

**TOWNSHIP OF MONTGOMERY
MUNICIPAL STORMWATER MANAGEMENT PLAN**



PREPARED FOR:

TOWNSHIP OF MONTGOMERY
2261 Route 206
Belle Mead, New Jersey 08502

**NJPES #NJG 0148261
PI ID # 208131
Somerset County**

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LIST OF ACRONYMS USED IN THIS REPORT

AMNET	NJDEP's Ambient Biomonitoring Network
BAT	Biological Action Team
BMP	Best Management Practice
CAT	Chemical Action Team
CWA	Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972)
D.O.	Dissolved Oxygen
EDPA	Effective Date of Permit Authorization
EPA	Environmental Protection Agency
GIS	Geographic Information System
HUC	Hydrologic Unit Code
MS4	Municipal Separate Storm Sewer System
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollution Discharge Elimination System
NPDES	National Pollution Discharge Elimination System
NPS	Non-point Source
RFA	Request for Authorization
SWPPP	Storm Water Pollution Prevention Plan
SWQS	Surface Water Quality Standards
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USGS	United States Geologic Survey

1.0 Regulations Impacting Montgomery Township

In 1972, Congress amended the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) to prohibit the discharge of any pollutant to waters of the United States from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. This act established the goal of making our nation's waters suitable for the propagation of fish, aquatic and wildlife; recreational purposes; and the use of these waters for the public water supply, agricultural, industrial and other purposes. The act recognized the damaging effects that unmanaged stormwater can have on these national goals.

In 1987, Congress amended the Clean Water Act to require implementation, in two phases, of a comprehensive national program for addressing storm water discharges. The first phase of the program, commonly referred to as "Phase I" was promulgated on November 16, 1990 and required permits for stormwater discharges from priority sources including municipal separate storm sewer systems generally serving populations of 100,000 or more and several categories of industrial activity, including construction sites that disturbed five or more acres of land.

The second phase of the program, commonly referred to as "Phase II" was promulgated by the Federal government on December 8, 1999 and became effective on February 7, 2000. "Phase II" expanded the program to include discharges from smaller municipal separate storm sewer systems in urbanized areas and from construction sites that disturbed between one and five acres of land. The federal regulation required the implementation of six minimum measures and best management practices.

As a result of the U.S Environmental Protection Agency Phase II rules, the State of New Jersey Department of Environmental Protection developed the Municipal Stormwater Regulation program. The program addresses pollutants entering waters from storm drain systems owned or operated by local, county, state, interstate or federal agencies. The regulations refer to the storm drain systems as Municipal Separate Storm Sewer Systems (MS4s). New Jersey Pollutant Discharge Elimination System (NJPDES) permits have been issued to municipalities throughout the state as well as to public complexes and highway agencies. The Municipal Stormwater Regulation Program is being implemented through four types of NJPDES Permits, a Tier A Permit, a Tier B Permit, a Public Complex Permit and a Highway Permit.

Regulations Impacting Montgomery Township (Cont'd)

The Township of Montgomery contains a Municipal Separate Storm Sewer Systems known as an MS4 and is considered a Tier A municipality under the NJPDES system. The regulations for the NJPDES Tier A Permits were issued on February 2, 2004 and became effective March 3, 2004. The Township of Montgomery was required to submit a Request for Authorization, known as a RFA on March 31, 2004 and the permit authorization was dated April 1, 2004. April 1, 2004 is known as the effective date of the permit authorization or the EDPA date.

Under Section F.3.b.ii of the Tier A NJPDES Permit, municipalities are required to adopt a municipal stormwater management plan in accordance with NJAC 7:8-4 within 12 months of the effective date of the permit authorization, or by April 1, 2005. The municipal stormwater management plan is an element of the Township Master Plan and must be presented at a public meeting that is advertised ten days prior to the meeting with the written stormwater management plan on file with the Township. This document satisfies those requirements.

Under Section E.2 of the Tier A NJPDES Permit, municipalities are required to prepare and implement a written stormwater pollution prevention plan within 12 months of the effective date of the permit authorization, or by April 1, 2005. The municipal stormwater pollution prevention plan is abbreviated as the SWPPP. The basic SWPPP consists of seventeen forms to be completed and implemented by the team members of the pollution prevention team. Maps of the municipality are required to plan the implementation of the pollution prevention plan. The pollution prevention plan completed by April 1, 2005 will be signed and certified and kept on file within the municipality for inspection by NJDEP. The pollution prevention plan forms, maps and lists will become a “living document” that will change through out the year and will track how the stormwater pollution prevention plan is being implemented by the municipality. Montgomery Township has completed the SWPPP and is implementing the plan.

Regulations Impacting Montgomery Township (Cont'd)

Under Section F.5 of the Tier A NJPDES Permit and as part of the municipal stormwater pollution prevention plan, the municipality must adopt improper disposal of waste ordinances to prevent pollution from entering the inlets and streams within the municipality by October 1, 2005. These ordinances include pet waste, litter control, improper disposal of waste, wildlife feeding, yard waste, and illicit connection ordinances. The pet waste ordinance was adopted April 7, 2005. The remaining ordinances were adopted by the municipality.

Under Section H.3.a of the Tier A NJPDES Permit, the Township of Montgomery is required to file an Annual Report and Certification to the New Jersey Department of Environmental Protection on or before May 2, 2005 and every 12 months thereafter. The Annual Report and Certification shall be maintained by the municipality for a period of five years. The Annual Report and Certification is the only document required to be sent to NJDEP. The required Annual Reports and Certifications have been completed by Montgomery Township.

Under Section F.3.b.iii of the Tier A NJPDES Permit, municipalities are required to adopt ordinances to implement the municipal stormwater management plan 12 months after the adoption of the municipal stormwater plan. In effect, municipalities have 24 months from the effective date of the permit authorization, or by April 1, 2006 to adopt stormwater management ordinances that set forth exact stormwater management design standards for development and redevelopment. The draft stormwater management ordinances are located in the Appendix section of this plan.

The Sourland Mountain Regional Stormwater Management Plan which includes Montgomery Township is under development at this time. When the Sourland Mountain Regional Stormwater Management Plan is adopted, the municipal plan will be required to be revised to conform to the regional stormwater management plan.

The Montgomery Township municipal stormwater plan will be reviewed and approved by Somerset County and the New Jersey Department of Environmental Protection.

Subchapter 4 of NJAC 7:8 sets forth the specific requirements of a Municipal Stormwater Management Plan and is located in Attachment 2 for reference.

Subchapter 5 of NJAC 7:8 sets forth the groundwater recharge, water quantity, and water quality standards for stormwater design. If any exceptions are required from the design and performance standards for development projects over one acre submitted to the Planning or Zoning Board, the stormwater management plan identifies mitigation options to offset the exceptions. Montgomery has unique characteristics and the mitigation plan provides the municipality with the power to correct and repair deficiencies that may be creating water quality impairments within each sub watershed. The mitigation option has been incorporated into the stormwater ordinance.

