

Township of Cranford

Municipal Stormwater Management Plan

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Township of Cranford Stormwater Management Plan

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Stormwater Management Plan

Introduction

The Township of Cranford Stormwater Management Plan documents the Township's strategy to redress stormwater issues related to development. This plan is being prepared to bring the Township into compliance with New Jersey Administrative Code 7:14A-25, Municipal Stormwater Regulations and contains all of the required elements set forth by New Jersey Administrative Code 7:8, Stormwater Management Rules. The Cranford Stormwater Management 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 acres of land. The use of these standards within the Township is intended to diminish stormwater runoff through recharging of groundwater, improve stormwater runoff quality, and improve the overall quality of receiving water bodies. The plan discusses long-term operation and maintenance measures for existing and future stormwater facilities within the Township.

The plan reviews and proposes updates to existing ordinances, the Township Master Plan, and other related documents that will assimilate the concepts of low impact development techniques. These techniques will be incorporated in the design of future public and private projects within the Township. The final component of the plan develops a mitigation strategy to be used when a variance or exemption from the Township design and performance standards is sought. The plan's mitigation strategy further identifies measures to alleviate the impact of existing development on stormwater runoff quantity and quality.

The Township of Cranford is only 4.9 square miles in size. The Township Recreation and Open Space Inventory for all undeveloped open lands in the township, all township and county parks and township and private vacant lands is 384.34 Acres. There is only one farm in the community and that is contained in 5.55 acres. All these vacant or agricultural lands add up to only 389.89 acres or 0.6 square miles. According to the state regulations, "if a municipality can document that it has combined total of less than one square mile of vacant or agricultural lands, the municipality is not required to complete the build out analysis."

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Goals

Through this municipal stormwater management plan, the Township of Cranford seeks to establish a guiding document with the intended goals of:

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

To accomplish these goals, this plan outlines specific stormwater design and performance standards for new development. Furthermore, the plan develops stormwater management controls to reduce 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.

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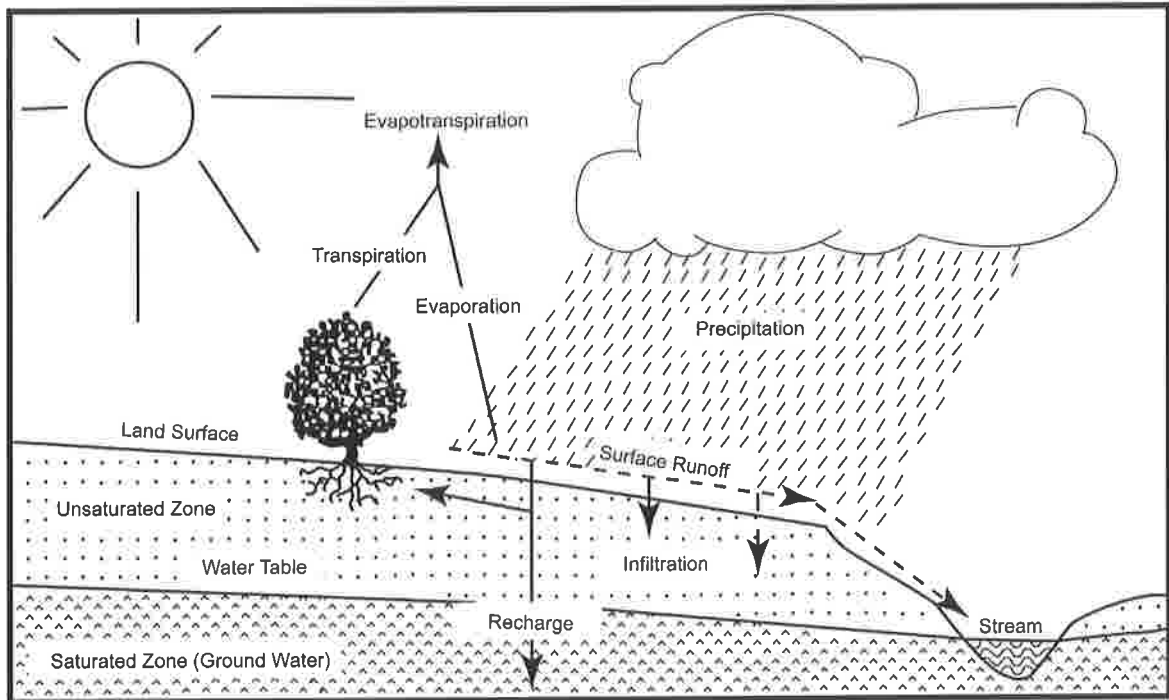
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Stormwater Discussion

Land development can dramatically alter the hydrologic cycle (See Figure C-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.

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Figure C-1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32.

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.

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Background

The Township of Cranford is located in Union County, New Jersey and covers approximately 4.79 square miles. The population of Cranford has decreased from approximately 27,400 residents in 1970 to the current population of approximately 22,600 residents. The Township lies within the State's Metropolitan Planning Area PA-1, which is designated for redevelopment. Consequently, the Township is undergoing redevelopment and build-out that is resulting in increased stormwater runoff and stormwater pollutant loads. This increased stormwater volume eventually discharges into the Township's main waterway, the Rahway River. The Rahway River runs the length of Cranford and after traversing several other downstream townships, flows into the Arthur Kill and Atlantic Ocean. Figure C-2 shows waterways within the Township. Figure C-3 shows the Rahway River drainage area and highlights the river from Cranford to the Arthur Kill. Figure C-4 locates the Township on a United States Geological Survey quadrangle map.

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 Rahway River flows the length of Cranford in a north to south direction and is within the NJDEP's watershed management area 7 (WMA 7). The Rahway River is classified as an FW-2 nontrout stream. The section of the Rahway River that flows through Cranford has a biological impairment rating of severely impaired based on the 1999 AMNET study as shown in Figure C-5. Water quality chemical data on the Rahway River that has been collected by the NJDEP and other regulatory agencies, indicates the river (for monitoring sites closest to Cranford) has exhibited elevated levels of phosphorus, inorganic nitrogen (nitrate + nitrite), bacteria (fecal coliform), sodium, and lead. Dissolved oxygen tends to be low during the summer and fall but usually within acceptable levels for a nontrout river. In Sublist 5 of "New Jersey's 2004 Integrated List of Waterbodies" shows that there is a low impairment rating of Benthic Macroinvertebrates. The result of these findings indicate that the Rahway River is impaired, and that the NJDEP is required to develop a total maximum daily load (TMDL) for these pollutants.

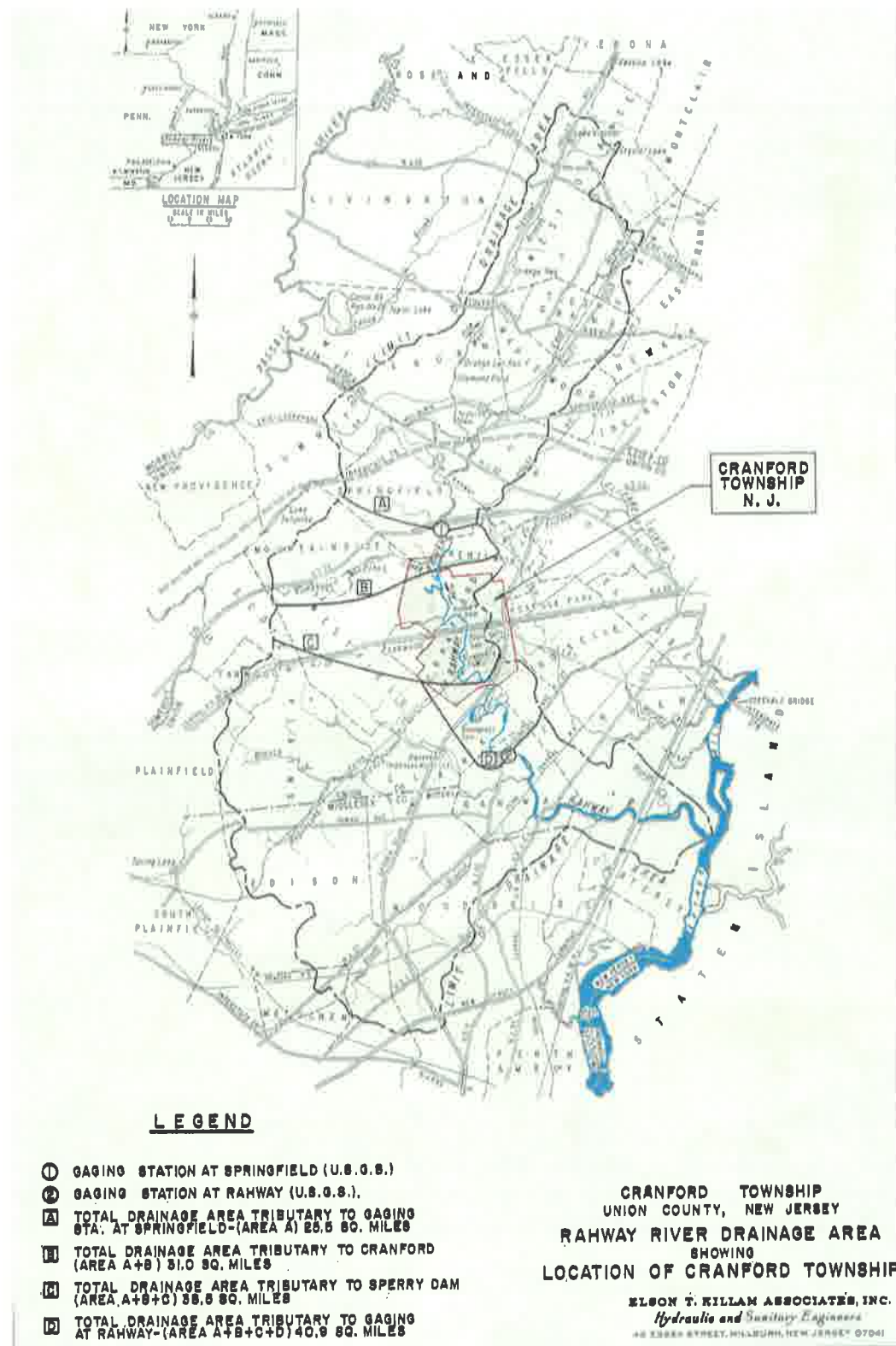
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Figure C-2: Township and Its Waterways



