Number of Taxa: 13
Total Number of Individuals: 90
% Contribution of Dominant Family: 54.44 % (Hydropsychidae)
Family Biotic Index: 5.01
Scraper/Filterer Collector Ratio: 0.04
Shredder/Total Ratio: 0.07
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 2
% EPT: 55.56
EPT/C: 6.25
NJIS Rating: 18
Biological Condition: Moderately Impaired
Habitat Analysis: 131
Deficiency(s) noted: Paucity of Clean Water Organisms

Observations

Streamwater: Slightly Turbid....Flow: Moderate....Width/Depth (ft): 30-35/1
Substrate: Gravel/Sand, Snags....StreamBank Vegetation/Stability: Trees, Shrubs/Good
Canopy: Mostly Closed....Other: Agriculture-cropland, Rural; Storm sewer
Trout stocked, Iron precipitate; Water temp. 19.3C / pH 6.5SU / DO 7.4mg/L / Cond. 239umhos

Station: AN0498
Manasquan River, Hospital Road, Wall Twp., Monmouth
Asbury Park USGS Quadrangle
Date Sampled: 08/17/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Caenidae	7	26
Lumbriculidae	8	15
Chironomidae	6	14
Elmidae	4	6
Heptageniidae	4	6
BloodRed Chironomidae	8	5
Gammaridae	4	5
Tubificidae	10	5
Hydropsychidae	4	4
Calopterygidae	5	3
Sialidae	4	3
Corixidae	9	2
Tipulidae	3	2
Dryopidae	5	1
Polycentropodidae	6	1

Statistical Analysis

Number of Taxa: 15
Total Number of Individuals: 98
% Contribution of Dominant Family: 26.53 % (Caenidae)
Family Biotic Index: 6.35
Scraper/Filterer Collector Ratio: 2.60
Shredder/Total Ratio: 0.05
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 4
% EPT: 37.76
EPT/C: 1.95
NJIS Rating: 24
Biological Condition: Nonimpaired
Habitat Analysis: 165

Observations

Streamwater: Slightly Turbid....Flow: Moderate....Width/Depth (ft): 25/2
Substrate: Gravel/Sand, Mud....StreamBank Vegetation/Stability: Trees, Shrubs/Fair
Canopy: Mostly Closed....Other: Rural, Forested; Storm sewer
Frog; Water temp. 20.8C / pH 6.5SU / DO 7.6mg/L / Cond. 200umhos