The Montgomery Township Ordinance meets and exceeds the New Jersey model stormwater ordinance for municipalities in the following areas:

- a. The definition of major development as “ultimately disturbing one or more acres of land or increasing impervious coverage by more than one quarter acre or 10,890 square feet”.
- b. Requirement of Non Structural Stormwater Management Strategies Point System (NSPS)
- c. Requirement of Low Impact Development Checklist if NSPS points are not met
- d. Water Quality Requirements (previously called nonpoint source pollutant loading analysis) for applicants seeking subdivision or minor or major site plan or approval for “d” variances pursuant to N.J.S.A. 40:55D=70d or for “c” variances for lot coverage.
- e. Mitigation Requirements specific for Montgomery Township
- f. Maintenance Guarantees for stormwater best management practices (BMP’s) to be maintained by the Township
- g. Standards for soil testing

2.0 Overview of the Montgomery Stormwater Management Plan

This Municipal Stormwater Management Plan documents the strategy for Montgomery Township to address stormwater-related impacts. The creation of this plan is required by N.J.A.C. 7:14A-25 Municipal Stormwater Regulations. This plan contains the elements as described in N.J.A.C. 7:8 Section 4.2 of the Stormwater Management Rules. Montgomery Township contains more than one square mile of open space and agricultural land based on the NJDEP geographical information system (GIS) data available. An Existing Land Use Land Cover based on the NJDEP 1995-1997 Land use/Land Cover GIS Data Set is provided in the Appendix, **Map 1, Existing Land Use/ Land Cover**. As of 1995, approximately 28% or 9 square miles of the Township contains forested land cover and roughly 26% or 8 square miles of the Township contains agricultural uses.

This Municipal Stormwater Management Plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for major development, defined as projects that disturb one or more acre of land or the increase of impervious area by more than one quarter acre. The implementation of these standards into the Montgomery Township Master Plan is intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides baseflow in receiving water bodies. The plan stresses non structural best management practices or low impact development with specific requirements for soil testing to ensure the long-term operation and maintenance of stormwater facilities to perform well in the soil and water table conditions within Montgomery Township.

Residential projects presented to the Montgomery Township Planning and Zoning Boards must meet the Residential Site Improvement Standards for stormwater management design. The basic stormwater design and performance standards being implemented in this stormwater management plan are the same as the design and performance standards for stormwater management in the Residential Site Improvement Standards and as set forth under N.J.A.C. 7:8 Section 5.

Non-residential development projects are currently reviewed under Ordinance Section 16-5.2, Drainage. Detention and retention basins are required to hold storm water runoff such that discharges from the site will not exceed pre-development rates. The water quality design standards that are in place for non- residential projects require no more than ninety percent (90%) of the runoff from 1 ¼ inches of rain falling in two hours be drained from the basin prior to 36 hours. The current ordinance requires that a “minimum of eighty percent (80%) of the proposed land use total suspended solids loading” will be removed in accordance with the New Jersey Stormwater Best Management Practices manual. The current design requirement is that the nonpoint source pollutant loads after development will not increase over the predevelopment nonpoint source pollutant loads. Nonpoint source pollutant load calculations are currently required for all applicant seeking subdivision or site plan approval or approval for “d” variances pursuant to N.J.S.A. 40:55D-70d or for “c” variances for lot coverage. The current ordinance requires nonstructural stormwater measures such as protection of riparian corridors, maintenance of the predevelopment time of concentration and protection of endangered habitats and species.



Cruser Brook at Pedestrian Bridge adjacent to Garrison Court

5/13/05

The adoption of the NJPDES stormwater management design ordinances for projects greater than one acre or an increase in impervious of one quarter acre will require stormwater management basin designs to meet reductions in the discharges from the site runoff from pre-development rates for the 2, 10 and 100 year storms, to provide water quality designs based on eighty percent (80%) reduction

of total suspended solids through the use of one or more best management practices, and to meet annual recharge requirements. The discharge reduction requirements are more stringent than the current Montgomery standards, the water quality requirements provide specific standards for the designer, and the recharge requirements were not previously required in Montgomery Township ordinances. Therefore, the implementation of this plan will have a substantial impact on the stormwater management design of commercial development projects.

The adoption of the stormwater management design ordinance will continue to require applicant's seeking subdivision or site plan approval or approval for "d" variances pursuant to N.J.S.A. 40:55D-70d or approval for "c" variances for lot coverage to meet standards for water quality. The applicant's will continue to be required to analyze the impact to total suspended solids, nitrogen and phosphorus and reduce the total suspended solids by eight percent (80%). The calculations are now called water quality calculations where they were previously called nonpoint source pollutant loading analysis.

Montgomery Township has implemented a critical areas ordinance to protect wetlands, slopes greater than fifteen percent (15%), one hundred year flood plains, stream corridors, wetland transition areas, and hydric soils. The critical area ordinance protects riparian buffers and removal of riparian vegetation which protects the aquatic ecosystems of the streams and waterways.

This plan contains a mitigation plan when an exemption of the design and performance standards is sought by a developer. As part of the mitigation section of the stormwater plan, specific and general stormwater management projects within Montgomery have been identified as alternative projects if a development cannot meet the stormwater standards. Exemptions are provided to ensure that commercial redevelopment of existing sites will continue to occur in Montgomery where the stormwater standards cannot be imposed.



Route 206 & 518, Commercial site for future redevelopment

An applicant must meet specific requirements in order to be granted an exemption from stormwater management design standards and proceed with a mitigation project.

3.0 Goals

The goals of the Montgomery Municipal Stormwater Management Plan are to:

- Reduce the impact of stormwater runoff for all stormwater events, especially high frequency events. High frequency events are storms that occur frequently with low rainfall amounts (also called the water quality storm);
- Improve baseflow to streams by maintaining groundwater recharge;
- Reduce silting of ponds and streams by providing total suspended solids reduction and reduction of soil erosion from any development or construction project;
- Improve in-stream and riparian habitat for all watershed residents (humans, wildlife, flora and fauna);
- Reduce flood damage, including damage to life and property;
- Prevent further degradation of existing stream features and structures;
- 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 best management practices.

To achieve these goals, a variety of strategies are proposed for implementation. Specific design and performance standards are included in the Montgomery Township Draft Stormwater Ordinance. Preventative and corrective maintenance is required to ensure the long term effectiveness and safety of stormwater management facilities. Under the review process, the Montgomery Township Planning and Zoning Boards will make sure that each facility has a detailed maintenance plan and meets all safety standards in accordance with the Montgomery Township Stormwater Ordinance.

4.0 Stormwater Discussion

Land development can dramatically alter the hydrologic cycle (See Figure 1) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration.