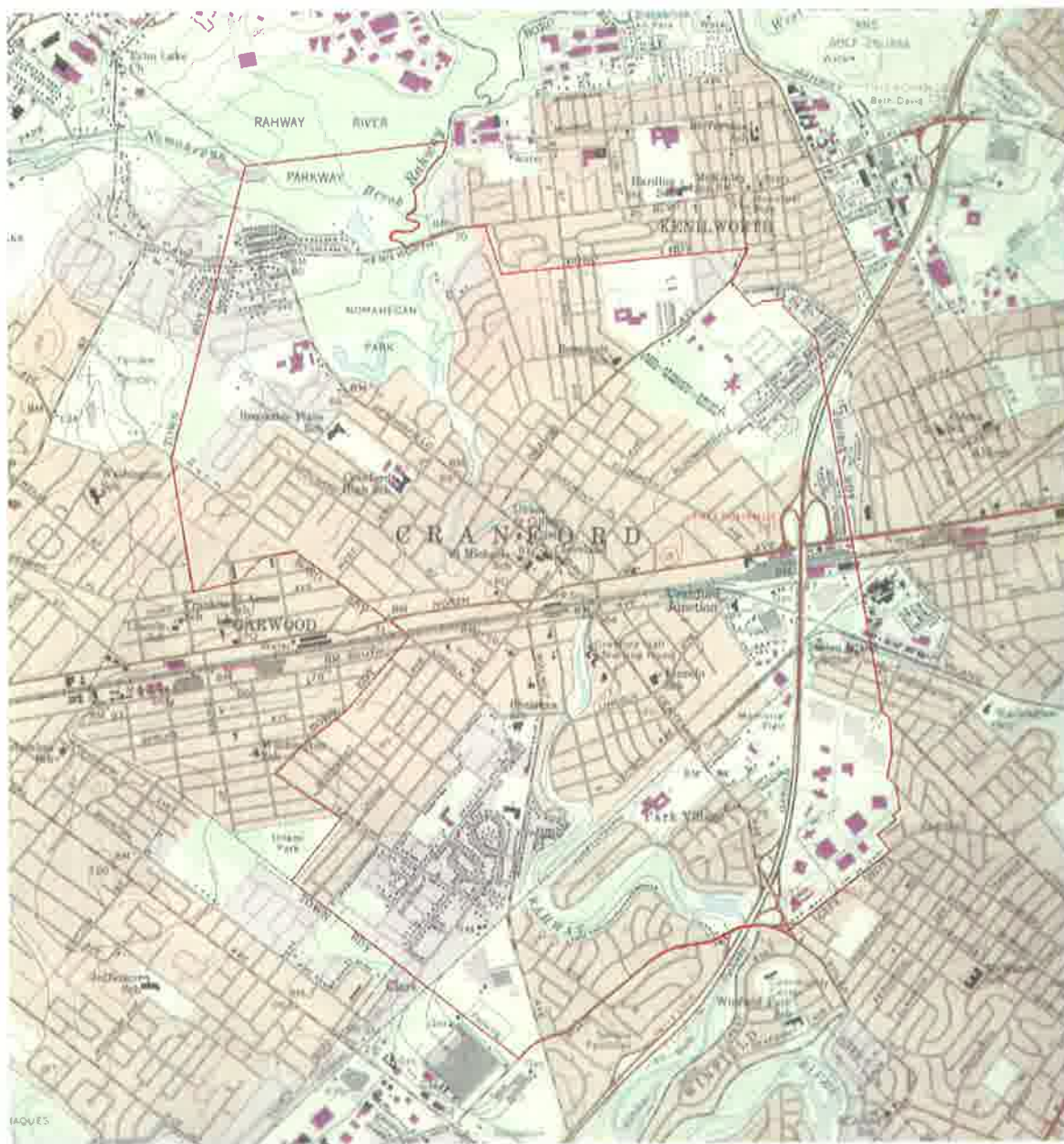
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Figure C-3: Rahway River From Cranford To The Arthur Kill



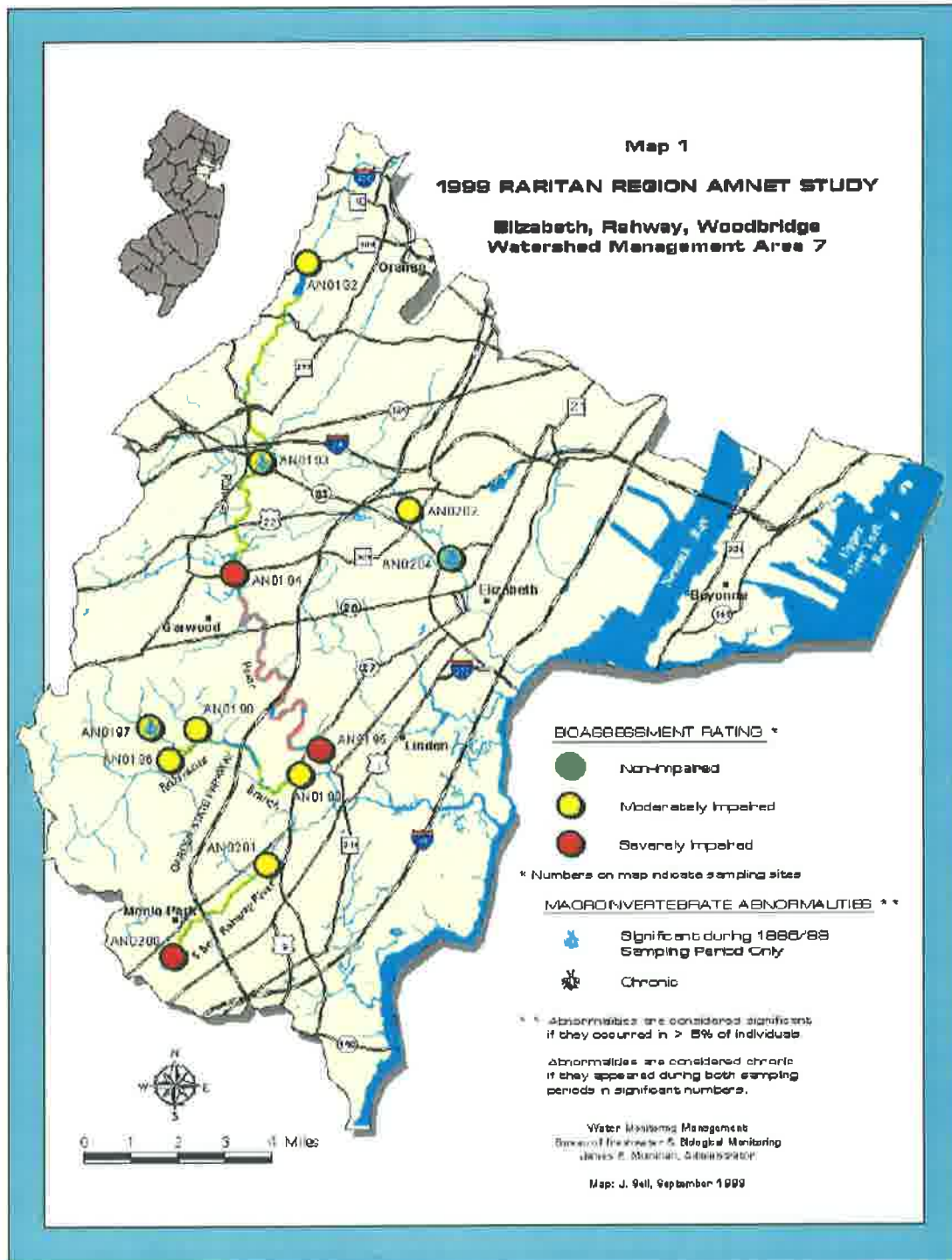
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Figure C-4: Township Boundary on a USGS Quadrangle



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Figure C-5: AMNET Study and Biological Rating
for the Rahway River



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A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which require an NJPDES permit to discharge, and nonpoint sources, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDLs are needed.

The Township of Cranford is also subject to water quantity problems in the form of flooding and occasional stream bank erosion. The flooding occurs within specific areas of the Township when the Rahway River overflows its banks and an earth dike that runs along Riverside Drive. There are also several local areas in the Township with flooding due to a lack of or undersized stormwater infrastructure. Flooding has occurred in 1968, 1971, 1972, 1973, and in 1999. The most recent flood of 1999 occurred when 9.4 inches of rain fell due to Hurricane Floyd over a 38-hour period, with 3.3 inches falling during the most intense two hour period. The 1999 storm was a 150 year recurrence storm event. The upstream USGS Gaging Station measured a peak flood elevation of 75.73 feet (national geodetic vertical datum – NGVD) in 1999 versus the storm of record in 1973 when a peak elevation of 75.93 feet NGVD was recorded with flows of 5430 CFS and 7990 CFS respectively. The 1973 storm had been the storm of record prior to the 1999 storm with a recurrence interval of 60 years and 6 inches of rain falling within a 5-hour period.

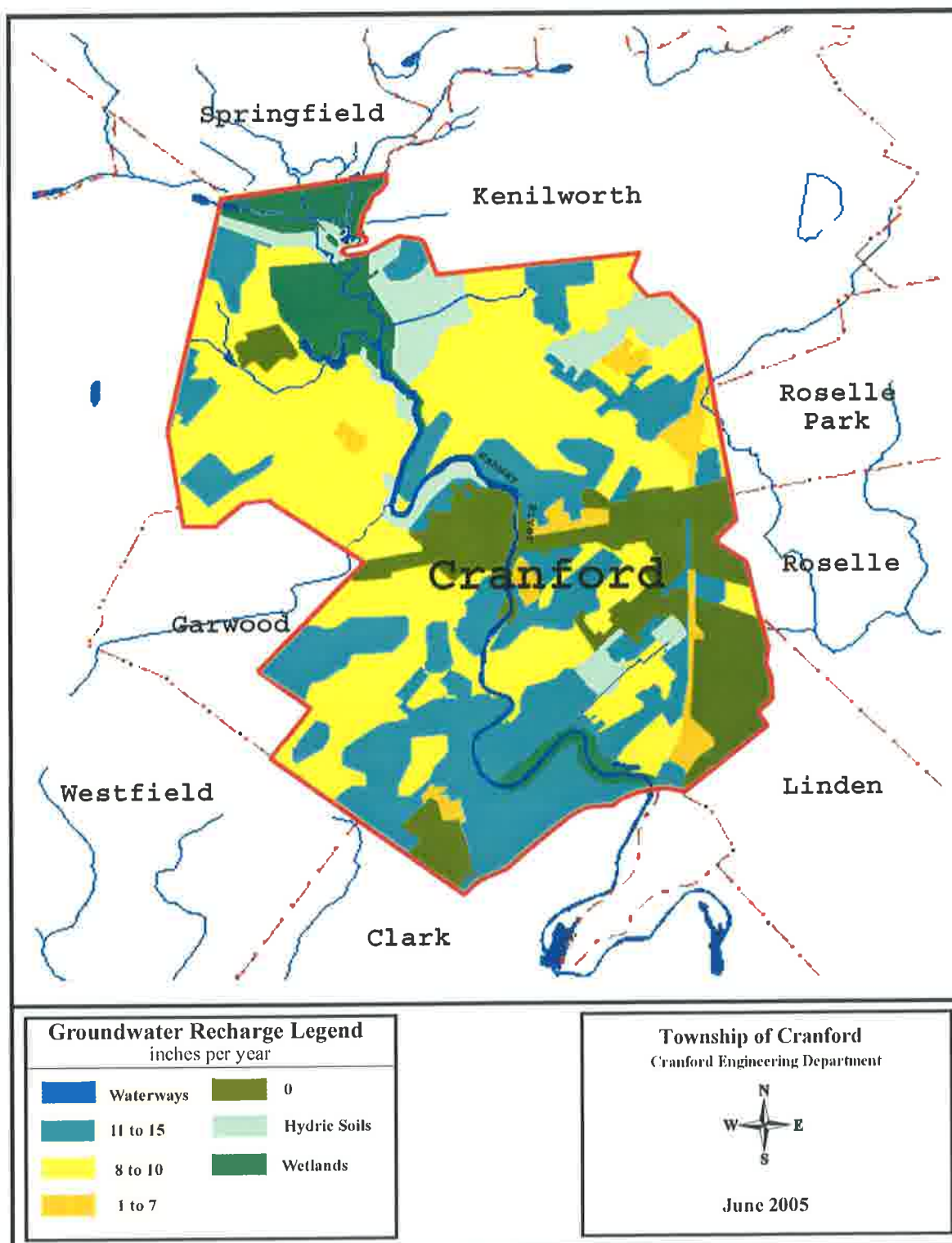
This flooding is the result of extensive development and a resulting increase in impervious cover throughout the Rahway River drainage area. In addition most of the housing that was built in flood prone areas within the Rahway River drainage area was built prior to the existing state and federal regulations that limit building in flood zones and wetlands. The impact of this increased impervious cover and building in flood hazard areas and wetlands is downstream flooding in the lower areas of Cranford. The high imperviousness of the Township has significantly decreased groundwater recharge and may also decrease base flows in streams during dry weather periods. Lower base flows would have a negative impact on instream habitat during summer months. Groundwater recharge areas are shown in Figure C-6. There are currently no known wells within the Township that are being used as a public water supply; however, two

