Municipal Stormwater Management Plan
For
Borough of Riverdale
Morris County, New Jersey

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Introduction

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

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

Goals

The goals of this MSWMP are to:

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

In addition, the Flood Hazard Control ordinance outlined in Chapter 104 of the Borough's Land Use Code, has the following statement of purpose:

It is the purpose of this chapter to promote the public health, safety and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;
- Ensure that potential buyers are notified that property is in an area of special flood hazard; and,
- Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

To achieve these goals, this plan outlines specific stormwater design and performance standards for new development Additionally, the plan proposes stormwater management controls to address impacts from existing development Preventative and corrective maintenance strategies are included in the plan to ensure long-term effectiveness of stormwater management facilities The plan also outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

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 Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates Clearing and grading a site can remove depressions that store rainfall Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge Reduced base flows and

increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

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

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

Background

Borough Description

The Borough of Riverdale encompasses 2.1 square mile area in Morris County, New Jersey. The population of the Borough has increased by 128 persons from 2,370 in 1990, to 2,498 in 2000, an increase of 5.4%. This population increase has resulted in new development. Changes in the landscape have most likely increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. Figure 2 illustrates the Borough of Riverdale boundary on USGS Quadrangle.

The Borough has exhibited water quantity problems including flooding, stream bank erosion, and diminished base flow in its streams. Many of the culverts associated with road crossings in the Borough are undersized. During severe storm events, these undersized culverts do not have adequate capacity, thereby causing a backwater effect and flooding upstream.

The Pequannock River runs along the northerly and easterly municipal boundaries. These areas are impacted by flooding during very large storm events. During 100 year storm events, flood elevations can rise to approximately ten feet above the stream bed. The primary neighborhoods affected by flooding are Riverview Terrace and William Street.

These culverts were designed for much different hydrologic conditions (i.e., less impervious area) than presently exist in the Borough. As the imperviousness increased in the Borough, the peak and volumes of stream flows also increased. The increased amount of water resulted in stream bank erosion, which resulted in unstable areas at roadway and bridge crossings, and degraded stream habitats. The high imperviousness of the Borough has significantly decreased groundwater recharge, decreasing base flows in streams during dry weather periods. Lower base flows can have a negative impact on in-stream habitat during the summer months.

Waterway Health

The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. There are over 800 AMNET sites throughout the state of New Jersey These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics. The major river bordering the Borough to the north and east is the Pequannock River which is listed as non-impaired at monitoring station AN0265. The Pequannock River is a Category One stream.

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. According to these reports, the Pequannock River has shown elevated levels of fecal coliform, mercury and lead. Although fecal coliform and mercury levels have improved over recent years, the report identifies temperature as a "Category 4" impairment of the Pequannock River. Potential causes for the increases in temperature include beaver dams and reservoir releases. A pollutant does not appear to be the cause of temperature increases and, therefore, the development of a TMDL is not necessary at this time. It should be noted, the NJDEP Division of Watershed Management has established a TMDL to address temperature in the Pequannock River. However, this has yet to be approved or adopted by the NJDEP.

Flooding

Comprehensive descriptions of the flooding problems in the Borough are contained in Chapter 104 of the Borough's Land Use Code The areas of special flood hazard are identified by the Federal Insurance Administration in a report entitled the "Flood Insurance Study for the Borough of Riverdale," dated October 15, 1985, with accompanying Flood Insurance Rate Maps and Flood Boundary-Floodway Maps. The Flood Insurance Study is on file in the Borough of Riverdale Municipal Building. By reference, this Code is made part of this Municipal Stormwater Plan.