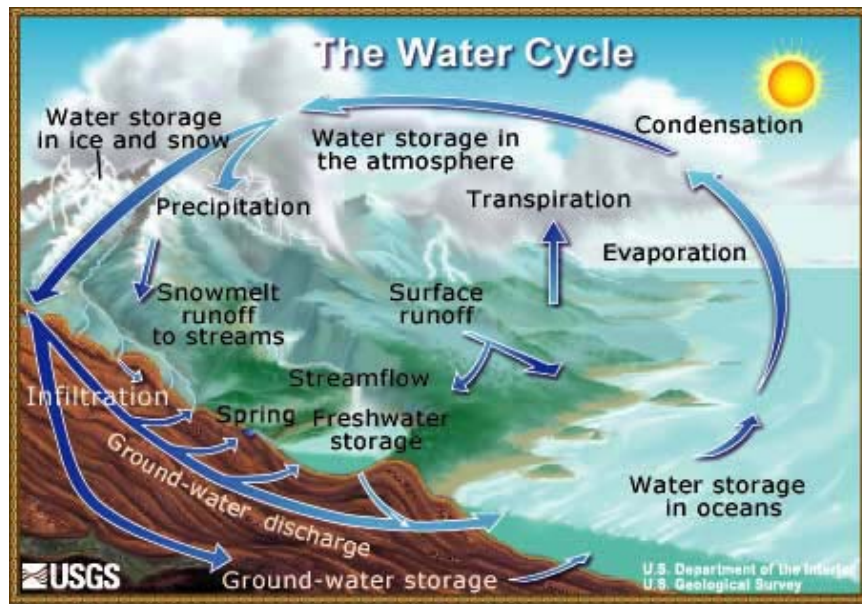


Illustration by John M. Evans, Colorado District, USGS

Figure 1. Hydrologic Cycle

Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Downstream erosion, sediment deposits can be seen in Photograph 1.



Photograph 1. Embankment Erosion on Rock Brook

Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can cause destruction of habitat, to which some species cannot adapt.

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

Groundwater recharge and well head protection areas in Montgomery Township are shown in the Appendix, on **Map 11, Groundwater Recharge and Well Head Protection**

Areas. Soil types, which can be evaluated for the recharge capacity and depth to seasonal high water table, are shown in the Appendix, on **Map 10, Soil Erodible Land Class.**

Land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting the stream biology. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

5.0 Montgomery Township

The Township of Montgomery contains 32.61 square miles in the southern portion of Somerset County half way between New York City and Philadelphia. The Township is bordered by Hillsborough Township, Franklin Township, Borough of Rocky Hill, Princeton Township and Hopewell Township. The community has merged residential, commercial and agricultural uses while preserving open space, and historic districts, providing recreational facilities and providing excellent school facilities.



5.1 Population and Land Use

The population of Montgomery has increased from 9,612 in 1990 to 17,481 in the year 2000. This represents an eighty-two percent (82%) increase in the population over the ten year period. This growth rate was the highest rate of growth of any municipality in Somerset County during the decade. The Somerset County growth rate from 1990 to 2000 was 24%. The census data since 1970 is listed below:

Township	1970	1980	1990	2000
Montgomery	6,353	7,360	9,612	17,481

Montgomery Township is divided approximately in thirds among urban, forested and agricultural land uses. The existing land uses are shown in the Appendix, on **Map 1, Existing Land Use/Land Cover**. Urban land uses are the greatest land cover type, comprising approximately 31% of the land cover. Urban land uses are concentrated in clusters within the municipality with the greatest concentration in the northeast section of the Township adjacent to Franklin Township and Hillsborough Township. Higher density development has occurred in the southeast corner of Montgomery in the Apartment / Townhouse Residential Zone and in the Single Family Residential Clusters Zone. The existing zoning areas are shown in the Appendix, on **Map 3, Zoning Districts**.



Clinton Drive & Burton Circle

Forested land is the second most prevalent land cover over approximately 28% of the Township. Approximately half of Montgomery's forest areas are located in the northwestern

third of the Township in the Sourland Mountain area. The remaining forest areas are scattered throughout the Township with most being at low elevations and adjacent to the stream corridors.



Bedens Brook at Cherry Hill Road

Agriculture utilizes approximately 26% of the remaining land cover within the municipality. Wetlands take up approximately thirteen percent (13%) of the land cover area and are found adjacent to the stream corridors. In the Sourland Mountains, the wetlands are wide and create large headwaters to the streams flowing off the mountain area.

The 3M manufacturing plant is located in the Special Industrial Zone in the Sourland Mountain area in Montgomery Township. The raw material is extracted in an open pit mine, crushed and then colored for the surface material used in the manufacture of asphalt shingles. The production of the final product creates a by-product of a very fine grey powder. The by-product appears to be very light and soluble in water allowing it to be transported by water for long distances. The manufacturing facility has constructed a significant network of rip rap swales and stormwater basins to control stormwater management within the manufacturing facility.

The change in the major land use cover types between 1972 and 1990 are shown below. Roughly 5,000 acres of agricultural land was developed into urban land uses in the 23 year period from 1972 to 1995.

Land Use	1972	1995	Change (1972-1995)	
	Acres	Acres	Acres	Percent
Agriculture	10,277	5,341	-4,935	-48%
Urban	1,410	6,357	4,946	350%
Forest	6,631	5,724	-907	-14%
Wetlands	2,376	2,694	317.2	13.2%

5.2 Description of Watershed

Montgomery Township is located on the western side of the Millstone River in the Raritan Basin. The streams and tributaries within the municipal boundaries of Montgomery Township flow into the Millstone River, which is designated as Watershed Management Area 10, part of the Raritan Basin. The Millstone Watershed Management Area 10 is shown in the Appendix on **Map 6, Watershed Management Areas and Water Regions**.

The streams and tributaries in Montgomery Township generally flow from west to east, with the exception of Pike Brook which flows north to south and Cherry Brook, which flows south to north. Both Pike Brook and Cherry Brook flow into Bedens Brook along the southern side of the municipality. The streams can be clearly seen in the Appendix on **Map 12, Stream Corridors**.

Smaller subwatersheds within the major watershed are delineated by a fourteen digit hydrologic unit code, abbreviated HUC code. The nine subwatersheds within Montgomery

Township are listed below and are shown in the Appendix on **Map 7, HUC 14 (Subwatersheds)** and **USGS Quadragles**.

Nine Subwatersheds in Montgomery Township

- Bedens Brook (above Province Line Road), HUC 02030105110040
- Bedens Brook (below Province Line Road), HUC 02030105110050
- Cruiser Brook/Roaring Brook, HUC 02030105110090
- Millstone River (Bedens Brook to Heathcote Brook), HUC 02030105110030
- Millstone River (Balckwells Mills to Bedens Brook), HUC 02030105110110
- Pike Run (above Cruiser Brook), HUC 02030105110080
- Pike Run (below Cruiser Brook), HUC 02030105110100
- Rock Brook (above Camp Meeting Avenue), HUC 02030105110060
- Rock Brook (below Camp Meeting Avenue), HUC 02030105110070

In November 2002 and January 2003, the NJDEP proposed significant amendments to the State Water Quality Standards (SWQS) to upgrade the classification of streams to Category One Waters to provide stricter development standards to these waterways. Category One waters may include waters that originate from parks, freshwater trout production waters and their tributaries and shellfish waters of exceptional value. The Category One designation applies a 300 foot buffer along the stream corridor and stricter development standards. Within Montgomery Township Rock Brook, Roaring Brook, Cruiser Brook, and the headwaters of Beden Brook have been nominated for the Category One designation.