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wells border the Township and a small part of their wellhead protection areas fall within the Township's boundaries as shown in Figure C-7.

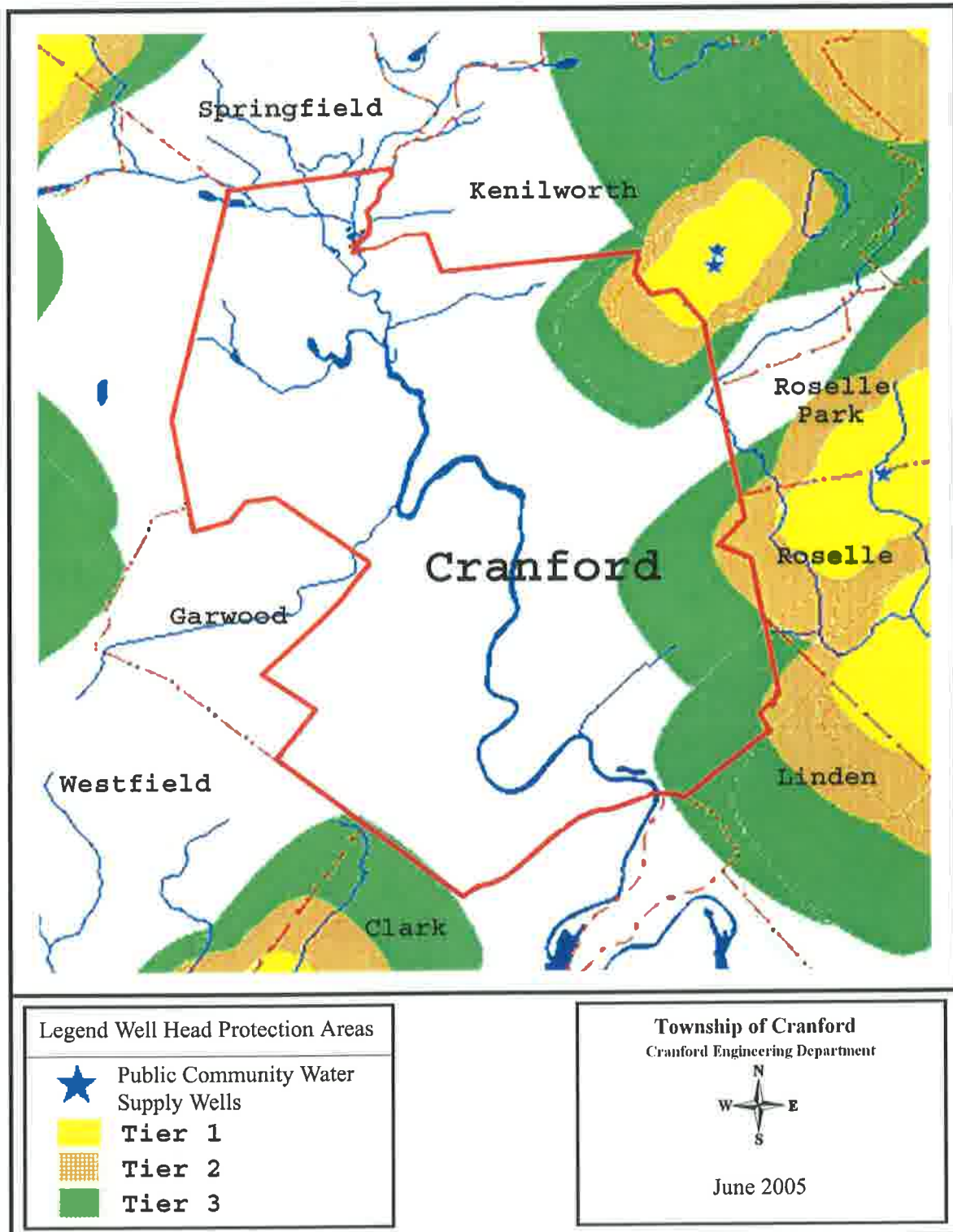
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Figure C-6: Groundwater Recharge Areas Within The Township



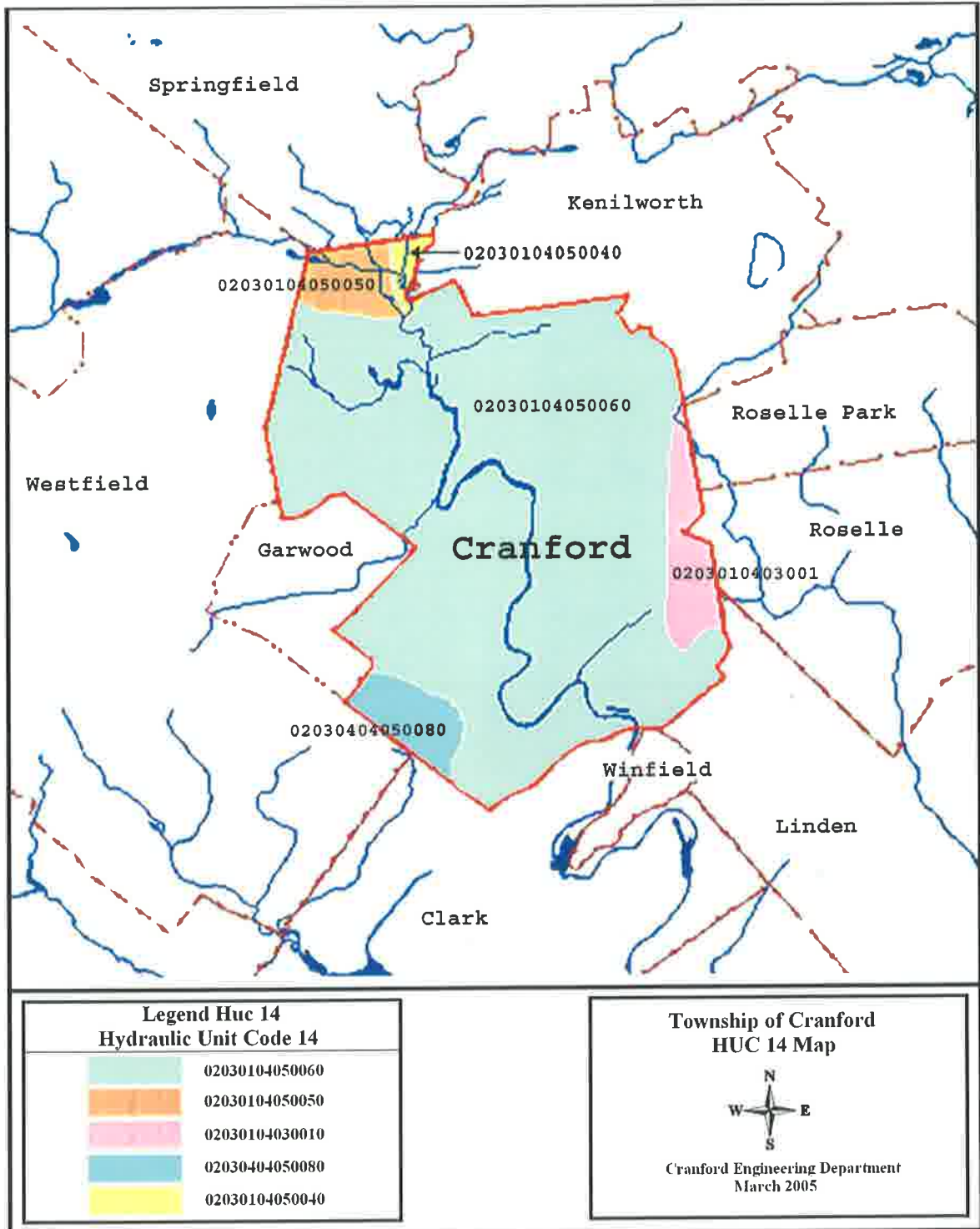
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Figure C-7: Well Head Protection Areas Within The Township



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Figure C-8: Hydraulic Unit Codes (HUC14s) Within The Township



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Design and Performance Standards

The Township will adopt the design and performance standards for stormwater management as presented in N.J.A.C. 7:8-5 as part of its Municipal Stormwater Management Plan, and enforce proper construction and function of those standards through the Township's Stormwater and other applicable ordinances. The adoption of these standards will put in place a means for the Township to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances will be submitted to the county for review and approval within 24 months of the effective date of the Stormwater Management Rules.

These standards will be adopted to minimize the adverse impact of major development on both water quantity and water quality. The Township will minimally require major development within the Township to meet all applicable regulations as set forth in N.J.A.C. 7:8.

These regulations address erosion control, groundwater recharge, stormwater runoff quality standards, standards for calculating stormwater runoff and groundwater recharge, structural stormwater management standards, and maintenance requirements. Major development is defined by N.J.A.C. 7:8 as the disturbance of one or more acres of land or the increase in impervious surface by one-quarter acre or more.

Certain project types may be exempt from these standards even though they may be considered major projects. Examples of this type of project might be:

- Underground utility construction that re-vegetates all disturbed areas.
- Above ground utility line projects that minimize disturbance and maximize the restoration of disturbed areas.
- The construction of pedestrian access such as a sidewalk or trail with a maximum width of 14 feet, provided that the access is made of a permeable material.

