MUNICIPAL STORMWATER MANAGEMENT PLAN
MASTER PLAN ELEMENT AMENDMENT

BOROUGH OF MANASQUAN
MONMOUTH COUNTY, NEW JERSEY

Adopted: April 22, 2008

Dated: March 26, 2008

PREPARED BY THE

MANASQUAN BOROUGH PLANNING BOARD

IN CONSULTATION WITH:

TM ASSOCIATES

11 Tindall Road
Middletown, New Jersey 07748
(732) 671-6400

CHARLES J. ROONEY, P.E., P.P
BOROUGH OF MANASQUAN ENGINEER
Licensed Professional Engineer No. GE32826
Licensed Professional Planner No. 04053

The original of this document has been signed and sealed in accordance with NJSA 45:14A-1 et. seq.

Members of the 2008 Planning Board

John Burke, Chairman

Thomas Carroll, Vice Chairman

George Dempsey, Mayor

Neil B. Hamilton

John Muly

James Coakley

James Kinneally, Councilman

Kevin Thompson

Richard Thomas

Joan Harriman (Alt. 1)

Leonard Sullivan (Alt 2)

Thomas Runge (Alt. 3)

David Armstrong (Alt. 4)

Michael Sinneck, Mayor's Designee

Geoffrey S. Cramer, Board Attorney

Albert D. Yodakis, P.E., Board Engineer

Mary C. Salerno, Board Secretary

T&M Associates, Stormwater Management Consultant

1.0 INTRODUCTION

As required by the Municipal Stormwater Regulations (N.J.A.C. 7:14A-25), the Borough of Manasquan Planning Board adopted a Municipal Stormwater Management Plan (Plan) to outline their approach to addressing the impacts resulting from stormwater related issues associated with future development and land use changes. The Plan addressed groundwater recharge, stormwater quantity, and stormwater quality impacts through the incorporation of stormwater design and performance standards for new development and redevelopment projects that disturb one or more acres of land or results in more than ¼ acres of additional impervious coverage. These standards are intended to minimize negative or adverse impacts of stormwater runoff such as decreased water quality, increased water quantity and reduction of groundwater recharge that provides base flow to receiving bodies of water.

In accordance with the Municipal Stormwater Regulations, a copy of the Borough Stormwater Master Plan Element was submitted to the Monmouth County Planning Board and its Stormwater Technical Advisory Committee, for their review and comment. Subsequently at the September 20, 2007 Stormwater Technical Advisory Committee Meeting and the October 15, 2007, Monmouth County Planning Board meeting the Plan was reviewed and conditionally approved subject to Manasquan Borough addressing several comments. The purpose of this amendment is to amend Manasquan's April 16, 2007, Municipal Stormwater Management Plan (Plan) to address the comments received by the County. Please note the changes herein are only intended to supplement Manasquan's Plan and do not replace the existing Plan.

2.0 MUNICIPAL STORMWATER MANAGEMENT MASTER PLAN ELEMENT AMENDMENT

The Plan is amended as follows:

1. There is a minor typographic error on the 5th line of the third paragraph on Page 19 of the Plan. This line should be modified to read "...the ground (depending upon hydrologic soil classifications) or into drainage facilities and..."

2. The first paragraph on Page 20 should be deleted and replaced with the following:

> "Groundwater recharge is the calculated amount of water actually absorbed into the groundwater from the surface. As stated above, impervious surfaces do not allow water to recharge the aquifers. It should be noted that groundwater recharge is also not calculated for surface water bodies, wetlands, or hydric soils because they may discharge, or recharge any area, or they may have no net effect, depending on each specific site, and its conditions (http://www.state.nj.us/dep/njgs/pricelst/ofmap/ofm32.pdf). A hydric soil, by definition, is a soil that formed under conditions of saturation, flooding or

ponding long enough during the growing season to develop anaerobic conditions in the upper part .(59 Fed. Reg. 35680, 7/13/94). Many of the areas of hydric soils are located in Fisherman's Cove, an area owned by the County which is a County Park. See Figure 8 for the Borough's Groundwater Recharge Areas."

3. The first sentence of the second paragraph on Page 20 should be modified to read "It should be noted that the entirety of the Borough is located within an urban Metropolitan Planning Area as delineated on the State Plan Policy Map (SPPM)."

4. The third paragraph on Page 20 should be deleted and replaced with the following:

"The Borough's water source is affected by the general reduction of groundwater recharge, since the Borough draws water from wells. The Borough's wells range from 101 to 120 feet deep and are drilled into the Kirkwood-Cohansey Aquifer. This aquifer is confined at the location of the wells, and is relatively invulnerable to contamination from polluted stormwater runoff. The Borough has five wells that are permitted to draw a total of 60 million gallons per month from this aquifer. Typically, aquifers are recharged via infiltration, therefore stormwater infiltration is very important in maintaining most aquifers."

5. The first paragraph on Page 21 should be deleted and replaced with the following:

"Wellhead Protection Areas (WHPA) are delineations of the horizontal extent captured by well pumping at a given rate over a two-, five-, and twelve-year period of time. These areas are the first step in defining the source of a public drinking supply well. It should be noted, however, that all confined wells have a fifty foot radius delineation which serves as an area to protect the well head. This fifty foot radius is controlled by the water purveyor. Figure 9 shows the location of the Borough wells which have been noted to each include a Tier 1: 2 year delineated WHPA within the water purveyor's 50 foot buffer zone."

RESOLUTION OF MEMORIALIZATION
PLANNING BOARD OF THE BOROUGH OF MANASQUAN
MONMOUTH COUNTY, NEW JERSEY

MATTER OF ADOPTION OF STORMWATER MANAGEMENT PLAN
MASTER PLAN ELEMENT AMENDMENT

Approved: April 22, 2008
Memorialized: April 22, 2008

WHEREAS, the Planning Board is a duly constituted authority created pursuant to the provisions of N.J.S.A. 40:55D-23 of the Municipal Land Use Law; and

WHEREAS, pursuant to N.J.S.A. 40:55D-28, the Planning Board may prepare, and after public hearing, amend a Master Plan or component parts thereof to guide the use of lands within the municipality in a manner which protects public health and safety and promotes the general welfare; and

WHEREAS, pursuant to N.J.A.C. 7:8-4.3(a), a municipality shall adopt a Municipal Stormwater Management Plan as an integral part of its Master Plan; and

WHEREAS, pursuant to N.J.A.C. 7:8-1.1 et. seq., the Planning Board prepared a Municipal Stormwater Management Plan – Master Plan Element, which was adopted on April 16, 2007, in order to comply with the requirements set forth in the New Jersey Administrative Code for Municipal Stormwater Management Planning; and

WHEREAS, Manasquan's Stormwater Master Plan Element was submitted to the Monmouth County Planning Board for review and approval, in accordance with N.J.A.C. 7:8; and

WHEREAS, on October 15, 2007, the Monmouth County Planning Board conditionally approved Manasquan's Municipal Stormwater Management Plan – Master Plan Element subject to Manasquan Borough preparing an amendment to its Stormwater Master Plan Element to address certain comments outlined in the Monmouth County Planning Board's Stormwater Technical Advisory Committee's Synopsis of Comments; and

WHEREAS, the Planning Board has prepared a Municipal Stormwater Management Plan – Master Plan Element Amendment (Amendment), to address the County's comments; and

WHEREAS, pursuant to N.J.S.A. 40:55D-1 et. seq., and specifically N.J.S.A. 40:55D-28 and N.J.S.A. 40:55D-13, the Planning Board conducted a public hearing on the 22nd day of April, 2008, due notice of said meeting has been given in accordance with New Jersey Statue the Open Public Meetings Act, and the Municipal Land Use Law, and a quorum of the Planning Board being present, the Planning Board reviewed and considered the proposed Amendment together with the public comment thereon, and the Planning Board determined that the Amendment is in compliance with the requirements of the Municipal Land Use Law and that

requirement for Stormwater Management pursuant to the applicable sections of the New Jersey Administrative Code.

NOW, THEREFORE, BE IT RESOLVED by the Planning Board of the Borough of Manasquan on this __22_of April, 2008, the action of the Planning Board taken on April 22, 2008 adopting the Municipal Stormwater Management Plan – Master Plan Amendment Element, prepared by T&M Associates, dated March 19, 2008 be and the same is hereby approved.

BE IT FURTHER RESOLVED, that the Board Secretary is hereby authorized and directed to cause a notice of this Resolution to be published in the *Coast Star* at the Borough's expense and to send a certified copy of this Resolution to the County, the Borough Clerk and the Borough Engineer, to affix a copy of this resolution and the Amendment to the official Stormwater Management Plan Master Plan Element and to make same available to all other interested parties.

John Muly

John Muly, Acting Vice-Chairman
Planning Board of the Borough of Manasquan

I hereby certify this to be a true and accurate copy of a Resolution duly adopted by the Planning Board of the Borough of Manasquan, Monmouth County, New Jersey, at a public meeting held on _April 22, 2008.