Sylvan Lake, located on the North Princeton Developmental Center is one of the ponds in Montgomery Township. The pond is part of the Rock Brook stream corridor and was created by a dam structure at the developmental center.



Sylvan Lake, North Princeton Developmental Center, 5/13/05

Currently there are nineteen contaminated sites within the Township as identified in the Known Contaminated Sites in New Jersey report last updated in 2001. It is important to take note of these sites and the status of remedial action, if any, as they will impact the selection of best management practices for stormwater management in immediately adjacent sites.



Superfund site off Route 206

There are two public community water supply wells located in Montgomery Township owned by the Elizabethtown Water Company. These public water supply sources need to be

protected against recharge of contaminated water. The well head protection areas are shown in the Appendix, **Map 11, Groundwater Recharge and Well Head Protection Areas.**

The watershed conditions within Montgomery Township are influenced by the underlying geology. The bedrock geology of Montgomery consists of sedimentary rocks of Lockatong, Stockton and Passaic formations and intrusive rocks of the Jurassic Diabase. The Sourland Mountain along the northwest side of the municipality consists of Lockatong, Jurassic Diabase and Stockton formations. The majority of Montgomery Township has underlying shales of Passaic and Passaic Gray formations.



Exposed Sediment Rock in Montgomery Township

The watershed characteristics can be evaluated by examining the erosivity of the soils in relationship to the areas of steep slopes. A map showing the critical slopes in purple and the highly erosive soils in red is shown in the Appendix on **Map 10, Soil Erodible Land Class.**

Montgomery Township has flat to gently rolling hills in the lower elevations and mountains at the higher elevations in the Sourland Mountain. Steep slopes occur in the transitional areas between the high and low areas. The most extensive areas of steep slope occur along Rock Brook near Hollow Road and from Back Brook to the northern township border with

Hillsborough. The slopes in both areas are greater than 25%. The steep slope areas need additional protection by steep slope design standards but also may have the most erosion if the soils are erosive in the steep slope areas.

One soil characteristic that influences development is the depth to seasonal high water table. The majority of the soils (56%) in Montgomery Township have a depth to seasonal high water table at or greater than 6 feet. A small percentage (4%) of the soils has a moderate depth to seasonal high water table of four feet. The remaining areas (42%) have less than three feet to the seasonal high water table. These are located adjacent to stream corridors, in the southern portion of the municipality or adjacent to the stream corridors. The stream corridors, flood plains and flood zones are shown in the Appendix on **Map 8, FEMA Flood Zones**.

5.3 Stream Conditions

The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of measurements related to the dynamic health of the macroinvertebrate community. The AMNET sites within Montgomery Township are shown in the Appendix on **Map 5, AMNET Stream Biological Monitoring Stations**.

The New Jersey Integrated Water Quality Monitoring and Assessment Report, 305(b) and 303(d) is required by the Federal Clean Water Act. The report identifies by watershed area waters that do not meet surface water quality standards and are impaired. The total maximum daily load, abbreviated TMDL, is the amount of a pollutant that can be accepted by a water body

without exceeding water quality standards or interfering with the ability to use a water body for one or more of its designated uses. The Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDL's are needed. Bedens Brook, Pike Run, Rock Brook and the Millstone River are listed on the 2006 Sublist 5 contained in Attachment 3. .

There are six AMNET Biological Monitoring Stations within Montgomery Township that are being monitored. The data for each AMNET site in Montgomery is listed below:

Site	Stream	1992 Rating (Score)	1998 Rating (Score)
AN0399	Rock Brook	Moderate (12)	Moderate (18)
AN0400	Rock Brook	Moderate (21)	No Sample
AN0401	Bedens Brook	Moderate (12)	Moderate (15)
AN0403	Cruser Brook	None (27)	Moderate (21)
AN0404	Back Brook	None (24)	Moderate (21)
AN0405	Pike Run	Moderate (15)	Severe (3)

Source: NJDEP AMNET data

The data indicates that the water quality has decreased in all of the streams sampled except Rock Brook. This would correlate to the land use data indicting the transformation of agricultural land to urban land and the decrease of overall open space. In general, a stream is not impaired if the overall impervious cover is less than ten percent, a stream will become moderately impaired when the overall impervious cover is between ten and thirty percent and a stream will become severely impaired when the impervious cover is greater than thirty percent.

TMDL reports are issued by NJDEP documenting the total maximum daily loads for all streams and conditions on the Sublist 5 of the Integrated List. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which

require an NJPDES permit to discharge, and nonpoint source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other best management practices or BMPs.

A review of the U.S Environmental Protection Agency (EPA) on line database for Total Maximum Daily Loads has been used find the current status of impaired waters within Montgomery Township. Under the 2002 cycle, Beden Brook is listed as impaired for fecal coliform, total phosphorus, arsenic with the aquatic life being moderately impaired. Under the 2002 cycle, Pike Run and Rock Brook are listed as moderately impaired for aquatic life.

The Total Maximum Daily Loads for Fecal Coliform to Address 48 Streams in the Raritan Water Region was proposed by NJDEP on April 21, 2003, established June 2003 and adopted in September of 2003. In this TMDL Report, the following stream segments within Montgomery Township are listed for fecal coliform:

Stream Segment	Description
1401600, 1401700	Impaired watersheds include portions of Beden Brook and Pike Run. The impaired watershed associated with Beden Brook begins at the confluence of Rock Brook and Beden Brook and extends downstream to the confluence of Beden Brook and Pike Run. The impaired watershed associated with Pike Run begins at the confluence of Pike Run and Cruser Brook and extends downstream to the confluence of Pike Run and Rock Brook.
1402000, 1402540	Portions of the Millstone River watershed. Impaired watershed associated with these segments begins at the confluence of Beden Brook and Millstone River and continues north to its confluence with the Raritan River. Excludes subwaterways associated with Royce Brook and Six Mile Run.

The TMDL report identifies the percent reduction necessary for each stream segment to meet the fecal coliform state water quality standards. Bedens Brook and Pike Run both have a required 97% reduction.