A waiver from strict compliance from these standards may be obtained from the administrative authority for the enlargement of an existing public roadway or railroad, or the construction or enlargement of a public pedestrian access, provided that the following conditions are met:

- The applicant shall demonstrate that there is a public need for the project that cannot be accomplished by any other means.
- The applicant shall demonstrate through an alternative analysis that the design option selected complies with these standards to the maximum extent practicable through the use of nonstructural and structural stormwater management measures.

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- The applicant shall demonstrate that in order to meet these standards, existing structures currently in use, such as homes and buildings, would need to be condemned.
- The applicant shall demonstrate that it does not own or have legal rights to areas, including potential to obtain said areas through condemnation excluding the aforementioned structures, within the upstream drainage area of the receiving water bodies affected, that would provide additional opportunities to mitigate the standards found to be unachievable on-site.

With increasing emphasis on non-point source pollution and concerns over the environmental impacts of land development, it has become necessary to develop effective alternatives to the centralized conveyance and treatment strategy that has been the basis for much of the stormwater management systems and programs in the state. Simply directing stormwater along curbed gutters to drainage inlets where piping conveys this stormwater to open detention basins for attenuation is no longer an acceptable means of treating stormwater. Implementation of new strategies is essential to minimize and even prevent adverse stormwater impacts from occurring while also providing for the necessary water quality treatment of pollutants at the source of these stormwater flows. Such strategies, referred to as Low Impact Development, seeks to reduce and/or prevent adverse runoff impacts through sound site planning and through both non-structural and structural management techniques that preserve or closely mimic the site's natural or pre-developed hydrologic responses to precipitation. As such, low impact development promotes the concept of designing with nature.

Effective low impact development includes non-structural and structural techniques referred to as Best Management Practices (BMP's). The non-structural BMP's utilized in low impact development concentrate on the following practices to be utilized in site development:

- Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.
- Minimize impervious surfaces and disconnect or break up flow of runoff over impervious surfaces.
- Maximize the protection of natural drainage features and vegetation.
- Minimize the "decrease" in the time of concentration of stormwater generated from project drainage areas from the pre-construction condition to the post-construction condition.
- Minimize land disturbance including clearing and grading.
- Minimize soil compaction.
- Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides.
- Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas.
- Provide drainage source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of these pollutants into stormwater runoff.

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The structural BMPs utilized in low impact development concentrate on the following practices to be utilized in site development in conjunction with the non-structural methods described above:

- **Bioretention Systems** – A bioretention system consists of a soil bed planted with native vegetation located above and underdrained sand layer. It can be configured either as a basin or a swale.
- **Constructed Stormwater Wetlands** – Constructed wetlands are wetlands systems designed to maximize the removal of pollutants from stormwater runoff through settling and both uptake and filtering by the vegetation.
- **Dry Wells** - A dry well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs and structures. Discharge of the accumulated stormwater from a dry well occurs through infiltration into the surrounding soils.
- **Extended Detention Basins** - An extended detention basin is a facility constructed through excavation or embankments that provides temporary storage of stormwater runoff. It has an outlet structure that detains runoff inflow and allows for controlled outflow to aid in mitigating stormwater flows from development. Usually this type of structure is utilized to provide both water quantity and water quality mitigation.
- **Infiltrative Basins** – Infiltration basins are similar to detention basins in that they both temporarily store stormwater runoff generated from a development project. The principal outlet to this type of basin is not a constructed outlet structure, but rather the highly permeable soils allowing for infiltration into the surrounding subsoils.
- **Manufactured Treatment Devices** – A manufactured treatment device is a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive materials, vortex separation, vegetative components, and/or other appropriate technology to remove pollutants from stormwater runoff.
- **Pervious Paving Systems** – Pervious pavement utilizes paving material which allows for stormwater to infiltrate through the pavement rather than accumulate as is the case with standard paving material. Pervious pavement utilizes void areas within the paving material to provide for this permeable feature.
- **Vegetated Rooftops** – (Reserved)
- **Sand Filters** – A sand filter consists of a forebay and an underdrained sand bed. Runoff entering the sand filter is conveyed first through the forebay, which removes trash, debris and coarse sediments, and then infiltrates through the sand bed to an outlet pipe at the bottom of the filter.
- **Vegetative Filters** – A vegetative filter is an area designed to remove suspended solids and other pollutants from stormwater runoff flowing through a length of vegetation, called a vegetative filter strip. The vegetation in a filter strip can range from turf grass to woody vegetation.
- **Wet Ponds** – A wet pond is a facility constructed through excavation or embankments that provides both permanent and temporary storage of stormwater

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runoff. It has an outlet structure that creates a permanent pool and detains and attenuates runoff inflows promoting the settlement of pollutants.

All structural stormwater management measures (structural BMPs) shall be designed according to the following conditions:

- They should take into account the existing site conditions, including, for example, environmentally critical areas, wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).
- They should be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate, and shall be parallel bars with one-inch (1") spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the parallel bars at the outlet structure shall be spaced no greater than one-third (1/3) the width of the diameter of the orifice or one-third (1/3) the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. In addition, the design of trash racks must comply with the requirements of N.J.A.C. 7:8-7.D.
- They should be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvements Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.
- At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.
- Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section N.J.A.C. 7:8-7.
- Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, groundwater recharge and water quality design and performance standards established by this subchapter.
- Manufactured treatment devices may be used to meet the requirements of this subchapter, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the NJ Department of Environmental Protection.
- In order to ensure adequate long term operation as well as preventative and corrective maintenance of stormwater management measures and structural BMPs, the designers of such facilities should submit to the municipality a Maintenance Plan indicating specific maintenance tasks and schedules as indicated in N.J.A.C. 7:8-5.8 "Maintenance Requirements". This maintenance plan will require the ultimate user of said structural BMPs to provide an annual certification that the stormwater management measures approved are functioning as designed and that the proper maintenance and inspection of said measures have been performed. Random spot inspections by the municipality will be conducted

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to ensure compliance along with appropriate enforcement actions such as fines to be levied should non-compliance result.

The following specific stormwater management performance design standards will be met:

- **Runoff Quantity**

Peak flow reductions requirements are to be implemented into the stormwater system design in order to mitigate the expected stormwater flow and volume increases created through proposed development. The peak flow reduction requirements, which are similar to those previously published in the N.J.D.E.P. Flood Hazard Area Control Act Rules and the New Jersey Department of Community Affairs Residential Site Improvement Standards (R.S.I.S.), are as follows:

2 year design storm - allowable peak rate for proposed development is 50% of existing peak rate (or 50% reduction)

10 year design storm - allowable peak rate for proposed development is 75% of existing peak rate (or 25% reduction)

100 year design storm - allowable peak rate for proposed development is 80% of existing peak rate (or 20% reduction)

- **Runoff Quality**

Stormwater management measures implemented during land development shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80% of the anticipated load from the developed site, expressed as an annual average. Table 2 in N.J.A.C.7:8-5.5 presents the presumed TSS removal rates for certain BMPs designed in accordance with the New Jersey Best Management Practices Manual. It shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load from the developed site in stormwater runoff generated from the water quality storm.

A 300 foot Special Water Resource Protection Area (S.W.R.P.A.) shall be preserved and maintained along all waters designated as Category One Waters in the N.J.D.E.P. Surface Water Quality Standards at N.J.A.C. 7:9B, and along perennial or intermittent streams that drain into or upstream of the Category One Waters as shown on the U.S.G.S. Quadrangle Maps or in the Union County Soils Survey, within the associated hydrologic unit code 14 (HUC14) drainage area. This SWRPA shall be measured radial/parallel from the streambank of the water body or, in the absence of defined banks, from the center of the stream.

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- Recharge (Although recharge does not apply in “Urban Development Areas,” we feel that it is an important measure to require, because of the environmental sensitivity of our streams and rivers.)

Groundwater recharge shall be designed in accordance with the following:

100% of the development site’s average annual pre-developed groundwater recharge volume will be maintained as calculated using the New Jersey Regional Groundwater Spreadsheet (N.J.G.R.S.) provided by the New Jersey Geological Society (N.J.G.S.)

or

100% of the difference between the development site’s pre-developed and post-developed 2 year design storm runoff amounts as calculated by utilizing current engineering design practices such as the Rational Method, Modified Rational Method, S.C.S. TR-55 Method as appropriate.

This groundwater recharge requirement does not apply to projects within “urban redevelopment areas” or to projects subject to the following types of stormwater:

- Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored, areas where hazardous materials are expected to be present in greater than “reportable quantities” as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4, and areas where recharge would be inconsistent with a NJDEP approved remediation action work plan or landfill closure plan and areas with high risks for spills of toxic material, such as gas stations and vehicle maintenance facilities.
- Industrial stormwater exposed to source material. “Source Material” means any material(s) or machinery, located at an industrial facility, that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials, intermediate products, final products, waste material, by-products, industrial machinery and fuels, and lubricants, solvents and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

The project shall be designed in regards to recharge such that the hydraulic impact on the groundwater table is avoided. Potential adverse hydraulic impacts include,

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but are not limited to, exacerbating a naturally or seasonal high water table so as to cause surficial ponding, flooding of basements or interference with the proper operation of subsurface disposal systems and other subsurface structures in the vicinity or down gradient of the recharge area.

Plan Consistency

Regional Stormwater Management Plans

The Township is not within a regional stormwater management planning area and therefore, this plan does not need to be consistent with any regional stormwater management plan. If a RSWMP is developed in the future, this Municipal Stormwater Management Plan will be updated to conform to the regional stormwater management plan.

Residential Site Plan Improvement Standards

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.

Soil Erosion and Sediment Control Standards

The Township'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, Township inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Somerset-Union Soil Conservation District.

Total Maximum Daily Loads (TMDLs)

TMDLs represent the assimilative or carrying capacity of the receiving water taking into consideration point and nonpoint sources of pollution, natural background, and surface water withdrawals. A TMDL is developed as a mechanism for identifying all the contributors to surface water quality impacts and setting goals for load reductions for specific pollutants as necessary to meet surface water quality standards. TMDLs are required, under Section 303(d) of the federal Clean Water Act, to be developed for water bodies that cannot meet surface water quality standards after the implementation of technology-based effluent limitations. TMDLs may also be established to help maintain or improve water quality in waters that are not impaired.

A TMDL establishes Waste Load Allocations and Load Allocations for point and nonpoint sources, respectively. Regulations concerning TMDLs are contained in EPA's Water Quality Planning and Management Regulations (40 CFR 130). "A TMDL is established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of

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knowledge concerning the relationship between effluent limitations and water quality." (40 CFR 130.7(c)).

Revisions to New Jersey's TMDL requirements have recently been proposed as part of the Water Quality and Watershed Management rules. Where TMDLs are required to address documented surface water quality impairment, allocations are made to the varying sources contributing to the water quality problem in order to reduce the total pollutant load received by the water body. Load reduction goals established through TMDLs are achieved through the issuance of waste load allocations for point source discharges and load allocations for nonpoint source discharges. Since nonpoint source pollution, by definition, does not come from discrete, identifiable sources, load allocations would consist of the identification of categories of nonpoint sources that contribute to the parameters of concern. The load allocation would also include specific load reduction measures for those categories of sources, to be implemented through best management practices (BMPs) including local ordinances for stormwater management and nonpoint source pollution control, headwaters protection practices, or other mechanisms for addressing the priority issues of concern.