Wellhead Protection Areas

The Borough owns and operates one Public Community Water Supply (PCWS) well which is located within the Borough The New Jersey Geological Survey (NJGS) has delineated Wellhead Protection Areas (WHPAs) for this PCWS well. As described below, a WHPA is a calculated area around a production well that defines the portion of an aquifer that contributes water to a well over a specified time interval The locations of the delineated Wellhead Protection Areas for the one PCWS are shown on Figure 3

A WHPA is divided into three sequential tiers based on the Time of Travel (TOT) to a production well. TOT is the time it takes for a given particle of groundwater to flow to a pumping well. It is directly related to the distance the groundwater must travel to arrive at the well once well pumping starts For a given TOT, the distance will vary from well to well depending on the rate of pumping and aquifer characteristics WHPA Tier 1 is derived from a 2-Year TOT and is based on findings that bacteria have polluted wells and viruses have survived in groundwater for up to 270 days WHPA Tier 2, derived from

a 5-year TOT, is based on the lag time of a pollution plume caused by adsorption/desorption, the variable rate of pollutant travel, and the acceleration of groundwater once it comes close to a pumping well. WHPA Tier 3 is derived from a 12-year TOT, and is established to provide sufficient time so that monitoring and cleanup of a potential pollution source or release can be completed before contamination reaches a pumping well. All three WHPA Tiers are defined using line boundaries and polygon areas generated with the ARC/INFO Geographic Information System.

Groundwater Recharge

A map of the various annual groundwater recharge rates in the Borough are depicted in Figure 4. As can be seen in the Figure, the annual recharge rates in the Borough range from essentially no recharge to an annual rate of approximately 17 inches per year. These annual recharge rates were obtained from the New Jersey Geological Survey (NJGS) and are based on New Jersey Geological Survey Report GSR-32 – A Method for Evaluating Ground-Water-Recharge Areas in New Jersey. These rates are presented as guidance for identifying both general groundwater recharge rates and areas for potential recharge measures and are not intended for design purposes.

Geology

Figure 5 depicts the different soil types within the Borough. According to the Soil Survey of Morris County, prepared by the USDA National Resource Conservation Service and the NJ Agricultural Experiment Station, there are two major soil types within the Borough. The western half of the Borough consists of soils formed in young glacial till and are generally classified as Rockaway-Hibernia-Urban land. These soils are deep, well drained to somewhat poorly drained, gently sloping to steep gravelly sandy loams and stony to extremely stony loams and sandy loams that overlie granitic gneiss on uplands. The eastern half of the Borough consists of soils formed in organic deposits, glacial lake sediment or glacial outwash and are generally classified as Riverhead-Urban Land-Pompton on outwash plains and terraces. These soils are deep, well drained to somewhat poorly drained, nearly level to strongly sloping gravelly sandy loams that overlie stratified outwash sand and gravel.

Watersheds

Figure 6 shows the Hydrologic Unit Code (HUC) 14 areas within the Borough. According to the NJDEP and USGS, portions of two major watersheds are located within the Borough. Over 98% of the Borough is located within the Pequannock River watershed (below the Macopin gauge). According to NJDEP mapping, a very small portion of the Borough, at the southerly tip (south of Wilson Avenue East), is located within the Pompton River watershed (Lincoln Park tributaries). The HUC14 of each of these watersheds is shown below:

SWID	Sub-watershed Description	HUC14 Code	WMA No.	Downstream SWID
03AA08	Pequannock River (below Macopin gage)	02030103050080	3	03DA02
03DA01	Lincoln Park Tributaries (Pompton River)	02030103110010	3	03DA02

Design and Performance Standards

Any major residential land development proposed subject to review and approval by the Borough of Riverdale will also be reviewed in accordance with the stormwater management requirements of the New Jersey Residential Site Improvement Standards (NJAC 5:21). These standards may be supplemented where permitted by additional stormwater design and performance standards developed by the Borough In addition, any application for a new agricultural development that meets the definition of major development shall be submitted to the Morris County Soil Conservation District for review and approval in accordance with the requirements of this section and the Standards for Soil Erosion and Sediment Control in New Jersey

In accordance with the requirements of the New Jersey Stormwater Management Rules (NJAC 7:8), major land developments within the Borough of Riverdale will be required to meet specific stormwater design and performance standards. The stormwater design and performance standards will be applied to major developments through the forthcoming Stormwater Control Ordinance that will be developed and adopted by the Borough following the adoption of this Municipal Stormwater Management Plan. Complete details of each standard can be found in Subchapter 5 of the New Jersey Stormwater Management Rules and summaries of these design and performance standards are presented below:

Soil Erosion and Sediment Control: All major developments shall meet the requirements of the Soil Erosion and Sediment Control Standards for New Jersey. The Morris County Soil Conservation District has review authority for compliance with these standards.