The Total Maximum Daily Loads for Fecal Coliform to Address 4 Streams in the Raritan Water Region was proposed by NJDEP on May 2, 2005. The TMDL report has not been established or approved. In the proposed TMDL report, the following stream segment is proposed:

Stream Segment	Description
1401560	Impaired watershed includes begins at the confluence of Rock Brook and Beden Brook and continues west and north to the origination of Rock Brook

The TMDL report identifies a 46% percent reduction necessary for Rock Brook to meet the fecal coliform state water quality standards. The potential sources of contamination include wildlife (deer and geese), livestock, suburban stormwater, and residential sections on septic systems. The strategies to improve water quality include organizing local community based goose management programs, prioritizing federal funds for agricultural best management practices and implementation of the Phase II stormwater program.

6.0 Design and Performance Standards

Montgomery Township currently utilizes the Residential Site Improvement Standards for stormwater management design for all residential development before the Planning and Zoning Boards. The Residential Site Improvement Standards supersede all Township of Montgomery design standards and do not have to be adopted by the municipality.

Non-residential development projects are currently reviewed under the design standards of the Ordinance 16-5.2, Drainage. The design requirements are that post construction peak rates of runoff should not be greater than pre-construction peak rates of runoff. The adoption of the NJPDES stormwater management design ordinances will require the stormwater management basin design to meet stricter peak rate of reduction requirements, water quality requirements to reduce total suspended solids and recharge requirements. The predevelopment peak rate of runoff from a 2 year storm will be reduced by 50% after development; the peak rate of runoff from a 10 year storm will be reduced 75%; and the peak rate of runoff from a 100 year storm will be reduced 80%.

For non-residential projects, the annual rate of rainfall that was infiltrated into the ground before development will be required to be infiltrated or recharged after development. Eighty percent (80%) of

the total suspended solids will have to be removed from the water before is it discharged to the stream or storm pipe system through the use of one or more approved Best Management Practices (BMP's).

Single family residential applications will not have to meet the stormwater requirements unless the proposed improvements will ultimately disturbing one or more acres of land or increasing impervious coverage by more than one quarter acre or 10,890 square feet.

For site plans and subdivision plans, the Planning and Zoning Board will review development plans to meet the stormwater regulations of the Township stormwater standards for residential and non-residential development. Under the Montgomery Engineering Department, Montgomery Township inspectors observe construction of all projects to ensure that the stormwater management measures are installed and constructed as shown on the approved plans.



Storm Inlet in Conformance with Attachment C of Stormwater Regulations

7.0 Evaluation of Master Plan

Montgomery Township has reviewed the master plan and ordinances, and the following is a list of the sections in the Township land use and zoning ordinances that could be modified to incorporate nonstructural stormwater management strategies. Once the ordinance texts are completed, they will be submitted to the county review agency for review and approval and a copy will be sent to the Department of Environmental Protection at the time of submission.

Chapter XVI of the Township Code, entitled Land Development Ordinance was reviewed with regard to incorporating nonstructural management strategies or low impact development (LID) strategies and to ensure that none of the existing ordinances conflicted with the proposed ordinance. The Municipal Regulation Checklist provided as Appendix B to the New Jersey Best Management Practices Manual was used for guidance. These are the ordinance sections identified for revision:

Section 16-6.4.d Permitted Activity in Stream Corridor

Section 16-6.4.d.6(c) add item (10) to permit nonstructural stormwater management practices when there is no reasonable or prudent alternative and provided all soil boring conditions are met.

Section 16-4.2 Area and Yard Requirements

Section 16-4.2.d footnote 12 restricts tree clearing of lots in the MR, R-5 and R-2 Zone. Additional natural landscape requirements could be applied in the R-5 and M-5 Zones.

Section 16-5.14.c.3 Sidewalks

Private sidewalks that would not be maintained by the Township could be constructed out of pervious materials.

Section 16-5.8.c.2(c) Pavement for parking lots

Private parking lots that would be privately maintained could be constructed out of pervious materials.

Section 16-6.5.g.5(a) Single Family conservation design

The newer terminology of low impact design could be added to the description of the subdivision design.

Section §16-5.14.b. Curbs.

No revisions are required to the current ordinance which does not require curb along all streets, thus promoting non structural measures.

8.0 Land Use/Build-Out Analysis

The Land Use/Build-Out Analysis is element 9 of NJAC 7:8-4.2. This analysis illustrates the potential pollutant loads to the streams, lakes and waterways in the municipality under maximum development permitted in the zoning code. The Township Zoning is provided on **Map 3**. Using this map **Table C-1** below was prepared to present the pollutant loading coefficients by land cover as published in the NJDEP's Stormwater BMP Manual. An additional column was added to the State's table to correlate the State's land cover designations to the Montgomery Township zoning district designations.

Table C-1 Pollutant Loads by Land Cover

NJDEP Land Cover Categories	Montgomery Corresponding Zoning Districts	Total Phosphorus Load (lbs/acre/year)	Total Nitrogen Load (lbs/acre/year)	Total Suspended Solids Load (lbs/acre/year)
High, Medium Density Residential	APT/TH, ARH, R, VN	1.4	15	140
Low Density, Rural Residential	MR, R-1, R-2, R-5	0.6	5	100
Commercial	CC-1, CC-2, HC, LM, NC, REO-1, REO-2, REO-3, SB	2.1	22	200
Industrial	N/A	1.5	16	200
Urban, Mixed Urban, Other Urban	PPE, MR/SI	1.0	10	120
Agricultural	N/A	1.3	10	300
Forest, Water, Wetlands	N/A	0.1	3	40
Barrenland/Transitional Area	N/A	0.5	5	60

Source: NJDEP Stormwater BMP Manual 2004.

- APT/TH - Apartment/Townhouse Residential
- ARH - Age-Restricted Housing
- CC-1 - Community Commercial
- CC-2 - Community Commercial
- HC - Highway Commercial
- LM - Limited Manufacturing
- MR - Mountain Residential
- MR/SI - Mountain Residential/Special Industry
- NC - Neighborhood Commercial
- PPE - Public, Parks, and Education
- R - Single-Family-Residential
- R-1 - Single-Family-Residential
- R-2 - Single-Family-Residential
- R-5 - Single-Family-Residential
- REO-1 - Research, Engineering and Office
- REO-2 - Research, Engineering and Office
- REO-3 - Research, Engineering and Office
- SB - Small Business
- VN - Village Neighborhood

Map 13, Developable Lands is a composite drawing utilizing the information from **Maps 1, 2, 3 and 4** that identifies all of the constrained land within the Township by HUC14 boundary. The remaining 13,137 acres of developable area is broken down per land use and the results are shown in **Table C-2** on the following pages. The developable area remaining in this table was calculated by subtracting the out the constrained land area from the total area (less road right-of-way) in each zoning district within the HUC14.

The annual pollutant loads at full build-out is presented in **Table C-3** for the developable acres in the Township by multiplying the developable acres per land use category in **Table C-2** by the pollutant load per acre in **Table C-1**. **Table C-3** quantifies the importance of controlling the impacts from development.