A TMDL is considered "proposed" when NJDEP publishes the TMDL Report as a proposed Water Quality Management Plan Amendment in the New Jersey Register (NJR) for public review and comment. A TMDL is considered to be "established" when NJDEP finalizes the TMDL Report after considering comments received during the public comment period for the proposed plan amendment and formally submits it to EPA Region 2 for thirty (30)-day review and approval. The TMDL is considered "approved" when the NJDEP-established TMDL is approved by EPA Region 2. The TMDL is considered to be "adopted" when the EPA-approved TMDL is adopted by NJDEP as a water quality management plan amendment and the adoption notice is published in the NJR.

Total Maximum Daily Loads (TMDLs) For The Rahway River In Cranford

Presently there is only one TMDL for fecal coliform that has been established for the stretch of the Rahway River that traverses the Township of Cranford. A subset of total coliform, fecal coliform originates from the intestines of warm-blooded animals and is excreted in their feces. Fecal coliform does not include organisms found naturally in soils, and is therefore preferred over total coliform as a pathogen indicator. A standard for measuring fecal coliform is the number of bacterial colonies found by filtering 100 milliliters of water through a membrane filter and then incubating the filter for a specified time. N.J.A.C. 7:9B-1.1(c) of the New Jersey Surface Water Quality Standards state that, "Fecal coliform levels shall not exceed a geometric average of 200CFU/100 ml (colony forming units) nor should more than 10 percent of the total samples taken during any 30-day period exceed 400CFU/100 ml in FW2 waters."

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The fecal coliform TMDL was required for the Rahway River after several water samples taken between 1994 and 2001 at three monitoring sites exceeded water quality standards. Sampling sites were located in West Orange, Springfield, and Rahway. The average summer CFU count was 1600CFU/100ml, which is significantly higher than water quality standards of 200CFU/100ml and 400CFU/100ml. To put 1600CFU/100ml into perspective, a typical beach would be closed after two consecutive samples of 200CFU/100ml were obtained. Pathogen counts may vary from being within acceptable levels during very cold weather when the river is frozen over, to highly elevated counts as these summer averages show. This information is summarized in table C-1, that was taken from the *Amendment to the Lower Raritan/Middlesex Water Quality Management Plan* available from the NJDEP on its watershed management web site. In order for these monitoring sites to become compliant with water quality standards, a reduction of approximately 90% of the current fecal coliform bacteria is required. The Rahway River is considered to be impaired due to these elevated pathogen levels.

To improve the river's water quality, contributing sources of fecal coliform must be identified and managed. Possible sources of contamination include geese, pets, illicit discharges, sanitary sewer discharges, and sanitary sewer seepage. Previous work performed in other areas of the state indicates that old and failing sanitary sewers may be even larger contributors to the problem than geese. Areas of high river pathogen concentrations must be located and their source identified. Once a source is identified, a solution can then be developed and implemented to reduce the contamination.

Remediation of fecal coliform contamination will include public education of residents on problems created by improper disposal of pet and animal waste, adherence to new development stormwater quality regulations, reforestation of stream buffers to keep geese further back from the water, repairing old sanitary sewers and laterals that may be leaking, and shutting down illegal discharges. The first step however, is to identify true polluting sources.

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Table C-1: Water Quality Measurements For The Rahway River

Appendix C: TMDL Calculations

WMA	303(d) Category 5 Segments	Water Quality Stations	Station Names	Load Allocation (LA) and Margin of Safety (MOS)										Wasteload Allocation (WLA)	Period of record used in analysis
				200 FC/100ml Standard					400 FC/100ml Standard						
				N (# of values)	Geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	Summer N	Summer geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS		
7	01393350, 01393450	01393350, 01393450	WB Elizabeth River near Union, Elizabeth River at Upland Lake at Elizabeth	24	2006	42%	90%	94%	13	2340	42%	97%	98%	98%	2/16/94 - 8/17/99
7	01393960, 01394500, 01395000	01393960, 01394500, 01395000	WB Rahway River at Northfield Ave. at West Orange, Rahway River near Springfield, Rahway River at Rahway	85	1569	23%	87%	90%	63	1680	23%	98%	97%	97%	2/14/94 - 8/2/01
7	01395200, 01396003	01395200, 01396003	Robinson Branch at Scotch Plains, Robinson Branch at St Georges Ave at Rahway	10	626	60%	68%	87%	10	626	60%	88%	96%	96%	6/2/98 - 8/30/00
8	01396219, 01396280, 01396535	01396219, 01396280, 01396535	Stony Brook at Fairview Avenue at Naughtlight, SB Raritan River at Middle Valley, SB Raritan River Arch St at	43	272	34%	26%	52%	21	809	34%	92%	94%	94%	1/25/94 - 8/26/99
8	01396550, 01396598	01396550, 01396598	Spruce Run at Newport, Spruce Run near Glen	39	110	32%	-82%	-24%	28	99	32%	31%	53%	53%	2/1/94 - 8/9/01
8	01396560	01396560	Mulhockaway Creek at Van Syckel	40	330	36%	39%	61%	29	464	36%	85%	91%	91%	2/1/94 - 8/9/01
8	01398000	01398000	Neshanic River at Reaville	39	288	40%	31%	58%	28	313	40%	78%	87%	87%	2/1/94 - 8/9/01

From the Amendment to the Lower Raritan/Middlesex Water Quality Management Plan, NJDEP.

The Township of Cranford will implement whatever measures are required by the New Jersey Department of Environmental Protection to reduce the Township's contributing portion of pathogenic contamination that enters the Rahway River from Township sources.

Future TMDLs may be established by the New Jersey Department of Environmental Protection for other pollutants in the Rahway River. TMDLs will probably be established for phosphorous and may be established for sodium, lead, or nitrogen.

Nonstructural Stormwater Management Strategies

The Township of Cranford is in the process of reviewing its master plan. Because we are 90% into the process we are not going to review the existing plan. Any ordinances and sections in the Township land use and zoning ordinances will be modified to incorporate nonstructural stormwater management strategies. The ordinances that are identified for revision will be incorporated into the Storm Water Management Plan. Once the ordinance texts are completed, they will be submitted to the Union County review agency for review and approval within 24 months of the effective date of the Stormwater Management Permit. A copy will be sent to the Department of Environmental Protection at the time of submission to Union County.

These revised ordinances will govern all new development and redevelopment within the Township and implement the best management practices as set forth by the by the New Jersey Environmental Protection Agency for both public and private projects

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Land Use/Build-Out Analysis

The land use/build-out analysis section is not required because all vacant or agricultural lands add up to only 389.89 acres or 0.6 square miles. According to the state regulations, "if a municipality can document that it has combined total of less than one square mile of vacant or agricultural lands, the municipality is not required to complete the build out analysis." However, the Township is working on developing three maps will eventually be included in the plan:

- 1) The first map will show all open space within the Township of Cranford.
- 2) The second map will show undevelopable land within the Township of Cranford (i.e. park lands, wetlands, waterways, county land, Green Acres).
- 3) The third map will show all open space less the undevelopable land or the remaining developable open space within the Township including vacant lots and farmland.

Mitigation Plans

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

Mitigation Project Criteria

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

Long-term maintenance for a mitigating municipal project would be a financial obligation calculated by the Township Engineer. The financial obligation would be for a period of thirty years and ensure at least enough funds for a one-time rehabilitation of the mitigating project.

The applicant can select one of the following projects listed to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information on the projects can be obtained from the Township Engineer. The exact project details would be worked out at the time of the request either by the Engineering Department or the developer requesting the variance. The project identification list is presented here only to show that such mitigation projects exist. Should no financially equivalent mitigating project be identifiable, then the developer may be able to pay into

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an escrow account a portion of an identifiable project that would be used for the project once it is fully funded. The source of additional funding to fully fund a project may be public or private. Listed below are specific projects that can be used to address the mitigation requirements.

Groundwater Recharge – Provide a Stormwater Detention/Recharge System For:

- The municipal building and/or parking lot at 8 Springfield Avenue.
- The Township library and community center and/or parking lot at 220-224 Walnut Avenue.
- The Centennial Avenue pool facilities and parking lot.
- The Orange Avenue pool facilities and parking lot.
- The Department of Public Works facility on North Avenue East.
- Any of the local schools and their parking lots.
- Other possible mitigation projects to be determined.

Water Quality

- Remove 80% of the suspended solids for any of the above listed projects.
- Replace or rehabilitate any sanitary sewer that may in the future be identified through testing to be found to be leaking.
- Retrofitting an existing storm sewer system where the outfall of the system is found to have greater than 80% suspended solids.
- The developer may propose any mitigating water quality project that would measurably improve the water quality of the Rahway River and is acceptable to the Township Engineer.
- Retrofitting Municipal storm drain inlets.

Water Quantity

- South Union Avenue and James Avenue storm sewer improvement/enlargement project.
- Carolina Street and Chester Lang Place storm sewer improvement project.
- Albany Street and Cranford Avenue storm sewer project.
- The developer may propose any mitigating water quantity project that reduces peak stormwater flow into the Rahway River or alleviates a flooding condition within the Township. The project may be located in an upstream township if peak flow into the Rahway River is reduced by such a project. The Township Engineer would have to approve any proposed project.

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2. The mitigating project may provide mitigation that is not equivalent to the impacts for which the variance or exemption is sought, but that addresses the same issue. For example, if a variance is given because the 80 percent TSS requirement is not met, the selected project may address water quality impacts due to a fecal impairment. Such a project would in general have to improve the quality of the Rahway River by reducing one of the TMDL pollutants for the section of the Rahway River that traverses the Township. While we do not have a list of mitigating projects that fit this category, the Township will consider any reasonable mitigation project put forth by a developer that can be determined to be equivalent. Listed below are example ideas for this kind of mitigation project.

Water Quality

- Re-establish or create a vegetative buffer along a section of the Rahway River within the Township or within a county park located in the Township that would buffer high density geese habitat from the river. The concept would be to provide natural filtering of goose droppings before they reach the river.
- Provide animal management measures including public education and park improvements to reduce the fecal load from animals that may be entering the Rahway River within the Township.

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

ARTICLE VI, Stormwater Control; Revised dd/mm/yy by Ord. No. xx-x

DRAFT 8/01/24

136-39. Scope, Purpose and Objectives; findings.

A. Policy Statement

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

B. Purpose and Objectives

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

1. Protecting human life and health.
2. Minimizing expenditure of public money for costly flood control projects.
3. Minimizing the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public.
4. Minimizing prolonged business interruptions.
5. Minimizing damage to public facilities and utilities such as water and gas mains, electric, telephones and sewer lines, streets, and bridges located in floodplains.
6. Maintaining a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future damages from flood.
7. Ensuring that potential property purchasers are notified that property is in a flood-prone area.
8. Promoting water quality for rivers and streams.