Mary C. Salerno

Mary C. Salerno, Board Secretary
Planning Board of the Borough of Manasquan

MUNICIPAL STORMWATER MANAGEMENT PLAN
MASTER PLAN ELEMENT

BOROUGH OF MANASQUAN
MONMOUTH COUNTY, NEW JERSEY

Adopted: March 1, 2005

Amended: April 16, 2007

PREPARED FOR:

BOROUGH OF MANASQUAN PLANNING BOARD

PREPARED BY:

CHARLES J. ROONEY, P.E., P.P
BOROUGH OF MANASQUAN ENGINEER
Licensed Professional Engineer No. GE32826
Licensed Professional Planner No. 04053

T&M ASSOCIATES
11 Tindall Road
Middletown, New Jersey 07748
(732) 671-6400

February 2005

The original of this document has been signed and sealed in accordance with New Jersey Law
H:\MSQN\01620\Calculations & Reports\COUNTY AMENDED MSQN MSWMP Adopted.doc

Members of the 2007 Planning Board

John Burke, Chairman

Thomas Carroll, Vice Chairman

Richard Dunne, Mayor

Neil B. Hamilton

James Coakley

Ron Jacobson, Councilman

Patricia Dunne

Richard Thomas

Kevin Thompson

Joan Harriman (Alt. 1)

Tom Runge (Alt. 3)

Geoffery S. Cramer, Board Attorney

Philip R. Kavanaugh, P.E., P.P., P.L.S., Board Engineer/ Planner

Mary C. Salerno, Board Secretary

T&M Associates, Stormwater Management Consultant

BOROUGH OF MANASQUAN
PLANNING BOARD

RESOLUTION ADOPTING MUNICIPAL STORMWATER MANAGEMENT PLAN MASTER PLAN ELEMENT

WHEREAS, the Planning Board is a duly constituted approving authority created pursuant to the provisions of N.J.S.A. 40:55D-23 of the Municipal Land Use Law; and

WHEREAS, pursuant to N.J.S.A. 40:55D-28, the Planning Board may prepare and after public hearing, may amend a Master Plan or component parts thereof to guide the use of lands within the municipality in a manner which protects public health and safety and promotes the general welfare; and

WHEREAS, pursuant to N.J.A.C. 7:8-4.3(a), a municipality shall adopt a Municipal Stormwater Management Plan as an integral part of its Master Plan; and

WHEREAS, pursuant to N.J.A.C. 7:8-1.1 et. seq., the Planning Board has prepared a Municipal Stormwater Management Plan - Master Plan Element in order to comply with the requirements set forth in the New Jersey Administrative Code for Municipal Stormwater Management Planning; and

WHEREAS, pursuant to the requirements of the Municipal Land Use Law, N.J.S.A. 40:55D-1 et. seq. And specifically N.J.S.A. 40:55-D-28 and N.J.S.A. 40:55D-13, the Planning Board conducted a public hearing on the 1st day of March 2005, due notice of said meetings having been given in accordance with New Jersey Statutes, the Open Public Meetings Act and the Municipal Land Use Law and a quorum of the Planning Board being present, the Planning Board reviewed and considered the proposed Municipal Stormwater Management Plan - Master Plan Element along with any public comment thereon and the Planning Board having determined that the Municipal Stormwater Management Plan - Master Plan Element is in compliance with the requirements of the Municipal Land Use Law and the requirements for Stormwater Management pursuant to the applicable sections of the New Jersey Administrative Code.

NOW, THEREFORE BE IT RESOLVED, by the Planning Board of the Borough of Manasquan on this 1st day of March, 2005, that the Municipal Stormwater Management Plan - Master Plan Element prepared by Charles J. Rooney, P.E., P.P., Manasquan Borough Engineer, dated February 2005 and is hereby adopted.

BE IT FURTHER RESOLVED that a copy of this Resolution confirming the adoption of the Borough of Manasquan Stormwater Management Plan Master Plan Element together with a copy of said Management Plan be provided by the Board's Secretary to the Monmouth County Planning Board within thirty (30) days from the date hereof as required by N.J.S.A. 40:55D-13.

JOHN BURKE, Chairman
Manasquan Planning Board

The foregoing is a true copy of a Resolution adopted by the Manasquan Planning Board at a meeting on March 1, 2005.

Mary C. Salerno

MARY C. SALERNO, SECRETARY
Manasquan Planning Board

TABLE OF CONTENTS

INTRODUCTION 1

GOALS AND OBJECTIVES 1

STORMWATER DISCUSSION 3

Hydrologic Cycle 3

Impacts of Stormwater 4

BACKGROUND 6

Demographics and Land Use 6

Waterways 14

Water Quality 17

Water Quantity 19

Groundwater Recharge 19

DESIGN AND PERFORMANCE STANDARDS 24

PLAN CONSISTENCY 26

Regional Stormwater Management Plans 26

Total Maximum Daily Loads 26

Residential Site Improvement Standards (RSIS) 26

Soil Conservation 26

Monmouth County Growth Management Guide 27

State Development or Redevelopment Plan (SDRP) 28

STORMWATER MANAGEMENT STRATEGIES 29

Nonstructural Strategies 30

Structural Stormwater Management 32

LAND USE/ BUILD-OUT ANALYSIS 36

MITIGATION PLAN 37

Mitigation Project Criteria 37

Developer Mitigation Plan Requirements 38

RECOMMENDATIONS 41

BIBLIOGRAPHY 43

List of Tables

Table 1 : Historical Population Growth 1930 – 2000 6
Table 2: General Housing Characteristics 8
Table 3: 2004 Recreation and Open Space Inventory (ROSI) Report 9
Table 4: Existing Land Use 10
Table 5: NRCS 24 Hour Design Storm Rainfall Depth (inches) – September 2004 27

List of Figures

Figure 1: Hydrologic Cycle 3
Figure 2: Topographic Map 7
Figure 3: Existing Land Use Map 11
Figure 4: Borough Zoning Map 12
Figure 5: Wetlands and Water Land Uses – Constrained Land 13
Figure 6: Borough Waterbodies 15
Figure 7: Hydrologic Units - HUC-14s 16
Figure 8: Groundwater Recharge Areas 22
Figure 9 Wellhead Protection Areas 23

INTRODUCTION

As required by the Municipal Stormwater Regulations (N.J.A.C. 7:14A-25), the Borough of Manasquan has developed this Municipal Stormwater Management Plan (MSWMP) to outline their approach to addressing the impacts resulting from stormwater related issues associated with future development, redevelopment, and land use changes. The MSWMP addresses groundwater recharge, stormwater quantity, and stormwater quality impacts through the incorporation of stormwater design and performance standards for new development and redevelopment projects that disturb one or more acres of land. The standards are intended to minimize negative or adverse impacts of stormwater runoff such as decreased water quality, increased water quantity and reduction of groundwater recharge that provides base flow to the Borough's receiving bodies of water. In addition to minimizing these impacts, the MSWMP provides long term operation and maintenance measures for existing and proposed stormwater management facilities.

The MSWMP also provides recommendations for ordinance modifications in order to expedite the implementation of stormwater management strategies and includes mitigation strategies to permit the Borough to grant variances or exemptions from proposed design and performance standards set forth by the Municipal Stormwater Regulations (N.J.A.C. 7:8-5.5).

GOALS AND OBJECTIVES

The goals of this MSWMP are:

1. Reduce flood damage, including damage to life and property;
2. Minimize, to the extent practical, any increase in stormwater runoff from any new development;
3. Reduce soil erosion from any development or construction project;
4. Encourage the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
5. Maintain groundwater recharge; (Borough is within PA-1 area)
6. Prevent, to the greatest extent feasible, an increase in nonpoint pollution;
7. Maintain the integrity of stream channels for their biological function, as well as for drainage;

8. 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;
9. Protect public safety through the proper design and operation of stormwater basins; and
10. Increase public awareness of stormwater management through public education.

In addition to the State mandated goals described above, the Borough also encourages the following as outlined in their Master Plan and Reexamination Report:

11. To promote the conservation of historic sites and districts, open space, energy resources and valuable natural resources in the State and prevent urban sprawl and degradation of the environment through improper use of land;
12. To promote the conservation of land areas of significant environmental value, including wetlands, floodways and other areas unsuitable for development due to severe building limitations or impacts, and critical environmental constraints; and
13. To protect contiguous parcels to preserve desirable environmental features and provide habitat and protection of wildlife.

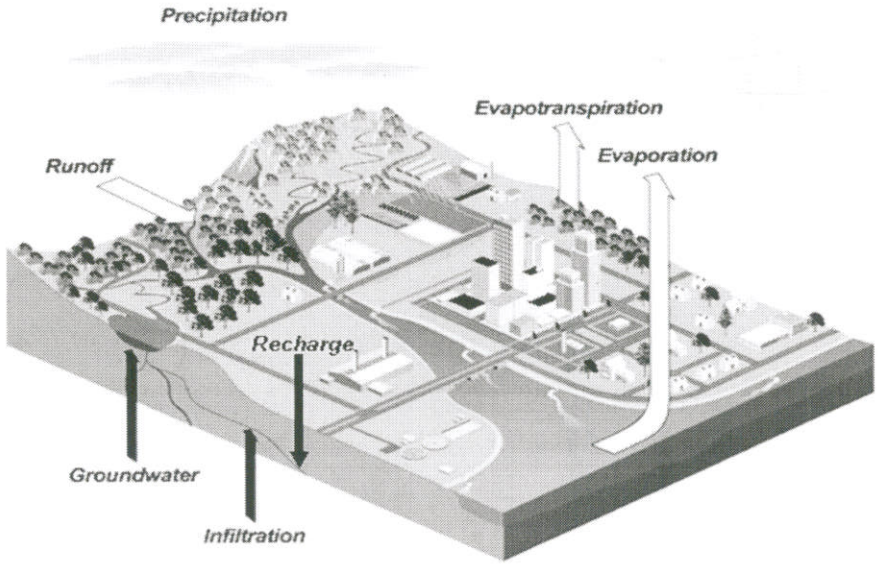
To achieve these goals, the MSWMP outlines specific stormwater design and performance standards for new development and redevelopment projects and proposes stormwater management controls for addressing impacts from existing developments. Preventive and corrective maintenance strategies are also included to ensure the long-term effectiveness of stormwater management facilities and the MSWMP outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

STORMWATER DISCUSSION

HYDROLOGIC CYCLE

The hydrologic cycle or water cycle (Figure 1) is the continuous circulation of water between the ocean, atmosphere, and land. The driving force of this natural cycle is the sun. Water, stored in oceans, depressions, streams, rivers, waterbodies, vegetation and even land surface, continuously evaporates due to solar energy. This water vapor then condenses in the atmosphere to form clouds and fog. After water condenses, it precipitates, usually in the form of rain or snow, onto land surfaces and waterbodies. Precipitation falling on land surfaces is often intercepted by vegetation. Plants and trees transpire water vapor back into the atmosphere, as well as aid in the infiltration of water into the soil. The vaporization of water through transpiration and evaporation is called evapo-transpiration. Infiltrated water percolates through the soil as groundwater, while surface water flows overland. Groundwater and surface water flow to major waterbodies and eventually flows to the Earth's seas and oceans. This constant process of evapo-transpiration, condensation, precipitation, and infiltration comprises the hydrologic cycle.