Table C-4 below summarizes the remaining developable land by land use in descending order. This table illustrates that the largest remaining developable land area is zoned as residential (high, medium density plus low density and rural residential) with at total of 11,285 acres out of 13,137 acres of developable land or 86% of the total available land for development. This represents the single largest remaining land use category remaining to be developed and where the Township will need to focus its efforts to control non-point source pollution through low impact developments measures that a typical homeowner can maintain to achieve the greatest benefit.

Table C-4
Developable Area Remaining by Land Use

NJDEP Land Use	Montgomery Corresponding Zoning Districts	Remaining Acres	Percentage
Low Density, Rural Res.	MR, R-1, R-2, R-5	10,841	82.5%
Commercial	CC-1, CC-2, HC, LM, NC, REO-1, REO-2, REO-3, SB	1,144	8.7%
Urban, Mixed, Other	PPE, MR/SI	708	5.4%
High, Med Density Res.	APT/TH, ARH, R, VN	444	3.4%
Industrial	N/A	0	0.0%
Agricultural	N/A	0	0.0%
Forest, Water, Wetlands	N/A	0	0.0%
Barrenland/Transitional	N/A	0	0.0%
Watershed Total	N/A	13,137	100.0%

Table C-2 HUC14 Build-Out Calculations

HUC14 and Zone	Total Acres	Constrained Lands Acres	Developed & Undeveloped Area Acres
HUC14 ID	Subwatershed Name		
02030105110030	Millstone R (Beden Bk to Heathcote Bk)		
High, Med Density Res.	275.2	44.2	231.0
Low Density, Rural Res.	276.1	27.5	248.6
Commercial	341.9	46.5	295.3
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	195.2	152.3	43.0
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	1,088.3	270.5	817.8
HUC14 ID	Subwatershed Name		
02030105110040	Beden Brook (above Province Line Rd)		
High, Med Density Res.	0.0	0.0	0.0
Low Density, Rural Res.	85.4	5.1	80.3
Commercial	0.0	0.0	0.0
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	0.0	0.0	0.0
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	85.4	5.1	80.3
HUC14 ID	Subwatershed Name		
02030105110050	Beden Brook (below Province Line Rd)		
High, Med Density Res.	153.4	21.4	132.0
Low Density, Rural Res.	4,089.4	1,253.0	2,836.4
Commercial	402.7	101.7	301.0
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	429.9	377.8	52.2
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	5,075.4	1,753.8	3,321.6

Table C-2 HUC14 Build-Out Calculations (continued)

HUC14 and Zone	Total Acres	Constrained Lands Acres	Developed & Undeveloped Area Acres
HUC14 ID	Subwatershed Name		
02030105110060	Rock Brook (above Camp Meeting Ave)		
High, Med Density Res.	0.0	0.0	0.0
Low Density, Rural Res.	1,261.8	164.4	1,097.3
Commercial	0.0	0.0	0.0
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	0.0	0.0	0.0
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	1,261.8	164.4	1,097.3
HUC14 ID	Subwatershed Name		
02030105110070	Rock Brook (below Camp Meeting Ave)		
High, Med Density Res.	12.7	0.0	12.7
Low Density, Rural Res.	1,254.1	322.4	931.7
Commercial	14.8	4.6	10.2
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	872.4	566.0	306.3
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	2,154.0	893.0	1,261.0
HUC14 ID	Subwatershed Name		
02030105110080	Pike Run (above Crusier Brook)		
High, Med Density Res.	62.8	0.0	62.8
Low Density, Rural Res.	457.5	88.7	368.8
Commercial	26.0	0.1	26.0
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	9.6	9.6	0.0
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	555.9	98.4	457.5

Table C-2 HUC14 Build-Out Calculations (continued)

HUC14 and Zone	Total Acres	Constrained Lands Acres	Developed & Undeveloped Area Acres
HUC14 ID	Subwatershed Name		
02030105110090	Cruser Brook / Roaring Brook		
High, Med Density Res.	0.0	0.0	0.0
Low Density, Rural Res.	1,144.4	331.2	813.2
Commercial	283.7	24.8	259.0
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	915.7	677.9	237.8
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	2,343.8	1,033.8	1,310.0
HUC14 ID	Subwatershed Name		
02030105110100	Pike Run (below Cruser Brook)		
High, Med Density Res.	5.2	0.1	5.1
Low Density, Rural Res.	5,107.8	1,294.7	3,813.1
Commercial	280.0	27.0	253.0
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	695.0	626.8	68.2
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	6,088.0	1,948.6	4,139.4
HUC14 ID	Subwatershed Name		
02030105110110	Millstone R (Blackwells Mills to Beden Bk)		
High, Med Density Res.	0.0	0.0	0.0
Low Density, Rural Res.	817.7	166.4	651.2
Commercial	0.0	0.0	0.0
Industrial	0.0	0.0	0.0
Urban, Mixed, Other	228.6	228.1	0.4
Agricultural	0.0	0.0	0.0
Forest, Water, Wetlands	0.0	0.0	0.0
Barrenland/Transitional	0.0	0.0	0.0
Watershed Total	1,046.2	394.6	651.7
Township Total	19,698.9	6,562.3	13,136.7

Table C-3 Nonpoint Source Loads at Build-Out

HUC14 and Zone	Developed & Undeveloped Area Acres	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/yr)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
HUC14 ID	Subwatershed Name						
02030105110030	Millstone R (Beden Bk to Heathcote Bk)						
High, Med Density Res.	231.0	1.4	323.4	15	3,464.7	140	32,337.4
Low Density, Rural Res.	248.6	0.6	149.2	5	1,243.0	100	24,859.6
Commercial	295.3	2.1	620.2	22	6,496.9	200	59,063.0
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	43.0	1.0	43.0	10	429.5	120	5,154.4
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	817.8		1,136		11,634		121,414
HUC14 ID	Subwatershed Name						
02030105110040	Beden Brook (above Province Line Rd)						
High, Med Density Res.	0.0	1.4	0.0	15	0.0	140	0.4
Low Density, Rural Res.	80.3	0.6	48.2	5	401.5	100	8,029.8
Commercial	0.0	2.1	0.0	22	0.0	200	0.0
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	0.0	1.0	0.0	10	0.0	120	0.0
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	80.3		48		402		8,030
HUC14 ID	Subwatershed Name						
02030105110050	Beden Brook (below Province Line Rd)						
High, Med Density Res.	132.0	1.4	184.8	15	1,979.8	140	18,478.6
Low Density, Rural Res.	2,836.4	0.6	1,701.9	5	14,182.1	100	283,641.7
Commercial	301.0	2.1	632.1	22	6,622.2	200	60,202.0
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	52.2	1.0	52.2	10	521.7	120	6,259.9
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	3,321.6		2,571		23,306		368,582

TP = Total Phosphorus

TN= Total Nitrogen

TSS= Total Suspended Solids

Table C-3 Nonpoint Source Loads at Build-Out (continued)