C. Findings of Fact.

The Township Committee of the Township of Cranford finds that:

1. The flood hazard areas of the Township of Cranford are subject to periodic inundation which could result in loss of life or property, affect health and produce safety hazards, disrupt commerce and governmental services or result in extraordinary public expenditures and impairment of the tax base, all of which adversely affect the public health, safety and general welfare.
2. These flood losses are caused by the cumulative effect of obstructions in floodplains causing increases in flood heights and velocities and by the occupancy in flood hazard areas by uses vulnerable to floods or uses hazardous to other lands which are inadequately protected from flood damage.
3. These flood losses are also caused by the cumulative effect of increases in impervious cover by construction of structures, such as new homes, buildings, building additions, roadways, driveways, patios, and other materials that dis-allow water to pass through soils into the groundwater, or to be stored in plant life, and soils.
4. By not controlling stormwater runoff, soil erosion, loss of ground water recharge, and pollution reduction through structural BMP's, nonstructural or low impact techniques that reduce or prevent pollutants from being placed on the sites or from being exposed to stormwater, the streams and rivers in the Township of Cranford will become more polluted, will lose natural plant and aquatic life, and will eventually reduce the natural beauty and charm of the townships streams and river.

D. Applicability

1. This ordinance shall be applicable to all construction plans, building additions, driveway widening, new patios, pools, garages, sheds, and any residential projects that are below the threshold of major developments, if they are neither a site plan or subdivision, that increase impervious cover 100 SF (Square Feet) or more, and/or negatively effect the flow of stormwater including:

a. Non-residential major developments; and

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

c. Aspects of all development in the special flood hazards areas within the jurisdiction of Cranford, Union County, New Jersey, that are not covered under the Cranford Township Article VIA "Flood Damage Prevention."

2. This ordinance shall also be applicable to all major developments undertaken by the Township of Cranford.

E. Compatibility with Other Permit and Ordinance Requirements

Development approvals issued for subdivisions and site plans pursuant to this ordinance are to be considered an integral part of development approvals under the subdivision and site plan review process and do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance. In their interpretation

and application, the provisions of this ordinance shall be held to be the minimum requirements for the promotion of the public health, safety, and general welfare. This ordinance is not intended to interfere with, abrogate, or annul any other ordinances, rule or regulation, statute, or other provision of law except that, where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, the more restrictive provisions or higher standards shall control.

136-40. Definitions

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

BMPs, Best Management Practices as found in the latest addition of the New Jersey Stormwater Best Management Practices Manual

“Compaction” means the increase in soil bulk density.

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

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

A county planning agency; or

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

“Department” means the New Jersey Department of Environmental Protection.

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

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

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

“Drainage area” means a geographic area within which stormwater, sediments, or dissolved materials drain to a particular receiving water body or to a particular point along a receiving water body.

“Environmentally critical areas” means an area or feature which is of significant environmental value, including but not limited to: stream corridors; natural heritage priority sites; habitat of endangered or threatened species; large areas of contiguous open space or upland forest; steep slopes; and well head protection and groundwater recharge areas. Habitats of endangered or threatened species are identified using the Department’s Landscape Project as approved by the Department’s Endangered and Nongame Species Program.

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

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

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

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

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

“Municipality” means any city, borough, town, township, or village.

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

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

“Person” means any individual, corporation, company, partnership, firm, association, Township of Cranford, or political subdivision of this State subject to municipal jurisdiction pursuant to the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- (1) Delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), Designated Centers, Cores or Nodes;
- (2) Designated as CAFRA Centers, Cores or Nodes;
- (3) Designated as Urban Enterprise Zones; and
- (4) Designated as Urban Coordinating Council Empowerment Neighborhoods.

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

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

136-41. General Standards Provisions

A. Design and Performance Standards for Stormwater Management Measures

1. Stormwater management measures for major development shall be developed to meet the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater runoff quality standards in Section 136-42. To the maximum extent practicable, these standards shall be met by incorporating nonstructural stormwater management strategies into the design. If these strategies alone are not sufficient to meet these standards, structural stormwater management measures necessary to meet these standards shall be incorporated into the design.
2. The standards in this ordinance not only apply to new development but any development that causes the increase in impervious cover. These standards are intended to minimize the impact of stormwater runoff on water quality and water quantity in receiving water bodies and maintain groundwater recharge. The standards do not apply to new major development to the extent that alternative design and performance standards are applicable under a regional stormwater management plan or Water Quality Management Plan adopted in accordance with Department rules.
3. Administration. The administration and enforcement of the provisions of this Article relating to the construction, erection, maintenance and continued operation at design capacity of stormwater detention facilities and other facilities, structures, devices and techniques required to carry out the objectives of this Article shall be the responsibility of the Township Engineer.
4. Basis for establishing the areas of special flood hazard. The areas of special flood hazard have been identified by the Federal Insurance Administration through a scientific and engineering report entitled the "Flood Insurance Study for the Township of Cranford," dated August 16, 1982, with accompanying Flood Insurance Rate Maps and Flood Boundary - Floodway Maps, which report is hereby adopted by reference and declared to be part of this Article. The Flood Insurance Study is on file at the office of the Township Engineer.
5. Other flood hazard areas. When the base flood elevation and floodway data has not been provided in accordance with Subsection 4 above, the Township Engineer shall obtain, review and reasonably utilize any base flood elevations and floodway data available from any federal, state or other source in order to properly interpret and enforce the Land Development Ordinance for any type of construction in the Township of Cranford.

136-42: Stormwater Management Requirements for All Development

- A. All Major developments shall incorporate a maintenance plan for the stormwater management measures incorporated into the design of a major development in accordance with Section 136-47.2.
- B. Stormwater management measures shall avoid adverse impacts of concentrated flow on habitat for threatened and endangered species as documented in the Department' Landscape Project or Natural Heritage Database established under N.J.S.A. 13:1B-15.147 through 15.150, particularly *Helonias bullata* (swamp pink) and/or *Clemmys muhlenbergi* (bog turtle).

C. The following linear development projects are exempt from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 136-42. G and H:

1. The construction of an underground utility line provided that the disturbed areas are re-vegetated upon completion;
2. The construction of an aboveground utility line provided that the existing conditions are maintained to the maximum extent practicable; and
3. The construction of a public pedestrian access, such as a sidewalk or trail with a maximum width of 14 feet, provided that the access is made of permeable material.
4. The reconstruction or widening of public roadways.

D. A waiver from strict compliance from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 136-42.G and 136-42.H may be obtained for the enlargement of an existing public roadway or railroad; or the construction or enlargement of a public pedestrian access, provided that the following conditions are met:

1. The applicant demonstrates that there is a public need for the project that cannot be accomplished by any other means;
2. The applicant demonstrates through an alternatives analysis, that through the use of nonstructural and structural stormwater management strategies and measures, the option selected complies with the requirements of Sections 136-42.G and H to the maximum extent practicable;
3. The applicant demonstrates that, in order to meet the requirements of Sections 136-42. G and H, existing structures currently in use, such as homes and buildings, would need to be condemned; and
4. The applicant demonstrates that it does not own or have other rights to areas, including the potential to obtain through condemnation lands not falling under Subsection D.3 above within the upstream drainage area of the receiving stream that would provide additional opportunities to mitigate the requirements of Sections 136-42. G and H that were not achievable on-site.

E. Runoff standards. The following standards shall apply to all development in the Township, except Section 136-42 C:

1. The rate of stormwater runoff from the site is not increased as a result of the development proposed in the application.
2. The volume of stormwater runoff shall be minimized.
3. The drainage of the adjacent areas is not adversely affected.
4. Soil absorption and groundwater recharge capacity of the area is not decreased below what occurs there under existing conditions.
5. The natural drainage pattern of the area is not significantly altered.

F. Nonstructural Stormwater Management Strategies

1. To the maximum extent practicable, the standards in Sections 136-42 G and H shall be met by incorporating nonstructural stormwater management strategies set forth in this section into the design. The applicant shall identify the nonstructural measures incorporated into the design of the project. If the applicant contends that it is not feasible for engineering,

environmental, or safety reasons to incorporate any nonstructural stormwater management measures identified in Paragraph 2 below into the design of a particular project, the applicant shall identify the strategy considered and provide basis for the contention.

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

- a. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
- b. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;
- c. Maximize the protection of natural drainage features and vegetation;
- d. Minimize the decrease in the "time of concentration" from pre-construction to post construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the watershed to the point of interest within a watershed;
- e. Minimize land disturbance including clearing and grading;
- f. Minimize soil compaction;
- g. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;
- h. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas;
- i. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site, in order to prevent or minimize the release of those pollutants into stormwater runoff. Such source controls include, but are not limited to:
 - (1) Site design features that help to prevent accumulation of trash and debris in drainage systems, including features that satisfy Section 136-42 F.3. below;
 - (2) Site design features that help to prevent discharge of trash and debris from drainage systems;
 - (3) Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and
 - (4) When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24- 39 et seq., and implementing rules.

3. Site design features identified under Section 136-42.2.i.(2) above shall comply with the following standard to control passage of solid and floatable materials through storm drain inlets. For purposes of this paragraph, "solid and floatable materials" means sediment, debris, trash, and other floating, suspended, or settleable solids. For exemptions to this standard see Section 136-42.3.c below.

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

- (1) The New Jersey Department of Transportation (NJDOT) bicycle safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (April 1996); or
- (2) A different grate, if each individual clear space in that grate has an area of no more than seven (7.0) square inches, or is no greater than 0.5 inches across the smallest dimension.

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

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

c. This standard does not apply:

- (1) Where the review agency determines that this standard would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets that meet these standards;
 - (2) Where flows from the water quality design storm as specified in Section 4.136-42.1 are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:
 - (a) A rectangular space four and five-eighths inches long and one and one-half inches wide (this option does not apply for outfall netting facilities); or
 - (b) A bar screen having a bar spacing of 0.5 inches.
 - (3) Where flows are conveyed through a trash rack that has parallel bars with one-inch (1") spacing between the bars, to the elevation of the water quality design storm as specified in Section 136-42 H.1; or
 - (4) Where the New Jersey Department of Environmental Protection determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet this standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.
4. Any land area used by a major development as a nonstructural stormwater management measure to meet the performance standards in Sections 136-42 G and H for all non-residential construction shall be dedicated by easement to the government agency, subjected to a conservation restriction filed with the appropriate County Clerk's office, or subject to an approved equivalent restriction that ensures that measure or an equivalent stormwater management measure approved by the reviewing agency is maintained in perpetuity.

5. Guidance for nonstructural stormwater management strategies is available in the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 136-45, or found on the Department's website at www.njstormwater.org.