Figure 1: Hydrologic Cycle



Source: Kern River Connections http://www.creativille.org/kernriver/watershed.htm

IMPACTS OF STORMWATER

As towns and cities develop from rural agricultural communities, the landscape is altered in dramatic ways. Both residential and nonresidential development on former agricultural fields and pastures can have a great impact on the hydrologic cycle for the specific site. Localized impacts to the hydrologic cycle will ultimately impact the hydrologic cycle of the entire watershed encompassing that development site.

Prior to any land development, native vegetation often intercepts precipitation directly or absorbs infiltrated runoff into their roots. Development often replaces native vegetation with lawns or impervious cover, such as pavement or structures, thereby reducing the amount of evapo-transpiration and infiltration. Regrading and clearing of lots disturbs the natural topography of rises and depressions that can naturally capture rainwater and allow for infiltration and evaporation. Construction activities often compact soil, thereby decreasing its permeability or ability to infiltrate stormwater. Development activities also generally increase the volume of stormwater runoff from a given site.

Connected impervious surfaces and storm sewers (such as roof gutters emptying into paved parking lots that drain into a storm sewer) allow the runoff to be transported downstream more rapidly than natural areas. This shortens travel time and increases the rainfall- runoff response of the drainage area, causing downstream waterways to peak higher and quicker than natural areas, a situation that can cause or exacerbate downstream flooding, erosion, and sedimentation in stream channels. Furthermore, connected impervious surfaces do not allow pollutants to be filtered, or for infiltration and ground water recharge to occur prior to reaching the receiving waters. Increase volume combined with reduced base flows, results in a greater fluctuation between normal and storm flows causing greater channel erosion. Additionally, reduced base flows, increased fluctuation, and soil erosion can affect the downstream hydrology of the watershed, impacting ecological integrity.

Water quantity impacts combined with land development often adversely impacts stormwater quality. Impervious surfaces collect pollutants from the atmosphere, animal wastes, fertilizers

and pesticides, as well as pollutants from motor vehicle usage. Pollutants such as hydrocarbons, metals, suspended solids, pathogens, and organic and nitrogen containing compounds, collect and concentrate on impervious surfaces. During storm events, these pollutants are washed directly into municipal storm sewer systems. In addition to chemical and biological pollution, thermal pollution can occur from water collected or stored on impervious surfaces or in stormwater impoundments, which has been heated by the sun. Thermal pollution can affect aquatic habitats, adversely impacting cold water fish. Removal of shade trees and stabilizing vegetation from stream banks also contributes to thermal pollution.

Proper stormwater management will help mitigate the negative impact of land development and its effects on stormwater. This MSWMP outlines the Borough's plan to improve stormwater quality, decrease stormwater quantity, and increase groundwater recharge. By managing stormwater, the Borough will improve the quality of aquatic ecosystems and restore some of the natural balance to the environment.

BACKGROUND

The Borough of Manasquan encompasses 2.53 square miles of Monmouth County, New Jersey. Included in that 2.53 square miles are 1.15 square miles of water area and 1.38 square miles of land area (2000 U.S. Census). The Borough is a seashore resort community, bounded by the Atlantic Ocean to the East, the Township of Wall to the north and west, as well as the Borough of Sea Girt and Stockton Lake to the north. To the south, the Borough borders the Boroughs of Brielle and Point Pleasant Beach and the Roberts Swamp Creek, the Glimmer Glass Harbor, the Manasquan River, and the Manasquan Inlet. Figure 2 delineates the Borough boundaries on a United States Geological Survey (USGS) quadrangle map.

DEMOGRAPHICS AND LAND USE

Over the past 30 years the population of Manasquan has increased from 4,971 in 1970 to 5,354 in 1980, to 5,369 in 1990 and again in 2000 to 6,310 people. Since 1930, there has been a population increase of over 171% within the Borough.

Table 1 : Historical Population Growth 1930 – 2000

Year	*Borough of Manasquan*		*Monmouth County*		*New Jersey*	
	Total Population	*Average Annual Growth Rate Over the Prior 10-year Period*	*Total Population*	*Average Annual Growth Rate Over the Prior 10-year Period*	*Total Population*	*Average Annual Growth Rate Over the Prior 10-year Period*
1930	2,320	–	147,209	–	4,041,334	2.8%
1940	2,340	0.8%	161,238	0.9%	4,160,165	0.3%
1950	3,178	36%	225,327	4.0%	4,835,329	1.6%
1960	4,022	27%	334,401	4.8%	6,066,782	2.6%
1970	4,971	24%	461,849	3.8%	7,171,112	1.8%
1980	5,354	7.7%	503,173	0.9%	7,364,823	0.3%
1990	5,369	2.8%	553,124	1.0%	7,730,118	0.5%
2000	6,310	17.5%	615,305	1.1%	8,414,350	0.9%

Source: U.S. Census

Figure 2: Topographic Map
Borough of Manasquan
Monmouth County, New Jersey

N

0 2000 4000

Source: U.S.G.S. Asbury Park (1989) and Manasquan (1989), NJ Quadrangle Maps

With this population increase, came an increase in development from 2,882 housing units in 1970 to 3,531 housing units in 2000. Also, due to its proximity to the seashore, the Borough has many seasonal residents during the summer months renting vacant housing units.

Table 2: General Housing Characteristics

	1990		2000		Change
	Number	Percent	Number	Percent	Number
Occupancy Status					
Total Housing Units	3,220	100	3,531	100	311
Occupied Housing Units	2,217	68.9	2,600	73.6	383
Vacant Housing Units	1,003	31.1	931	26.4	- 72
Tenure					
Occupied Housing Units	2,217	100	2600	100	383
Owner- Occupied Housing Units	1,563	71	1,848	71.1	285
Renter- Occupied Housing Units	654	29	752	28.9	98
Vacancy Status					
Vacant Housing Units	1,003	100	931	100	- 72
Population	5,369	100	6,310	100	941
Households	2,217	100	2,600	100	383
Family Household	1,431	64.5	1,635	62.9	204
1 Person Household	647	29.2	785	30.2	138
Persons/ Household	2.4	-	2.43	-	0.03

Source: 1990, 2000 US Census

The properties listed below are those that the Borough of Manasquan currently has listed on the State Recreation and Open Space Inventory Report (ROSI), submitted in May of 2001. The Borough's Open Space Committee is reviewing this list for accuracy and it will be updated as required. There are approximately 94 acres listed, however, 42 acres belong to the County, and 25 acres are public beaches. Therefore, there are approximately 27 acres of Open Space,

including wetlands of which 20 acres are dedicated park lands and bike paths, which provide recreational uses such as sport courts, athletic fields, play grounds and walking paths. These dedicated parks lands are developed and no future development is anticipated at this time.

Table 3: 2004 Recreation and Open Space Inventory (ROSI) Report

Name	Location	Block	Lot	Acreage
Axel Carlson Park	Stockton Lake Blvd (B-4)	99	12	0.7070
		100	1	0.1300
		101	1	0.1320
Stockton Park	Second Ave (B-5,6)	163	1	9.273
Mallard Park	Perrine/Virginia (D-5)	133	21	0.6950
	Virginia (D-5)	137	13	0.5110
	Cedar/Perrine (C,D - 5,6)	138	1	5.2700
	Perrine (D-5, 6)	139	31	0.7620
	Pine/Cedar (C-5, D-5)	140	13	0.5069
	Cedar (C-5)	141	13	0.2534
	Cedar (C-6)	142	10	0.6213
Public Beach	(B,C,D,E – 6,7,8)	180	1	22.5
Public Beach North End	(B-7)	165	33	2.4
Fisherman's Cove COUNTY OWNED	Third Avenue and Brielle Road (D,E – 6,7)	188	2	31.77
		188	3	9.10
		188	5	2.20
		188	8	Unknown
Tassini Park (aka Longstreet)	Central Ave (C-1,2)	25	1.01	1.7259
		25	42	
		25	43	
Bike Path	N. Main Street (C-1)	30	1	1.283
		33	1	
		36	1	
		36	1.A	
		58	1	
		58	1A	
		58	2	
		58.A	1	
Mac's Pond	North Main Street (B-1)	44C	11	2.14
Indian Hill Park	Church and Fisk (D-1)	18	27	0.618
Curtis Park	Main and Warren (C-4)	87	1	1.405
No Name		99	2	Unknown
			Total	**~94.0**

Source: Manasquan Open Space Committee. *Open Space and Recreation Plan. Sept. 2003*

It should be noted that per the December 2003 *Borough of Manasquan Master Plan Re-Examination Report* the Borough is nearly fully developed and has very little land available for development. According to the 2004 *Housing Element and Fair Share Plan*, the Borough has less than one acre of vacant and developable land remaining. A large portion of the Borough's open space is Fisherman's Cove, which belongs to the County. The majority of the remaining vacant land is zoned for residential and some commercial uses. However, most development in the Borough is waterfront redevelopment, rehabilitation of older housing stock, which has decreased from 32% in 1970 to about 25% in 1990, or infill development in established neighborhoods. See Figure 3 and 4 for the Borough's existing land use and zoning maps.