HUC14 and Zone	Developed & Undeveloped Area Acres	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/yr)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
HUC14 ID	Subwatershed Name						
02030105110060	Rock Brook (above Camp Meeting Ave)						
High, Med Density Res.	0.0	1.4	0.0	15	0.0	140	0.0
Low Density, Rural Res.	1,097.3	0.6	658.4	5	5,486.6	100	109,732.7
Commercial	0.0	2.1	0.0	22	0.0	200	0.0
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	0.0	1.0	0.0	10	0.0	120	0.0
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	1,097.3		658		5,487		109,733
HUC14 ID	Subwatershed Name						
02030105110070	Rock Brook (below Camp Meeting Ave)						
High, Med Density Res.	12.7	1.4	17.8	15	191.2	140	1,784.5
Low Density, Rural Res.	931.7	0.6	559.0	5	4,658.7	100	93,173.5
Commercial	10.2	2.1	21.4	22	224.1	200	2,037.3
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	306.3	1.0	306.3	10	3,063.4	120	36,760.9
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	1,261.0		905		8,137		133,756
HUC14 ID	Subwatershed Name						
02030105110080	Pike Run (above Cruser Brook)						
High, Med Density Res.	62.8	1.4	87.9	15	941.7	140	8,788.8
Low Density, Rural Res.	368.8	0.6	221.3	5	1,844.0	100	36,879.0
Commercial	26.0	2.1	54.5	22	571.5	200	5,195.1
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	0.0	1.0	0.0	10	0.0	120	0.0
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	457.5		364		3,357		50,863

TP = Total Phosphorus

TN= Total Nitrogen

TSS= Total Suspended Solids

Table C-3 Nonpoint Source Loads at Build-Out (continued)

HUC14 and Zone	Developed & Undeveloped Area Acres	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/yr)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
HUC14 ID	Subwatershed Name						
02030105110090	Cruser Brook / Roaring Brook						
High, Med Density Res.	0.0	1.4	0.0	15	0.0	140	0.0
Low Density, Rural Res.	813.2	0.6	487.9	5	4,066.0	100	81,320.6
Commercial	259.0	2.1	543.8	22	5,697.0	200	51,791.2
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	237.8	1.0	237.8	10	2,378.1	120	28,537.5
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	1,310.0		1,270		12,141		161,649
HUC14 ID	Subwatershed Name						
02030105110100	Pike Run (below Cruser Brook)						
High, Med Density Res.	5.1	1.4	7.2	15	77.0	140	718.6
Low Density, Rural Res.	3,813.1	0.6	2,287.9	5	19,065.6	100	381,311.9
Commercial	253.0	2.1	531.3	22	5,566.0	200	50,599.6
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	68.2	1.0	68.2	10	681.7	120	8,180.6
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	4,139.4		2,895		25,390		440,811
HUC14 ID	Subwatershed Name						
02030105110110	Millstone R (Blackwells Mills to BedenBk)						
High, Med Density Res.	0.0	1.4	0.0	15	0.0	140	0.0
Low Density, Rural Res.	651.2	0.6	390.7	5	3,256.2	100	65,124.0
Commercial	0.0	2.1	0.0	22	0.0	200	0.0
Industrial	0.0	1.5	0.0	16	0.0	200	0.0
Urban, Mixed, Other	0.4	1.0	0.4	10	4.2	120	50.2
Agricultural	0.0	1.3	0.0	10	0.0	300	0.0
Forest, Water, Wetlands	0.0	0.1	0.0	3	0.0	40	0.0
Barrenland/Transitional	0.0	0.5	0.0	5	0.0	60	0.0
Watershed Total	651.7		391		3,260		65,174
Township Total	13,137		10,237		93,114		1,460,013

TP = Total Phosphorus

TN= Total Nitrogen

TSS= Total Suspended Solids

9.0 Mitigation Plans

9.1. Overview of Mitigation Process

This mitigation plan is provided for proposed projects with more than one acre or disturbance or an increase of one quarter acre of impervious coverage that need an exemption from one or more of the stormwater management design and performance standards. Exemptions are provided to ensure that redevelopment of existing sites will continue within Montgomery where the current stormwater standards cannot be imposed. The mitigation projects will ensure that the design standards are met through another means within the same stream corridor or within the Township. Exemptions are not to be granted for due to conditions created by the applicant. Mitigation projects can fall into the following Options:

Option 1. Exemptions are to be granted only upon the condition that the applicant provides a mitigation project of equal or additional stormwater design benefit value within the same sub-watershed as delineated by the HUC 14 number. For example if the applicant cannot reduce the peak rate of runoff from the 2, 10 and 100 year storm event to meet the 50%, 75% and 80% requirement on the site, the mitigation project might be retrofitting an existing basin within the same watershed with an outlet control device to reduce the peak rates of runoff by the same cubic feet per second reductions. An example of this type of project would be the retrofitting of the outfall pipe from the residential basin at Colfax Road.



Outfall Structure at Basin at Colfax Road, large opening does not provide water quality

In Montgomery Township, another way to meet peak rate of reduction requirements would be the removal of sediment obstructions in the stream to reduce the peak rate of flow downstream that occurs due to the sediment deposit and resultant reduction in flow area that increases velocity. The applicant would be required to analyze the existing drainage shed to the basin, determine the design solution that would restore the stream flow to natural conditions, and analyze the downstream conditions after removal of sediment to ensure that there are no negative downstream impacts. The developer must ensure long term maintenance of the project, including maintenance requirements per the NJDEP Stormwater BMP Manual. An example of this condition at Camp Meeting Road and Rock Brook is shown, however, less severe conditions exist at other locations.



Bridge at Camp Meeting Avenue and Rock Brook,
Four foot available between bridge and sediment deposits

Under Option 1, the applicant may select a specific mitigation project listed in this plan or work with the Montgomery Township Engineering Department to determine a suitable mitigation project in the same drainage area (HUC 14) from the general types of mitigation projects listed in this plan. The review of stormwater management design for the site and stormwater criteria provided by the mitigation project will be reviewed and approved by the Planning or Zoning Board Engineer, whichever is applicable, under the review process.

Option 2. If a suitable site cannot be identified within the same drainage area (HUC 14) as the proposed development, as set forth in Option 1, the mitigation project may provide mitigation that does have the equivalent stormwater design benefit value, but addresses the same issue. (ie. water quality or recharge) For example, if the applicant cannot meet the 80% reduction of the Total Suspended Solids requirement at the site, the mitigation project might be to repair the bank conditions at Mill Pond, to reduce sediment deposit and improve water quality.



Bank Conditions (East Side) at Mill Pond, note bare embankment

In the case of Option 2, the applicant will be required to determine the cost of meeting the design requirement on the development site and provide a stormwater design of equal or greater value at the mitigation site. The cost estimates for the stormwater development and mitigation will be reviewed and approved by the Planning or Zoning Board Engineer whichever is applicable, under the review process.