G. Erosion Control, Groundwater Recharge and Runoff Quantity Standards

1. This subsection contains minimum design and performance standards to control erosion, encourage and control infiltration and groundwater recharge, and control stormwater runoff quantity impacts of major development.
 - a. The minimum design and performance standards for erosion control are those established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.
 - b. The minimum design and performance standards for groundwater recharge are as follows:
 - (1) The design engineer shall, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at Section 136-43, either:
 - (a) Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site; or
 - (b) Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated.
 - (2) This groundwater recharge requirement does not apply to projects within the "urban redevelopment area," or to projects subject to (3) below.
 - (3) The following types of stormwater shall not be recharged:
 - (a) Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than "reportable quantities" as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4; areas where recharge would be inconsistent with Department approved remedial action work plan or landfill closure plan and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities; and
 - (b) Industrial stormwater exposed to "source material." "Source material" means any material(s) or machinery, located at an industrial facility that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials; intermediate products; final products; waste materials; by-products; industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

- (4) The design engineer shall assess the hydraulic impact on the groundwater table and design the site so as to avoid adverse hydraulic impacts. Potential adverse hydraulic impacts include, but are not limited to, exacerbating a naturally or seasonally high water table so as to cause surficial ponding, flooding of basements, or interference with the proper operation of subsurface sewage disposal systems and other subsurface structures in the vicinity or downgradient of the groundwater recharge area.
- c. In order to control stormwater runoff quantity impacts, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at Section 136-43, complete one of the following:
 - (1) Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two, 10, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;
 - (2) Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area;
 - (3) Design stormwater management measures so that the post-construction peak runoff rates for the 2, 10 and 100 year storm events are 50, 75 and 80 percent, respectively, of the preconstruction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed. The percentages shall not be applied to post-construction stormwater runoff into tidal flood hazard areas if the increased volume of stormwater runoff will not increase flood damages below the point of discharge;
 - (4) For residential site improvements with a proposed impervious cover increase of 1000 square feet or less, the required storage volume may be taken from the Chart entitled "Volume of Required Storage vs Additional Impervious Cover found in Section 136-45C. These residential improvements will only have to provide onsite stormwater storage in the form of stone landscape beds, wetlands ponds, seepage pits, underground stormwater storage chambers, or other BMP measures that will retain the stormwater runoff volume, as taken from this chart, and recharge that volume back into the ground or release it at a pre-improvement runoff rate. Any non-residential development still requires BMP's in accordance with this Article; or
2. Any application for a new agricultural development that meets the definition of major development at Section 136-40 shall be submitted to the appropriate Soil Conservation District for review and approval in accordance with the requirements of this section and any applicable Soil Conservation District guidelines for stormwater runoff quantity and erosion control. For the purposes of this section, "agricultural development" means land uses normally associated with the production of food, fiber and livestock for sale. Such uses do not include the development of land for the processing or sale of food and the manufacturing of agriculturally related products.

H. Stormwater Runoff Quality Standards

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

Table 1: Water Quality Design Storm Distribution			
Time (Minutes)	Cumulative Rainfall (Inches)	Time (Minutes)	Cumulative Rainfall (Inches)
0	0.0000	65	0.8917
5	0.0083	70	0.9917
10	0.0166	75	1.0500
15	0.0250	80	1.0840
20	0.0500	85	1.1170
25	0.0750	90	1.1500
30	0.1000	95	1.1750
35	0.1330	100	1.2000
40	0.1660	105	1.2250
45	0.1660	110	1.2334
50	0.2583	115	1.2417
55	0.3583	120	1.2500
60	0.6250		

2. For purposes of TSS reduction calculations, Table 2 below presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 136-45, or found on the Department's website at www.njstormwater.org. The BMP Manual and other sources of technical guidance are listed in Section 136-45. TSS reduction shall be calculated based on the removal rates for the BMPs in Table 2 below. Alternative removal rates and methods of calculating removal rates may be used if the design engineer provides documentation demonstrating the capability of these alternative rates and methods to the review agency. A copy of any approved alternative rate or method of calculating the removal rate shall be provided to the Department at the following address: Division of Watershed Management, New Jersey Department of Environmental Protection, PO Box 418 Trenton, New Jersey, 08625-0418.

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

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

Where

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

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

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

Table 2: TSS Removal Rates for BMPs	
Best Management Practice	TSS Percent Removal Rate
Bioretention Systems	90
Constructed Stormwater Wetland	90
Extended Detention Basin	40-60
Infiltration Structure	80
Manufactured Treatment Device	See Section 136-44C
Sand Filter	80
Vegetative Filter Strip	60-80
Wet Pond	50-90

4. If there is more than one onsite drainage area, the 80 percent TSS removal rate shall apply to each drainage area, unless the runoff from the sub-areas converge on site in which case the removal rate can be demonstrated through a calculation using a weighted average.
5. Stormwater management measures shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load of the anticipated load from the developed site in stormwater runoff generated from the water quality design storm. In achieving reduction of nutrients to the maximum extent feasible, the design of the site shall include nonstructural strategies and structural measures that optimize nutrient removal while still achieving the performance standards in Sections 136-42 G and H.
6. Additional information and examples are contained in the New Jersey Stormwater Best Management Practices Manual, which may be obtained from the address identified in Section 136-45.
7. In accordance with the definition of FW1 at N.J.A.C. 7:9B-1.4, stormwater management measures shall be designed to prevent any increase in stormwater runoff to waters classified as FW1.

Section 136-43: Calculation of Stormwater Runoff and Groundwater Recharge

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

1. The design engineer shall calculate runoff using one of the following methods:
 - a. The USDA Natural Resources Conservation Service (NRCS) methodology, including the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in the NRCS National Engineering Handbook Section 4 – Hydrology and Technical Release 55 – Urban Hydrology for Small Watersheds; or
 - b. The Rational Method for peak flow and the Modified Rational Method for hydrograph computations.
2. For the purpose of calculating runoff coefficients and groundwater recharge, there is a presumption that the pre-construction condition of a site or portion thereof is a wooded land use with good hydrologic condition. The term “runoff coefficient” applies to both the NRCS methodology at Section 136-43.A.1.a and the Rational and Modified Rational Methods at Section 136-43.A.1.b. A runoff coefficient or a groundwater recharge land cover for an existing condition may be used on all or a portion of the site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site for at least five years without interruption prior to the time of application. If more than one land cover have existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land use type is pasture, lawn, or park), with good cover (if the land use type is woods), or with good hydrologic condition and conservation treatment (if the land use type is cultivation).
3. In computing pre-construction stormwater runoff, the design engineer shall account for all significant land features and structures, such as ponds, wetlands, depressions, hedgerows, or culverts that may reduce pre-construction stormwater runoff rates and volumes.
4. In computing stormwater runoff from all design storms, the design engineer shall consider the relative stormwater runoff rates and/or volumes of pervious and impervious surfaces separately to accurately compute the rates and volume of stormwater runoff from the site. To calculate runoff from unconnected impervious cover, urban impervious area modifications as described in the NRCS Technical Release 55 – Urban Hydrology for Small Watersheds and other methods may be employed.
5. If the invert of the outlet structure of a stormwater management measure is below the flood hazard design flood elevation as defined at N.J.A.C. 7:13, the design engineer shall take into account the effects of tail water in the design of structural stormwater management measures.
6. The rainfall excess shall be computed for each site using accepted, published runoff coefficients, which reflect land use and topography. Acceptable runoff coefficients currently in practice include, but are not limited to, the following:

<u>Surface Type</u>	<u>Runoff Coefficient</u>
Streets: Asphaltic	0.70 to 0.95
Concrete	0.80 to 0.95
Brick	0.70 to 0.85
Drives and walks	0.75 to 0.85
Roofs	0.75 to 0.95
Lawns, sandy soil:	
Flat, 2%	0.05 to 0.10
Average, 2% to 7%	0.10 to 0.15
Steep, 7%	0.15 to 0.20
Lawns, heavy soil:	
Flat, 2%	0.13 to 0.17
Average, 2% to 7%	0.18 to 0.22
Steep, 7%	0.25 to 0.35

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

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

136-44: Standards for Structural Stormwater Management Measures

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

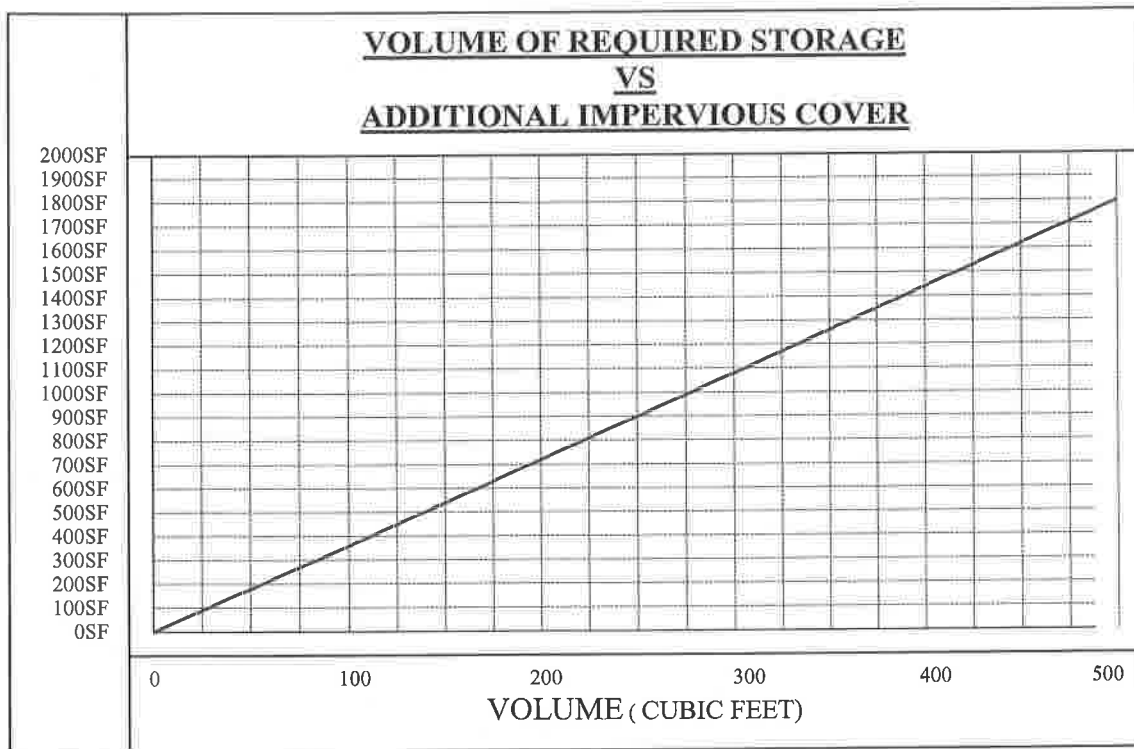
1. Structural stormwater management measures shall be designed to take into account the existing site conditions, including, for example, environmentally critical areas, wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).
2. Structural stormwater management measures shall be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate, and shall have parallel bars with one-inch (1") spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the parallel bars at the outlet structure shall be spaced no greater than one-third (1/3) the width of the diameter of the orifice or one-third (1/3) the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. In addition, the design of trash racks must comply with the requirements of Section 136-46 D.
3. Structural stormwater management measures shall be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvement Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.