The remaining vacant developable lands are environmentally constrained and are located in freshwater wetlands, within the 100 year flood hazard area, open water, steep slopes, or other land deemed constrained. The constraints limit or deny development of these parcels, which helps lessen nonpoint source pollution from these areas. (See Figure 5)

Table 4: Existing Land Use

Usage	Area (Ac)	% of the Borough
Vacant/ Developable	13.33/0.66	1.5 / 0.08
Single Family Residential	398.3	45.4
Multi-Family Residential	5.3	0.6
Commercial	55.1	6.3
Industrial	3.8	0.4
Public Parks/ Open Spaces	94	10.6
Public	52.9	6.0
Semi- Public	16.7	1.9
Boat Docks	1.3	0.1
Railroads, Street &,	9.8	1.1
Streets	95.2	10.9
Water Area	93.5	10.6

Source: Manasquan Borough Master Plan, 1989 and 2004 Housing Element and Fair Share Plan

Source: Existing Land Use, NJDEP (1995-1997).

NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

BOROUGH OF MANASQUAN

MONMOUTH COUNTY ... NEW JERSEY

R-1	One-Family Residential
R-2	One-Family Residential
R-3	One-Family Residential
R-4	Beachfront One-Family Residential
R-5	One-Family Residential
R-M	Multi-Family Residential
R-PM	Planned Multi-Family Residential
B-1	Business
B-2	Marine Business
B-3	General Business
O	Office
I	Industrial
P	Public Parking
CON	Conservation
PUD	Planned Unit Development

BORO OF SEA GIRT

TOWNSHIP OF WALL

STOCKTON LAKE

ATLANTIC OCEAN

GLIMMER GLASS HARBOR

WATSONS CREEK

DEBBIES CREEK

MANASQUAN RIVER

MANASQUAN INLET

BORO OF BRIELLE

TOWNSHIP OF WALL

Prepared by:

Paul F. Szymanski P.P.
N.J.P.P. #1773
Planning Consultant

Revised by:

Alan P. Hilla, Jr., P.E., P.P.
Birdsall Engineering, Inc.
4/99

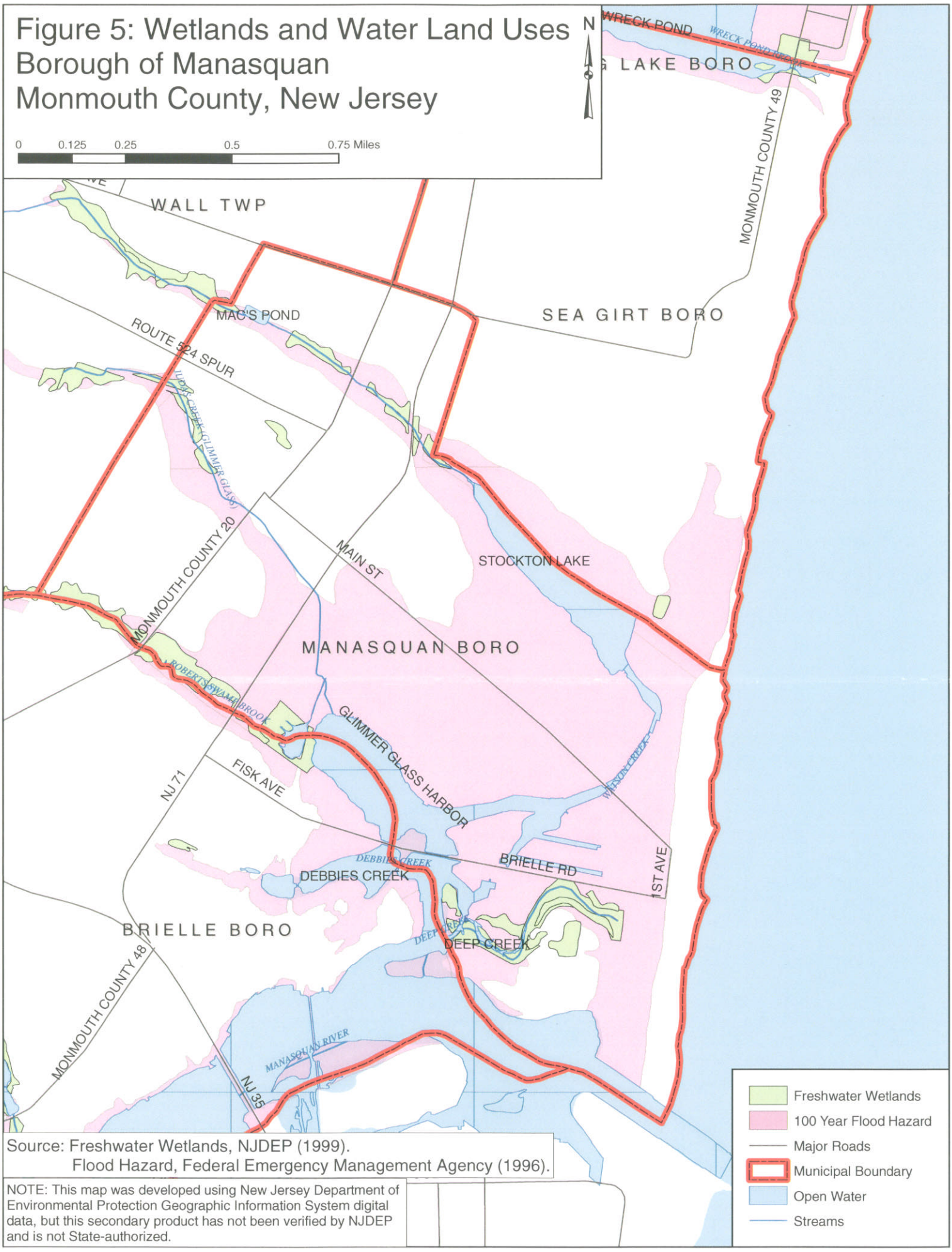
REVISED BY MONMOUTH COUNTY PLANNING BOARD
REV 11/1989 REV MARCH, 1978 - [illegible]

AUGUST 1965
REV. JULY, 1979 REV 6/80 & 10/80 REV 7/82 REV 7/83 FEB 1984 REV 5/85 REV 2/88 REV 4/92 REVISED 7/92 Paul F Szymanski PP

FIGURE 4

ZONING MAP

Figure 5: Wetlands and Water Land Uses
Borough of Manasquan
Monmouth County, New Jersey



Source: Freshwater Wetlands, NJDEP (1999).
Flood Hazard, Federal Emergency Management Agency (1996).

NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

WATERWAYS

The Borough's waterways include Judas Creek, Debbies Creek, Deep Creek, Mac's Pond, Stockton Lake, Roberts Swamp Brook, Watson Creek, and the Glimmer Glass Harbor. These waterways are tributaries feeding the Manasquan River and the Manasquan River Estuary. From there, the waterways flow to the Manasquan Inlet and out to the Atlantic Ocean. Figure 6 illustrates the waterways of the Borough.

The Manasquan River drains a watershed area of 82 square miles and is approximately 22 miles in length. The Manasquan River system flows southeast from its headwaters in Manalapan and Freehold Townships to the Manasquan Inlet and empties in the Atlantic Ocean. The Borough is one of thirteen municipalities located in the Manasquan watershed, and it is wholly encompassed therein. The Manasquan River tributaries include the Upper Manasquan, Debois Creek, Apple Brook, Long Brook, several cranberry bogs, the Upper and Lower Mingamahone Brooks, Marsh Bog Brook, Timber Swamp Brook, Squankum Brook, the Manasquan River, and the Manasquan River Estuary. There are several small ponds and lakes including Stockton Lake and Mac's Pond throughout the Borough.

The Borough is also located within the Manasquan River (Below Rt. 70 Bridge) and the Atlantic Coast (Shark River to Manasquan) HUC-14 subwatersheds. A HUC-14 subwatershed is a hydrologic unit code which NJDEP and USGS use to map small subwatersheds. HUC-14s are usually about 3,000 acres in size, according to the NJDEP. Figure 7, delineates the Borough's HUC-14 subwatersheds.

As the Borough has access to the Atlantic Ocean, the area has both public and privately owned marinas. They are located along the Manasquan River, the Glimmer Glass Harbor, and the surrounding tributary waters. In accordance to the Borough's Open Space and Recreation Plan Element in its *Master Plan Reexamination Report*, the Borough promotes conservation measures addressing the above water bodies and marina areas by requiring Conservation Easements in areas of the Borough that prohibit all removal of vegetation, construction and disturbance within a 50 foot zone or along the mean high water in the Glimmer Glass Island area.

Source: Streams and Open Water, NJDEP (1998).

NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Source: Subwatersheds (HUC 14), New Jersey Geological Survey (NJGS) (2000).

boundary of the zone. In addition, the Manasquan River is a No Discharge Zone for boaters. In other words, boaters can not discharge their holding tanks directly into the water unless they are 3 miles offshore. Thirdly, the Borough has a Waterways Clean-up Day on which Borough residents clean up litter and debris along the shoreline and in areas that are easily accessible by boat.

WATER QUALITY

The Ambient Biomonitoring Network (AMNET) was established by the New Jersey Department of Environmental Protection (NJDEP) to monitor and document the health of New Jersey's freshwater waterways. AMNET currently has 820 sites in five drainage basins that it monitors for benthic macro-invertebrates on a five-year cycle. Waterways are scored based on the data to generate the New Jersey Impairment Score (NJIS) and then categorized as severely impaired, moderately impaired, and non-impaired. The NJIS is based on biometrics and benthic macro-invertebrate health. (http://www.state.nj.us/dep/wmm/bfbm/). None of the Borough's waterways have been included in the AMNET reports, as the Borough's waterways are tidally influenced.