Option 3. The Planning or Zoning Board may allow the developer to provide funding for a specific project that has been identified in the Stormwater Management Plan if the value of meeting the on-site stormwater design is so low that it will not fund an entire project. The value of the funding must be equal or greater to the cost to implement the stormwater management design on site. The cost estimates for the stormwater development and mitigation will be reviewed and approved by the Planning or Zoning Board Engineer whichever is applicable, under the review process.

Option 3 shall be allowed only in situations where there will be no immediate impact on a sensitive receptor and where all other options have been exhausted. The collection of funds should be used as a last resort.

9.2. Specific Mitigation Projects by HUC

1. HUC 020301051100100, Mill Pond (Dead Tree Run Road/Bridgepoint Road), Sylvan Lake (NPDC/Skillman Village), Opatut Tract pond (Cherry Hill Road)

- a. Shore line restoration
- b. Removal of lake vegetation



2. HUC 02030105110070, Existing Swale at intersection of Stouts Road and Hollow Road

Project to Improve Water Quality

- a. Swale Repair and/or Replacement with Storm Pipe. (Typical)



3. HUC 02030105110070, Rock Brook below Camp Meeting Ave.

Project to Improve Water Quality

Hollow Road and Camp Meeting Avenue

- a. Analyze Stream Condition
- b. Remove sediment in stream bed
- c Repair embankments adjacent to Bessie Grove Memorial Park
- d. Repair embankments downstream of bridge



Bessie Grover Memorial Park downstream of Bridge at Camp Meeting and Rock Brook

Tree and Park Bench under scour conditions

4. HUC 02030105110060, Rock Brook north of Camp Meeting Ave.

Project to Improve Water Quality

Hollow Road and Grandview

- a. Analyze Stream Condition with bridge condition
- b. Analyze discharge pipe and runoff from roadway
- c. Remove sediment in stream bed
- d. Repair wing wall adjacent to Grandview bridge
- e. Repair/stabilize embankments downstream of bridge



Western Wing Wall, Grandview Avenue Bridge



Western embankment adjacent to Hollow Road at Grandview Avenue Bridge

9.3 General Types of Mitigation Projects

All mitigation projects are to be under the review and approval of the Montgomery Township Engineering Department. The general type mitigation projects within Montgomery Township are:

1. Repair of Roadside Swales:

- a. Analyze flows to roadside swale.
- b. Perform soil stabilization analysis.
- c. Determine possible design options
 - i. Install storm pipe, inlets in lieu of swale
 - ii. Redesign side slopes of swale
 - iii. Provide slope stability in swale.

All repairs of roadside swales will be approved by the Montgomery Township Engineering Department and the Somerset Union Conservation District. The repair of roadside swales will improve water quality by reducing total suspended solids that reach the stream. The priority of swales to be repaired within Township right-of-ways shall be determined by the Montgomery Township Engineering Department.



Swale repaired with rip rap, note gentle slope from pavement edge



Landscaped swale at Cherry Valley Road

2. Stormwater Basin Retrofit

Provide water quality and recharge measures at existing stormwater basins within the same HUC14 under the guidance of the Montgomery Township Engineering Department. The retrofit of existing basins may be accomplished through a variety and/or combination of options to meet the mitigation costs required. Retrofitting of basins should start with stormwater basins that are isolated from public view and not utilized for recreational activities. As the implementation of the Stormwater Pollution Prevention Plan and the educational outreach activities increase the general public's understanding of stormwater management and the fact that basins may hold water after a rainfall event in order to provide water quality, existing basins within the public view may be considered for retrofit. Review of each existing basin condition and surrounding condition should be reviewed with the Township before selecting one or more of the following options:

- a. Outlet Structure Modifications
- b. Regrading and Planting
- c. Elimination of Low Flow Channels

d. Installation of in-line or end-of-pipe Best Management Practice (BMP) as approved by the NJDEP to treat stormwater before it enters into an existing stormwater management basin. Acceptable devices can be found at njstormwater.org.



3. Stream and Stream Bank Stabilization

Mitigation projects other than those listed meeting the following criteria may be presented for review and approval by the Montgomery Township Engineering Department. Stabilization projects will be reviewed for the following benefits:

- a. Stabilization of eroded stream banks where public or private property or structures are threatened.
- b. Reduce sediment deposition in lakes, ponds and other low velocity areas.
- c. Improved water quality



Example of Stream Embankment Conditions along Rock Brook
causing Sediment Load and Loss of Trees

4. Stormwater Outfall Restoration

Mitigation of Existing Stormwater Outfalls within the same HUC14 under the guidance of the Montgomery Township Engineering Department. The retrofit of existing outfalls may be accomplished through a variety and/or combination of options to meet the mitigation costs required. Review of each existing outfall condition should be reviewed with the Township before selecting one or more of the following options:

- a. Replacement of conduit outlet protection with evidence of scour/erosion
- b. Replacement with installation of drop manhole to set outfall structure at invert of stream channel with outlet protection
- c. Installation of in-line or end-of-pipe Best Management Practice (BMP) as approved by the NJDEP to treat stormwater before the outfall point. Acceptable devices can be found at NJDEP's website www.njstormwater.org.

- d. Disconnect outfall from receiving waterway to eliminate erosion condition. Permitted only with detailed hydrologic analysis and stability analysis of the receiving area.

5. Inlet Retrofit

Retrofit existing inlets with the following:

- a. Metal bar insert to retrofit
- b. Replacement of cast curb piece
- c. Replacement of flat grate with a bicycle safe grate

All retrofits of inlets will be approved by the Montgomery Township Engineering Department to meet NJDEP Attachment “C” of the MS4 Permit requirements. The inserts improve water quality by reducing floatables and materials that reach the bottom of the inlet to decay and that ultimately reach the stream. The priority of inlets to be retrofit as a mitigation within Township right-of-ways shall be determined by the Montgomery Township Engineering Department. Montgomery Township will retrofit inlets when street are repaved. By including additional inlets as a mitigation option, the Township of Montgomery will be improving water quality on public right-of-ways that will not be repaved or resurfaced for the greatest number of years.

10.0 Summary

The Stormwater Management Plan was first presented to the Montgomery Township Planning Board at a public hearing on August 22, 2005, as required for the Township of Montgomery to meet the requirements of the Montgomery Township NJPDES MS4 permit. The plan was adopted and became an element of the Montgomery Township Master Plan and has been available on the Township web site.

The revised Stormwater Management Plan will be presented to the Montgomery Township Planning Board at a public hearing on July 23, 2007. The revised stormwater management plan includes a draft ordinances with significant changes from the draft ordinance of 2005. The masterplan committee has worked to craft an ordinance with standards beyond the state model municipal ordinance that will work for the soils and size of parcels being developed.

The stormwater management ordinances are scheduled for a first reading on July 19, 2007 and adoption on August 2, 2007 by the Montgomery Township Committee. These dates may change if significant revisions are required by Township Committee.