Groundwater Recharge: Unless otherwise exempted by the Stormwater Management Rules, all major developments must either maintain 100% of the development site's pre-developed annual groundwater recharge under post-developed site conditions or infiltrate the runoff increase between pre- to post-developed site conditions for a 2-Year, 24-hour III storm. Compliance with this standard must consider certain designated redevelopment areas and any WHPAs and known contaminated sites within the Township.

Stormwater Quality: All major developments must reduce the total suspended solids (TSS) load in the development site's post-construction runoff by a minimum of 80%. In addition, the post-construction nutrient load from the site must be reduced by the maximum extent feasible. Additional stormwater quality requirements are described below for land developments that drain to a Category One watercourse or its mapped tributaries.

Stormwater Quantity: All major developments must demonstrate compliance with one of three alternative stormwater quantity requirements for the 2, 10, and 100-Year storm events. These alternatives are: 1) preservation of existing development site runoff volumes and rates, 2) preservation of existing downstream peak runoff rates under full watershed development, or 3) reduction in existing site peak runoff rates by 50%, 25%, and 20%, respectively.

Nonstructural Stormwater Management - Compliance with the groundwater recharge and stormwater quality and quantity standards described above must be achieved through the use of nonstructural stormwater management measures to the maximum extent feasible. If the standards cannot be met through the exclusive use of nonstructural measures, then structural stormwater management measure shall be utilized to complete compliance.

Special Water Resource Protection Areas: All major developments must maintain a 300-foot buffer measured from the top of bank of all Category One watercourses, as designated by the NJDEP, and their tributaries, as mapped by the USGS and the Soil Survey of Morris County. At the present time, the Pequannock River is designated Category One watercourse upstream of Riverdale Road. As such, this requirement will apply to any waterway within the Borough designated as a Category One watercourse by the NJDEP in the future.

Threatened and Endangered Species Searches: All major developments subject to review by NJDEP's Land Use Regulation Program must conduct a Threatened and Endangered Species search using the Natural Heritage Database.

Plan Consistency

The Borough is not within a Regional Stormwater Management Planning Area and no TMDLs have been developed for waters within the Borough at this time; therefore, this plan does not need to be consistent with any regional stormwater management plans (RSWMPs) or any TMDLs. If any RSWMPs or TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent. It is possible the NJDEP will create a TMDL for temperature in the future; however, it remains to be approved or adopted.

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

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

Nonstructural Stormwater Management Strategies

In order to meet the design and performance standards for major land developments described in Subchapter 5 of the Stormwater Management Rules, the Borough will allow the utilization of a range of nonstructural management measures. In general, the design, construction, and maintenance of these measures, which are also known as Best Management Practices or BMPs, will be based upon the guidance provided by the current version of the NJDEP Stormwater Best Management Practices Manual. In particular, the guidance provided in Chapter Two of the Manual will be used for nonstructural stormwater management measures. As a result, the NJDEP Stormwater Best Management Practices Manual is incorporated by reference into the Borough of Riverdale's Municipal Stormwater Management Plan.

The Borough's ordinances are currently being reviewed to determine the proper amendments to implement the principles of nonstructural stormwater management. The Borough's master plan is currently being updated and will be completed by the end of 2006. This plan and the revised ordinances will be submitted to Morris County for review with a copy to the NJDEP, along with a copy of the master plan, maps, and an adoption schedule.

Land Use/Build-Out Analysis

The Borough's Master Plan is currently being updated and a build-out analysis is part of the update. The build-out analysis in the Master Plan is made part of the Stormwater Management Plan by reference Figure 7 shows the current land use within the Borough and Figure 8 shows the current zoning districts within the Borough.

Mitigation Plans

The Borough will utilize the waiver criteria contained in Subchapter 5 of the Stormwater Management Rules to develop a Mitigation Plan in order to grant necessary waivers from the design and performance standards at major land developments on a case-by-case basis A Mitigation Plan is currently being developed by the Borough and this Stormwater Management Plan will be updated after its completion The Mitigation Plan will be based upon the Mitigation Plan requirements contained in Subchapter 4 of the Stormwater Management Rules.