In addition to biological health, chemical data are gathered by the NJDEP and other organizations, and used to determine the health of waterways. The water quality data are used by NJDEP to develop Total Maximum Daily Loads (TMDL). A TMDL is the quantity of a pollutant that can enter a waterbody without exceeding water quality standards or interfering with the ability to use the waterbody for its designated usage. Point and non-point pollution, surface water withdrawals and natural background levels are included in the determination of a TMDL, as required by Section 303(d) of the Clean Water Act. Point source pollution includes, but is not limited to NJPDES permitted discharges, while non-point source pollution can include contaminated stormwater runoff from agricultural lands or impervious surfaces. Non-point source pollution is contamination that does not have a specific point of origin, and is often associated with human activities. TMDLs determine the allowable load from each source, with a factor of safety, for the pollutant entering the waterbody. TMDLs are used to either prevent further deterioration of waterbodies, or to improve current water quality.

Some of the strategies of TMDL implementation may include, the identification of various sources of pollution, stormwater treatment, implementation of updated ordinances, restriction of impervious surfaces, retrofitting stormwater systems, disconnection of impervious surfaces, and other use of other best management practices (BMPs). The Manasquan River Estuary is listed on New Jersey's 2004 Integrated List of Waterbodies, Sublists 1 and 5 (http://www.state.nj.us/dep/wmm/sgwqt/wat/index.html). The Manasquan River Estuary is listed for Total Coliform, Fecal Coliform, and Dissolved Oxygen impairments in different locations. The Manasquan River Estuary currently has an established TMDL for fecal coliform. According to the Division of Watershed Management of the NJDEP, this is not a specific stormwater TMDL, and as such is not governed by this MSWMP.

In addition to State monitoring, Monmouth County Health Department monitors several waterway sites throughout the Borough. These sites include:

- Glimmer Glass, dock at the condos by drawbridge
- Watsons Creek, end of 4th Ave. at bridge; at the center of bridge, and near the outfall
- Glimmer Glass, Perrine Blvd. across from Jackson Ave.
- Glimmer Glass, under the railroad bridge at the end of Perrine Blvd.
- Stockton Lake, end of Minerva Ave.
- Watsons Creek, south side of Ocean Ave bridge

These sites were sampled for water temperature, salinity, dissolved oxygen, fecal coliform and *Enteroccous* in 2003 and 2004. Historically, there have been sites with elevated fecal coliform where there is a large waterfowl population and the slow exchange of water due to tidal mixing.

According to the *Manasquan River Watershed Initial Characterization and Assessment Report* from the Manasquan Watershed Management Group in 1999, the Manasquan River watershed experiences a great influx of seasonal residents during the summer months. Therefore the river area becomes used for many recreational uses including fishing. The river system supports several species of fish and shellfish including: bluefish, summer and winter flounder, weakfish,

striped bass, mummichog, white sucker, yellow perch, brook trout, brown bull head, brown and rainbow trout, large mouth bass, hard and soft clams, and blue mussels. The Manasquan River Estuary has been designated as Shellfish Growing Area 6, by NJDEP. There are over 1500 acres of shellfish beds in the Estuary, however, most are restricted or even prohibited from harvest due to poor water quality. In addition to shellfish restrictions, there are several fish restrictions due to high dioxin, Polychlorinated Biphenyls (PCBs), chlordane (pesticide) and mercury. PCBs, dioxin , and chlordane are listed as possible carcinogens by the US EPA. American eel, bluefish over 6 lbs, striped bass, American lobster, largemouth bass, and chain pickerels are listed under the federal Food and Drug Administration (FDA) fish advisories.

WATER QUANTITY

Stormwater runoff often causes water quantity issues. In Manasquan, however, stormwater only exacerbates existing tidal flooding issues. There are several streets where stormwater compounds the tidal flooding including the low-lying streets of Cedar, Euclid and Perrine Blvd. These streets are located within the Glimmer Glass Harbor region bounded by Main Street, Union Avenue, Watson's Creek, and Perrine Boulevard. Brielle Road has existing tidal flooding that is exacerbated by stormwater. Areas where water quantity issues occur are outlined in the T&M Associates *Glimmer Glass Drainage Report* prepared in 2001.

GROUNDWATER RECHARGE

Increases in development of vacant sites have increased impervious surface areas. Impervious surface areas are portions of the development site covered with either structure and/or pavement that prevents the underlying soil from absorbing rainwater. Instead of entering the soil, rainwater from rooftops and pavement flows onto the adjacent ground, where it is partially absorbed into the ground (depending upon hydraulic soil classifications) or into drainage facilities and streams. The greater the amount of impervious surface, the greater volume of stormwater runoff that drains away from a given site. Greater volumes of stormwater can result in high water elevations in some locations along streams and can exacerbate streambed erosion, and potentially cause downstream siltation. These dynamics alter the floodplain and have negative impacts on both the stream and river ecosystems.

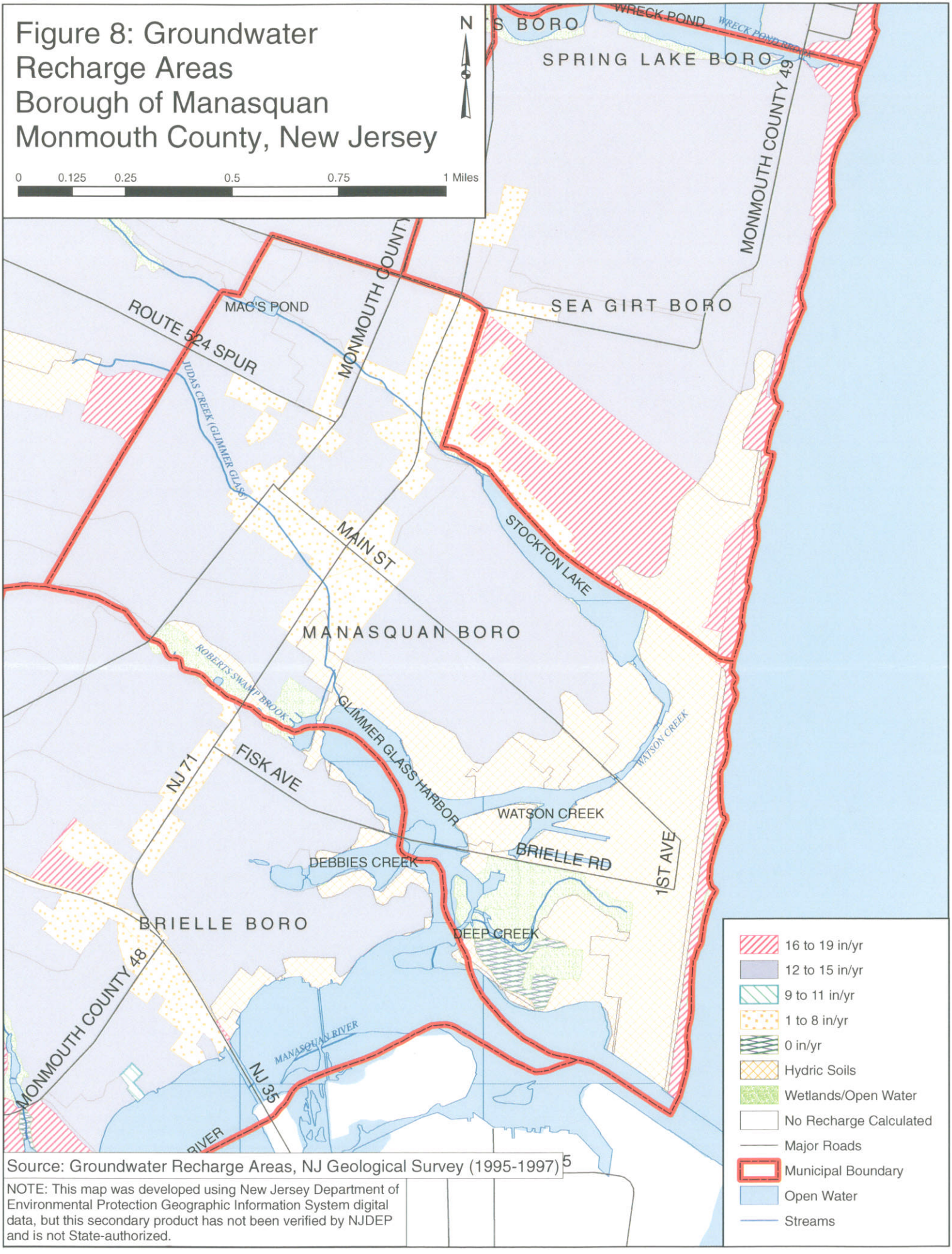
Groundwater recharge is the calculated amount of water actually absorbed into the groundwater from the surface. As stated above, impervious surfaces do not allow water to recharge the aquifers. It should be noted that groundwater recharge is also not calculated for surface water bodies, wetlands, or hydric soils because they may discharge, or recharge any area, or they may have no net effect, depending on each specific site, and its conditions (http://www.state.nj.us/dep/njgs/pricelst/ofmap/ofm32.pdf). A hydric soil, by definition, is a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part .(59 Fed. Reg. 35680, 7/13/94). See Figure 7 for the Borough's Groundwater Recharge Areas.

It should be noted that the Borough is located within an urban Metropolitan Planning Area as delineated on the State Plan Policy Map (SPPM). Per N.J.A.C. 7:8-5.4 (a) 2ii and N.J.A.C 7:8-1-2 there are conditions under which the Groundwater Recharge requirements for the Stormwater Management Rules do not apply for Metropolitan Planning Areas. "Previously developed" lands within urban areas are exempt from these requirements. "Previously developed" means any area on a site that is occupied by structures, been filled or graded. Areas that were deforested, but have reestablished woody vegetation are not considered "previously developed." In addition, only the areas within a given site that meet these criteria are exempt from the groundwater recharge requirements. It is possible to have a site that has partial areas of exemption, and other areas that are required to meet the requirements.

The Borough's water source is directly affected by the general reduction of groundwater recharge, since the Borough draws water from wells ranging from 101 to 120 feet deep drilled into the Kirkwood Formation Aquifer. The Borough has five wells that are permitted to draw a total of 60 million gallons per month from this aquifer. Typically, aquifers are recharged via infiltration, therefore stormwater infiltration is very important in maintaining most aquifers.

Wellhead Protection Areas (WHPA) are delineations of the horizontal extent captured by well pumping at a given rate over a two-, five-, and twelve-year period of time. These areas are the first step in defining the source of a public drinking supply well. It should be noted, however,

that all confined wells have a fifty foot radius delineation which serves as an area to protect the well head. This fifty foot radius is controlled by the water purveyor. No WHPAs with delineated and tiered capture areas are located within the Borough Figure 8 delineates the Borough's wellhead protection areas.



Source: Groundwater Recharge Areas, NJ Geological Survey (1995-1997)

NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Figure 9: Wellhead Protection Areas
Borough of Manasquan
Monmouth County, New Jersey
N
0
0.25
0.5
1 Miles
TS BORO
G LAKE BORO
1ST AVE
OLD
SEA GIRT AVE
MONMOUTH COUNTY 49
ROUTE 524 SPUR
WALL TWP
MANASQUAN BORO
SEA GIRT BORO
MONMOUTH COUNTY 20
MAIN ST
No Wellhead
Protection Areas
NJ 71
BRIELLE BORO
FISK AVE
JUDAS CREEK (GLIMMER GLASS)
WATSON CREEK
BRIELLE RD
1ST AVE
DEEP CREEK
MONMOUTH COUNTY 48
NJ 35
MANASQUAN RIVER
OCEAN COUNTY 635
MUNICIPALI
Public Community Wells
Open Water
Streams
Major Roads
Municipal Boundary
Source: Public Community Water Supply Wells , NJGS
NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

DESIGN AND PERFORMANCE STANDARDS

The Borough has adopted applicable design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to reduce the negative impact of stormwater runoff on water quality and quantity, and loss of groundwater recharge in receiving waterbodies. The section of this MSWMP, entitled Stormwater Management Strategies, indicates actions appropriate for various types of development within the Borough. Ultimately, design and performance standards must contain the necessary language to maintain stormwater management measures consistent with the applicable stormwater management rules, N.J.A.C. 7:8-5.8 - Maintenance Requirements. This also will include language for safety standards consistent with N.J.A.C. 7:8-6 - Safety Standards for Stormwater Management Basins. Upon adoption, the Borough's Stormwater Control Ordinance was submitted to the Monmouth County Planning Board for review and approval.

It should be noted that a number of the structural and nonstructural strategies require water to be retained for long periods of time. These requirements may increase the promulgation of mosquito breeding habitats. New development and redevelopment activities should be coordinated with the Monmouth County Mosquito Extermination Commission so that proposed structural and nonstructural strategies are properly maintained.

Proper inspection and maintenance are critical components for the successful performance of a stormwater management system. The Borough has prepared a Stormwater Pollution Prevention Plan (SPPP) to address inspection and maintenance for existing stormwater infrastructures throughout the Borough. Also included in the SPPP plan is the development of a Local Public Education Program to educate property owners on methods to reduce nonpoint stormwater pollution such as proper waste disposal, solids and floatable controls, fertilizer and pesticide use, pet waste, wildlife feeding, etc. New Development and redevelopment projects meeting the definition of "major development," will be required to develop and submit a detailed operation and maintenance plan for each best management practice (BMP) established in accordance with N.J.A.C. 7:8 - 5.8. Recommendations for proper maintenance procedures are available in the

NJDEP's *Best Management Practices (BMPs) Manual*. Copies of the maintenance plan(s) will be filed with the Borough Department of Public Works.

During construction, Borough personnel will observe construction of the project to ensure that the appropriate stormwater management measures are constructed and function as designed. Borough personnel will conduct periodic inspections after significant storms to ensure the system is functioning properly and to identify maintenance needs, if any. Annual checks will be done to identify any additional maintenance requirements. This may include clearing of blockages from inlets and/or outlet structures, removal of unhealthy vegetation or accumulated debris/materials. Disposal of accumulated debris will be done in accordance with local and State regulations.

Borough ordinances will provide for inspection of systems on private property upon giving reasonable notice. Ordinances will also provide for a time frame for maintenance procedures to occur upon receiving notice from the Borough that maintenance is required.

PLAN CONSISTENCY

REGIONAL STORMWATER MANAGEMENT PLANS

Currently, there are no adopted Regional Stormwater Management Plans (Regional Plans) developed for waterbodies located "within" the Borough's boundaries. This plan will be updated to be consistent with any Regional Plans that are established in the future. Manasquan will take part in the development of any proposed Regional Plans that may affect waterbodies within or adjacent to the Borough.

TOTAL MAXIMUM DAILY LOADS

The Manasquan River Estuary currently has a non-point source pollution TMDL for fecal coliform. However, according to the Division of Watershed Management of the NJDEP, this is not a specific stormwater TMDL, and as such is not governed by this MSWMP. This plan will be updated to be consistent with any future stormwater TMDL established by the NJDEP.

RESIDENTIAL SITE IMPROVEMENT STANDARDS (RSIS)

This Municipal Stormwater Management Plan is consistent with regulations established under the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The Borough will utilize the current update of the RSIS for stormwater management review of residential areas. This Plan incorporates the statute of RSIS and acknowledges that RSIS is periodically updated.

SOIL CONSERVATION

The Borough's Stormwater Management Control Ordinance will require that all new development and redevelopment projects comply with the Soil Erosion and Sediment Control Standards of New Jersey. In cooperation with the Freehold Soil Conservation District, Borough personnel will observe on-site soil erosion and sediment control measures as part of the construction site inspections.

All development and redevelopment projects shall use the most recent DelMarVa unit hydrograph for stormwater calculations. In addition the Freehold Soil Conservation District

requires the use of the most recent design storm rainfall data for stormwater calculations. The National Oceanographic and Atmospheric Administration (NOAA), the agency that develops statistical estimates of rainfall amounts, has increased its estimates for the majority of storm events, particularly the larger events. The following table indicates the old and new twenty-four hour rainfall amounts in inches for Monmouth County.

Table 5: NRCS 24 Hour Design Storm Rainfall Depth (inches) – September 2004

Storm Period	1 yr.		2 yr.		5 yr.		10 yr.		25 yr.		50 yr.		100 yr.	
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Monmouth County	2.8	**2.9**	3.4	**3.4**	4.4	**4.4**	5.3	**5.2**	6.0	**6.6**	6.5	**7.7**	7.5	**8.9**

Source: NOAA

MONMOUTH COUNTY GROWTH MANAGEMENT GUIDE

The Monmouth County Growth Management Guide, adopted in December 1995, sets forth a series of goals and objectives designed to enhance the quality of life for residents of Monmouth County. This plan is consistent with those objectives, which include:

- Encouraging the protection of the County's unique, diverse, natural and scenic natural resources; and
- Promoting the protection of non-renewable natural resources; and
- Encouraging the protection and conservation of all water resources; and
- Promoting the preservation and improvements of costal water resources; and
- Promoting the preservation and improvements of surface water quality; and
- Encouraging the preservation and improvements of groundwater quality and quantity; and
- Promoting the preservation, restoration, and enhancement of wetlands and stream corridors in order to protect the adjacent water bodies, such as streams, rivers, lakes, bays and oceans.

This plan is consistent with the County Growth Management Guide by encouraging the protection of stream corridors and encouraging flood control and ground water recharge and through the implementation of the principals of non-structural and structural strategies. This

Plan is also consistent with the County Growth Management Guide, by preserving and protecting valuable natural features within the Borough.

STATE DEVELOPMENT OR REDEVELOPMENT PLAN (SDRP)

This plan is consistent with the plans and policies of the SDRP, which was adopted in 2001. The SDRP places non environmentally constrained areas in the Borough in the Metropolitan Planning Area (PA1). According to the State Plan, most of the communities within the PA1 planning area are fully developed or almost fully developed with little vacant land available for new development. This Plan is consistent with the State Plan by preserving and protecting the established residential character of the Borough, preserving and upgrading the existing utility infrastructure, providing adequate open space facilities, and preserving and protecting valuable natural features within the Borough.

STORMWATER MANAGEMENT STRATEGIES

The Borough reviewed its Master Plan (1992), its *Master Plan Re-Examination Report* (December 2003) and its pertinent development ordinances for consistency with the new stormwater regulations. Based on its review the Borough found that revisions to the following ordinance sections would provide minimal benefit since the Borough is almost fully developed and no "major development" is anticipated.

- **Chapter 20-3.5: Curbs and Sidewalks Specifications:** This section requires that sidewalks and curbs be constructed of concrete unless adjoining curbs and sidewalks are constructed of other materials.

- **Chapter 29: Flood Prevention:** This chapter describes the Borough's flood prevention and determination of flooding hazards. This chapter also includes flood prevention design and performance standards.

- **Chapter 30-1.3 Soil and Soil Removal Review by Engineer:** This section describes the review standards for a soil removal permit.

- **Chapter 35-13. Parking:** This section defines the Borough's parking regulations and ratios. The current stall length is a minimum of nineteen feet.

- **Chapter 35-28: Application for Development:** This section describes the Borough's requirements for the type of information that must be included in proposed site plan applications and subdivisions. The Borough Stormwater Control Ordinance discusses required information.

- **Chapter 35-22.3c: Off tract Improvements: Improvements Required: *Drainage Improvements*:** This section describes fees that developers may pay into escrow for off tract improvements to the drainage system.
- **Chapter 20-6.2: Improvement having an impervious surface:** This ordinance describes the impervious surface regulations for the Borough.

NONSTRUCTURAL STRATEGIES

The MSWMP recommends the practical use of the following nonstructural strategies for all major developments in accordance with the NJDEP *Best Management Practices (BMPs) Manual*:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.
3. Maximize the protection of natural drainage features and vegetation.
4. Minimize the decrease in the pre-construction "time of concentration."
5. Minimize land disturbance including clearing and grading.
6. Minimize soil compaction.
7. Provide vegetated open-channel conveyance systems that discharge into and through stable vegetated areas.
8. Provide preventative source controls.

In addition, the NJDEP's *BMP Manual* further requires an applicant seeking approval for a major development to specifically identify which and how these nonstructural strategies have been incorporated into the development's design. Finally, for each of those nonstructural strategies that were not able to be incorporated into the development's design due to engineering, environmental, or safety reasons, the applicant must provide a basis for this contention.

Recommended Measures

Recommendations in the BMP manual may be implemented through the use of:

Vegetated Buffers

Native ground cover and grass areas can provide a vegetated buffer to assist in the filtering of stormwater runoff and provide locations for runoff from impervious areas. They are best utilized adjacent to a buffer strip, watercourse or drainage swale since the discharge will be in the form of sheet flow, making it difficult to convey the stormwater downstream in a normal conveyance system (swale or pipe).

- **Stream Corridor Buffer Strips**

  Buffer strips are undisturbed areas between development and the receiving waters. There are two management objectives associated with stream and valley corridor buffer strips:

  - To provide buffer protection along a stream and valley corridor to protect existing ecological form and functions; and
  - To minimize the impact of development on the stream itself (filter pollutants, provide shade and bank stability, reduce the velocity of overland flow).

  Buffers only provide limited benefits in terms of stormwater management; however, they are an integral part of a system of best management practices.

- **The Stabilization of Banks, Shoreline and Slopes**

  The root systems of trees, shrubs and plants effectively bind soils to resist erosion. Increasing the amount of required plant material for new and redeveloped residential and non-residential sites should be encouraged throughout the Borough. Planting schemes should be designed by a certified landscape architect to combine plant species that have complementary rooting characteristics to provide long-term stability.

- **Deterrence of Geese**

  Maintaining or planting dense woody vegetation around the perimeter of a pond or wetland is the most effective means of deterring geese from taking over and contaminating local lakes and ponds. Minimizing the amount of land that is mowed will also limit the preferred habitat for geese. Other methods and/or actions should also be investigated.

- **Fertilizers**

  The use of fertilizers to create the "perfect lawn" is an increasingly common problem in many residential areas. Fertilizer run-off increases the level of nutrients in water bodies and an accelerate eutrophication[2] in the lakes and rivers and continue on to the coastal areas. The excessive use of fertilizer causes nitrate contamination of groundwater. Good fertilizer maintenance practices help in reducing the amount of nitrates in the soil and thereby lower its content in the water. Initially, the Borough should work with the NJDEP to educate homeowners of the impacts of the overuse of fertilizers. This discussion should include other techniques to create a "green lawn" without over fertilizing. Almost as important as the use of fertilizer, is the combination of over fertilizing and over watering lawns. In many cases this leads to nutrient rich runoff, which ultimately migrates to a nearby stream, lake or other water body. If fertilizer is applied correctly, the natural characteristics of the underlying soils will absorb or filter out the nutrients in the fertilizer.

STRUCTURAL STORMWATER MANAGEMENT[3]

In Chapter 9 of its *Stormwater Management Best Management Practices* (BMP) *Manual*, the Department of Environmental Protection identifies several structural stormwater management options. The Borough recommends the following structural devices. It should be noted that each of these structures has advantages and disadvantages to manage stormwater. These structural methods should only be used after all non-structural strategies are deemed impracticable or unsafe. Specifically, the Borough encourages the use of structural stormwater management systems in a manner that maximizes the preservation of community character. As

[2] Eutrophication – The normally slow aging process by which a lake evolves into a bog or marsh and ultimately assumes a completely terrestrial state and disappears.
[3] Definitions provided in the NJDEP – Stormwater Best Management Practices Manual at: http://www.njstormwater.org/tier_A/ bmp_manual.htm

previously mentioned, Manasquan is a fully developed community and anticipates the majority of new construction as residential infill development that will disturb less than 1 acre of land

Bioretention Systems

A bioretention system consists of a soil bed planted with native vegetation located above an underdrained sand layer. It can be configured as either a bioretention basin or a bioretention swale. Stormwater runoff entering the bioretention system is filtered first through the vegetation and then the sand/soil mixture before being conveyed downstream by the underdrain system. Runoff storage depths above the planting bed surface are typically shallow. The adopted Total Suspended Solids (TSS) removal rate for bioretention systems is 90%.

- **Constructed Stormwater Wetlands**

  Constructed stormwater wetlands are wetland systems designed to maximize the removal of pollutants from stormwater runoff through settling and both uptake and filtering by vegetation. Constructed stormwater wetlands temporarily store runoff in relatively shallow pools that support conditions suitable for the growth of wetland plants. The adopted removal rate for constructed stormwater wetlands is 90%.

- **Dry Wells**

  A dry well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs of structures. Discharge of this stored runoff from a dry well occurs through infiltration into the surrounding soils. A dry well may be either a structural chamber and/or an excavated pit filled with aggregate. Due to the relatively low level of expected pollutants in roof runoff, a dry well cannot be used to directly comply with the suspended solids and nutrient removal requirements contained in the NJDEP Stormwater Management Rules at N.J.A.C. 7:8. However, due to its storage capacity, a dry well may be used to reduce the total stormwater quality design storm runoff volume that a roof would ordinarily discharge to downstream stormwater management facilities. Care should be taken with the location and size of drywells due to potential impacts on basements and foundations.

- **Extended Detention Basins**

  An extended detention basin is a facility constructed through filling and/or excavation that provides temporary storage of stormwater runoff. It has an outlet structure that detains and attenuates runoff inflows and promotes the settlement of pollutants. An extended detention basin is normally designed as a multistage facility that provides runoff storage and attenuation for both stormwater quality and quantity management. The adopted TSS removal rate for extended detention basins is 40 to 60%, depending on the duration of detention time provided in the basin.

- **Infiltration Basins**

  An infiltration basin is a facility constructed within highly permeable soils that provides temporary storage of stormwater runoff. An infiltration basin does not normally have a structural outlet to discharge runoff from the stormwater quality design storm, but may require an emergency overflow for extraordinary storm events. Instead, outflow from an infiltration basin is through the surrounding soil. An infiltration basin may also be combined with an extended detention basin to provide additional runoff storage for both stormwater quality and quantity management. The adopted TSS removal rate for infiltration basins is 80%.

- **Sand Filters**

  A sand filter consists of a forebay and underdrained sand bed. It can be configured as either a surface or subsurface facility. Runoff entering the sand filter is conveyed first through the forebay, which removes trash, debris, and coarse sediment, and then through the sand bed to an outlet pipe. Sand filters use solids settling, filtering, and adsorption processes to reduce pollutant concentrations in stormwater. The adopted TSS removal rate for sand filters is 80%.

- **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 vegetated filter strip. The vegetation in a filter strip can range from turf and native grasses to herbaceous and woody

vegetation, all of which can either be planted or indigenous. It is important to note that all runoff to a vegetated filter strip must both enter and flow through the strip as sheet flow. Failure to do so can severely reduce and even eliminate the filter strip's pollutant removal capabilities. The total suspended solid (TSS) removal rate for vegetative filters will depend upon the vegetated cover in the filter strip.

- **Wet Ponds**

  A wet pond is a stormwater facility constructed through filling and/or excavation 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 and promotes the settlement of pollutants. A wet pond, also known as a retention basin, can also be designed as a multi-stage facility that also provides extended detention for enhanced stormwater quality design storm treatment and runoff storage and attenuation for stormwater quantity management. The adopted TSS removal rate for wet ponds is 50 to 90% depending on the permanent pool storage volume in the pond and the length of the retention time provided by the pond.

LAND USE/ BUILD-OUT ANALYSIS

The Borough of Manasquan has 1.38 square miles of land area. The Borough has 0.001 square miles or 0.66 acres (see Table 4) of vacant developable land which is not environmentally, and therefore is exempt from the NJDEP regulations requiring the completion of a build-out analysis, which would indicate the potential for development within the Borough. Refer to Figure 3 for a copy of the Borough's Existing Land Use Map.

The Borough lies within the NJDEP's designated Coastal Area Facilities Review Act (CAFRA) boundary; therefore any future development must comply with those regulations for Planning Area 1.

MITIGATION PLAN

This mitigation plan is provided for proposed development or redevelopment projects that seek a variance or exemption from the stormwater management design and performance standards set forth in this MSWMP and N.J.A.C. 7:8-5.

MITIGATION PROJECT CRITERIA

To grant a variance or exemption from the stormwater regulations, new development and redevelopment plan applications must propose a mitigation project affecting the same sensitive receptor and located within the same drainage basin as the proposed development/redevelopment. Proposed mitigation projects must provide for additional groundwater recharge benefits, protection from stormwater runoff quantity or quality from previously developed property that does not currently meet the design and performance standards outlined in this MSWMP.

The proposed mitigation project must be completed for the performance standard for which the variance or exemption is requested. Performance standards must ensure the long-term maintenance of the approved mitigation system, which include the maintenance requirements under Chapters 8 and 9 of the NJDEP BMP Manual. The Borough does not anticipate granting variances or exemptions for "major developments" until a detailed mitigation plan is developed and approved. The Borough will consider granting variances or exemptions for "major developments" subject to the following NJDEP and local requirements:

1. The Developer shows that literal compliance is technically impractical or presents a substantial economic hardship.

2. The project must be within the same area that would contribute to the receptor impacted by the project. Note that depending on the specific performance standard waived, the sensitive receptor and/or the contributory area to that receptor may be different. If there are no specific sensitive receptors that would be impacted as the result of the grant of the waiver/exemption, then the location of the mitigation project can be located anywhere

within the Borough, and should be selected to provide the most benefit relative to an existing stormwater problem in the same category (quality, quantity or recharge).

3. Legal authorization must be obtained to construct the project at the location selected. This includes the maintenance and any access needs for the project in the future.

4. The project should be close to the location of the original project, and if possible, be located upstream 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 the project for which a waiver is obtained discharges to a tributary, but the closest location discharges to the main branch, it may be more beneficial to identify a location discharging to the same tributary.

5. For ease of administration, if sensitive receptors are addressed, 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.

6. It must be demonstrated that implementation of the mitigation project will result in no adverse impacts to other properties or the environment.

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

DEVELOPER MITIGATION PLAN REQUIREMENTS

Proposed mitigation projects shall have Mitigation Plans submitted to the Borough for review and approval prior to granting final approval for site development. Developers should include the following in a Mitigation Plan:

- Mitigation Project Name, Owner name and address, Developer name and address, Mitigation Project Location, Drainage Area, Cost Estimate;

- Proposed project and mitigation project descriptions, proposed mitigation strategy and impact to sensitive receptor. Descriptions should include what is being impacted, how it is impacted, what is being mitigated and how;
- Sensitive Receptor: Identify the sensitive receptor(s) related to the performance standard from which a waiver is sought. Demonstrate that the mitigation site contributes to the same sensitive receptor;
- Legal authorization required for construction , maintenance, and access;
- Responsible Party including: a schedule of required maintenance or maintenance plan, who will perform the maintenance, proposed cost of maintenance, and how it will be funded;
- All other permits required for construction of the mitigation project;
- Cost estimate of construction inspection; and
- Reason a waiver or exemption is requested and supporting evidence.

Due to the lack of vacant or developable land, it is anticipated that the majority of the mitigation projects proposed will result in retrofitting/rehabilitation of existing stormwater facilities and natural infrastructures. Therefore, the Applicant may select one area from the Glimmer Glass Harbor region bounded by Main Street, Warren Avenue, Watson's Creek, and Perrine Boulevard to be developed into a potential mitigation project. Areas where water quantity issues occur are described in T&M Associates *Glimmer Glass Drainage Report* prepared in 2001. Any applicant seeking relief via a mitigation option shall provide such relief that is equal to or greater than the parameter being sought for relief. Mitigation options shall be quantifiable in order to be compared to that being substandard on the proposed site. More detailed information may be available from the Borough or the Borough Engineer's office.

It is the developer's responsibility to provide a detailed study of any proposed mitigation project, and provide the Borough with a proposed mitigation plan for review and approval. Mitigation projects should meet all applicable safety, design and performance standards. Approval of the mitigation option will be under the sole discretion of the Board based on calculations provided by the applicant and reviewed by the Board's professional consultants. The applicant will be

required to submit an alternative mitigation option if the Board deems the proposed option not applicable.

RECOMMENDATIONS

The following are additional recommendations associated with this Stormwater Management Plan Element of the *Master Plan*:

- ***Recommendation A: Educate residents on the impacts of the overuse of fertilizers and good fertilizer maintenance practices.***

  As stated in the Stormwater Management Strategies section of this MSWMP, the overuse of fertilizers has a significant detrimental impact on surface water bodies and groundwater. The Borough should work with the NJDEP to educate residents, through their Local Education Program requirement in their Tier A Municipal Stormwater General Permit, on these impacts and encourage residents to use techniques to create a "green lawn" without over-fertilizing and/or to convert lawn areas to other kinds of vegetation that do not require fertilization and other chemical treatments. Many lawn services also "overspray" fertilizer onto roadways and adjacent properties. The Borough should investigate methods to minimize the application of fertilizers beyond property lines.

Recommendation B: Educate residents on techniques to deter geese.

Geese population can take over and contaminate local water bodies. The planting of vegetation around the perimeter of a waterbody is an effective means of deterring geese. The Borough should work with the NJDEP, through their Local Education Program requirement under their Tier A Municipal Stormwater General Permit, to educate residents on implementing geese deterrence techniques.

- ***Recommendation C: Seek to ensure the proper inspection, monitoring, and maintenance of all stormwater management facilities and develop strategies for all existing and future maintenance and improvements.***

  Stormwater facilities require regular maintenance to ensure effective and reliable

performance. Failure to perform the necessary maintenance can lead to diminished performance, deterioration and failure. In addition, a range of health and safety problems, including mosquito breeding and the potential for drowning, can result from improperly maintained facilities. To minimize these risks, the Borough should implement a procedure for regular inspection, monitoring, and maintenance of Borough owned stormwater facilities as required by the Stormwater Facilities Maintenance Program in their Tier A Municipal Stormwater General Permit.

The Borough should also encourage the use of low impact design methods and non-structural strategies that require less maintenance.

- ***Recommendation D: Encourage existing storm drains to be replaced with bicycle safe grates and Campbell Foundry Model #N-2-ECO inlet heads (or equal) to prevent floatable and solid debris from entering the storm water conveyance system.***

Typical roadway debris, such as bottles and cans, can easily enter stormwater conveyance systems through typical inlet openings. This debris is then transported downstream into the receiving water bodies. By replacing existing storm drain inlets with new inlet grates and inlet heads, which have a maximum opening size of 2-inches by 4-inches, the amount of debris entering the stream can be reduced, improving water quality.

BIBLIOGRAPHY

Borough of Manasquan, Manasquan Planning Board. *Borough of Manasquan Master Plan.* 1992.

Borough of Manasquan, Manasquan Planning Board. *Borough of Manasquan Master Plan Re-Examination.* Dec. 2003.

Borough of Manasquan, Borough of Manasquan Open Space Committee. *Open Space and Recreation Plan.* Sept. 2003.

Borough of Manasquan, *Land Development Ordinance.* <http://www.ordinance.com> June 6, 2004.

Borough of Manasquan, Manasquan Planning Board, *Housing Plan Element and Fair Share Plan.* Sept.. 2004.

French, Mark and Jeffery Hoffman. Ground-Water-Recharge Rates and Selected Open Space in the Rancocas, Pennsauken, and Cooper Watersheds, New Jersey. New Jersey Department of Environmental Protection. < http://www.state.nj.us/dep/njgs/pricelst/ofmap/ofm32.pdf> 2000.

Kern River Connections. The Hydrologic Cycle.
http://www.creativille.org/kernriver/watershed.htm

Linsley, Ray K., Franzini, Joseph B., Freyber, David L, and George Tchobanoglous. *Water resources Engineering.* 4th ed. New York, New York: Irwin McGraw-Hill, 1992

Manasquan Watershed Management Group. *Manasquan River Watershed Initial Characterization and Assessment Report.* March 1999.

New Jersey Administrative Code N.J.A.C. 7:14A-25: NJPDES Stormwater Rules. Jan. 5, 2004.

New Jersey Administrative Code, N.J.A.C. 7:8, Stormwater Management Rules, Feb. 2, 2004.

New Jersey Department of Environmental Protection, Division of Watershed Management. *Amendment to the Atlantic Water Quality Management Plan, Cape May County Water Quality Management Plan, Monmouth County Water Quality Management Plan, Ocean County Water Quality Management Plan, and Tri-County Water Quality Management Plan Total Maximum Daily Loads for Fecal Coliform to Address 31 Streams in the Atlantic Water Region.* Proposed Apr. 2003.

New Jersey Department of Environmental Protection, Division of Watershed Management *New Jersey Stormwater Best Management Practices Manual* April 2004.

New Jersey Department of Environmental Protection, Division of Watershed Management. *Tier A Municipal Guidance Document: NJPDES General Permit No. NJ0141852*. April 2004.
New Jersey Department of Environmental Protection. *The Ambient Biomonitoring Network Watershed Management Area 12, 13, 14, 15, and 16, Atlantic Region*. March 2001. (http://www.state.nj.us/dep/wmm/bfbm/).

New Jersey Department of Environmental Protection. Guidance for the Development of Municipal Mitigation Plans (http://www.njstormwater.org/docs/munimitipplan030706.pdf), February 2006.

New Jersey Department of Environmental Protection. List of Category One Streams, Lakes and Reservoirs <http://www.nj.gov/dep/cleanwater/c1_waters_list.pdf. >

New Jersey Department of Environmental Protection. Division of Watershed Management. Total Maximum Daily Loads. <http://www.state.nj.us/dep/watershedmgt/tmdl.htm> Sept. 1, 2004.

New Jersey Department of Environmental Protection. Division of Watershed Management. <http://www.state.nj.us/dep/watershedmgt/index.htm> Dec. 15, 2004.

New Jersey Department of Environmental Protection. Stormwater and Nonpoint Source Pollution, <www.njstormwater.org> August 30, 2004.

New Jersey Department of Environmental Protection. Sub-list 1-5, New Jersey's 2004 Integrated List of Water Bodies <http://www.state.nj.us/dep/wmm/bfbm/>, June 22, 2004

T&M Associates. *Glimmer Glass Drainage Report.* 2001.

United States Department of Agriculture, Natural Resource Conservation Service. Hydric Soils – Introduction. <http://soils.usda.gov/use/hydric/intro.html> Jan. 24, 2007.

United States Census Bureau. Profile of General Demographic Characteristics: 1990, 1990

United States Census Bureau. Profile of General Demographic Characteristics: 2000, 2000.

United States Census Bureau. 1990 Summary Tape File (STF 1), 1990.