4. At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.
 5. Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section 136-46.
- B. Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, groundwater recharge and water quality design and performance standards established by Section 136-42 of this ordinance.
- C. Manufactured treatment devices may be used to meet the requirements of Section 136-42 in this ordinance, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the Department.

136-45: Sources for Technical Guidance

- A. Technical guidance for stormwater management measures can be found in the documents listed at 1 and 2 below, which are available from Maps and Publications, New Jersey Department of Environmental Protection, 428 East State Street, P.O. Box 420, Trenton, New Jersey, 08625; telephone (609) 777-1038.
1. Guidelines for stormwater management measures are contained in the New Jersey Stormwater Best Management Practices Manual, as amended. Information is provided on stormwater management measures such as: bioretention systems, constructed stormwater wetlands, dry wells, extended detention basins, infiltration structures, manufactured treatment devices, pervious paving, sand filters, vegetative filter strips, and wet ponds.
 2. The New Jersey Department of Environmental Protection Stormwater Management Facilities Maintenance Manual, as amended.
- B. Additional technical guidance for stormwater management measures can be obtained from the following:
1. The "Standards for Soil Erosion and Sediment Control in New Jersey" promulgated by the State Soil Conservation Committee and incorporated into N.J.A.C. 2:90. Copies of these standards may be obtained by contacting the State Soil Conservation Committee or any of the Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey 08625; (609) 292-5540;
 2. The Rutgers Cooperative Extension Service, 732-932-9306; and
 3. The Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey, 08625, (609) 292-5540.

- C. Use of the following “Volume of Required Storage vs. Additional Impervious Cover” chart for change in impervious cover that is 1000 square feet or less for residential development only. Non-residential site plans and developments still required BMP’s as addressed in this Article.



136-46: Safety Standards for Stormwater Management Basins

- A. This section sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This section applies to any new stormwater management basin.
- B. Requirements for Trash Racks, Overflow Grates and Escape Provisions
1. A trash rack is a device designed to catch trash and debris and prevent the clogging of outlet structures. Trash racks shall be installed at the intake to the outlet from the stormwater management basin to ensure proper functioning of the basin outlets in accordance with the following:
 - a. The trash rack shall have parallel bars, with no greater than six inch spacing between the bars.
 - b. The trash rack shall be designed so as not to adversely affect the hydraulic performance of the outlet pipe or structure.

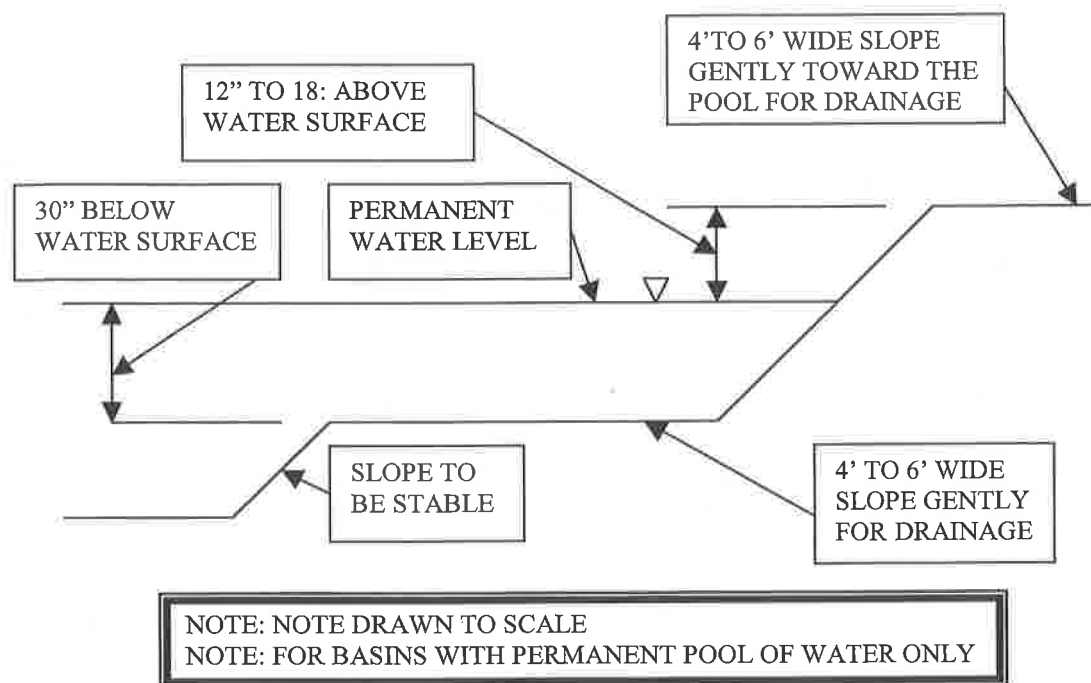
- c. The average velocity of flow through a clean trash rack is not to exceed 2.5 feet per second under the full range of stage and discharge. Velocity is to be computed on the basis of the net area of opening through the rack.
 - d. The trash rack shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs/ft sq.
- 2. An overflow grate is designed to prevent obstruction of the overflow structure. If an outlet structure has an overflow grate, such grate shall meet the following requirements:
 - a. The overflow grate shall be secured to the outlet structure but removable for emergencies and maintenance.
 - b. The overflow grate spacing shall be no less than two inches across the smallest dimension.
 - c. The overflow grate shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs./ft sq.
- 3. For purposes of this paragraph 3, escape provisions means the permanent installation of ladders, steps, rungs, or other features that provide easily accessible means of egress from stormwater management basins. Stormwater management basins shall include escape provisions as follows:
 - a. If a stormwater management basin has an outlet structure, escape provisions shall be incorporated in or on the structure. With the prior approval of the reviewing agency identified in Section 136-46.C a freestanding outlet structure may be exempted from this requirement.
 - b. Safety ledges shall be constructed on the slopes of all new stormwater management basins having a permanent pool of water deeper than two and one-half feet. Such safety ledges shall be comprised of two steps. Each step shall be four to six feet in width. One step shall be located approximately two and one-half feet below the permanent water surface, and the second step shall be located one to one and one-half feet above the permanent water surface. See Section 136-46.D for an illustration of safety ledges in a stormwater management basin.
 - c. In new stormwater management basins, the maximum interior slope for an earthen dam, embankment, or berm shall not be steeper than 3 horizontal to 1 vertical.

C. Variance or Exemption from Safety Standards

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

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

Depicted is an elevation view



136-47.1: Requirements for a Site Development Stormwater Plan

A. Submission of Site Development Stormwater Plan

1. Whenever an applicant seeks municipal approval of a development subject to this ordinance, the applicant shall submit all of the required components of the Checklist for the Site Development Stormwater Plan at Section 136-47.C below as part of the submission of the applicant's application for subdivision or site plan approval. A "Site Development Stormwater Plan" is not required for residential improvements or residential developments that have 1000 square feet or less change of impervious cover.
2. The applicant shall demonstrate that the project meets the standards set forth in this ordinance.
3. The applicant shall submit eighteen (18) copies of the materials listed in the checklist for site development stormwater plans in accordance with Section 136-47.1.C of this ordinance.

B. Site Development Stormwater Plan Approval

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

C. Checklist Requirements

The following information shall be required:

1. Topographic Base Map

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

2. Environmental Site Analysis

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

3. Project Description and Site Plan(s)

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

4. Land Use Planning and Source Control Plan

This plan shall provide a demonstration of how the goals and standards of Sections 136-41 through 136-44 are being met. The focus of this plan shall be to describe how the site is being developed to meet the objective of controlling groundwater recharge, stormwater quality and stormwater quantity problems at the source by land management and source controls whenever possible.

5. Stormwater Management Facilities Map

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

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

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

6. Calculations

a. Comprehensive hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in Section 136-42 of this ordinance.

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

7. Maintenance and Repair Plan

The design and planning of the stormwater management facility shall meet the maintenance requirements of Section 136-47.2.

8. Waiver from Submission Requirements

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

Section 136-47.2: Maintenance and Repair

A. Applicability

1. Projects subject to review as in Section 136-39.D of this ordinance shall comply with the requirements of Sections 136-47.2.B and 136-47.2.C.

B. General Maintenance

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

3. Responsibility for maintenance shall not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project.
 4. If the person responsible for maintenance identified under Section 136-47.2.B.2 above is not a public agency, the maintenance plan and any future revisions based on Section 136-47.2.B.7 below shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.
 5. Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of nonvegetated linings.
 6. The person responsible for maintenance identified under Section 136-47.2.B.2 above shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders
 7. The person responsible for maintenance identified under Section 136-47.2.B.2 above shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.
 8. The person responsible for maintenance identified under Section 136-47.2.B.2 above shall retain and make available, upon request by any public entity with administrative, health, environmental, or safety authority over the site, the maintenance plan and the documentation required by Sections 136-47.2.B.6 and 136-47.2.B.7 above.
 9. The requirements of Sections 136-47.2.B.3 and 136-47.2.B.4 do not apply to stormwater management facilities that are dedicated to and accepted by the municipality or another governmental agency.
 10. In the event that the stormwater management facility becomes a danger to public safety or public health, or if it is in need of maintenance or repair, the municipality shall so notify the responsible person in writing. Upon receipt of that notice, the responsible person shall have fourteen (14) days to effect maintenance and repair of the facility in a manner that is approved by the municipal engineer or his designee. The municipality, in its discretion, may extend the time allowed for effecting maintenance and repair for good cause. If the responsible person fails or refuses to perform such maintenance and repair, the municipality or County may immediately proceed to do so and shall bill the cost thereof to the responsible person.
- C. Nothing in this section shall preclude the municipality in which the major development is located from requiring the posting of a performance or maintenance guarantee in accordance with N.J.S.A. 40:55D-53.

Section 136-47.3: Violations and Penalties

A. Any person who erects, constructs, alters, repairs, converts, maintains, or uses any building, structure or land in violation of this ordinance shall be subject to penalties. Unless otherwise specifically provided herein, any violation of the provisions of this chapter shall be punishable by a

fine not to exceed \$1,000.00 or by imprisonment in the county jail for a term not to exceed 90 days, or both, at the discretion of the Municipal Court. Each day that the violation continues, after a notice of violation and a reasonable opportunity to correct or remedy the violation, shall constitute a separate violation.

Section 136-47.4: Effective Date

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

Section 136-47.5: Severability

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

Section 136-47.6: Abrogation and Greater Restrictions

This article is not intended to repeal, abrogate or impair any existing easements, covenants, or deed restrictions. However, where this article and another ordinance, easement, covenant or deed restriction conflicts or overlaps, whichever, imposes the more stringent restrictions shall prevail.

Section 136-47.7: Interpretation.

In the interpretation and application of this Article, all provisions shall be:

- A. Considered as Minimum requirements.
- B. Deemed neither to limit nor repeal any other powers granted under state statutes.

Section 136-47.8: Warning and Disclaimer of Liability

The degree of flooding protection required by this Article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights maybe increased by man-made or natural causes. This Article does not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding or flood damages. This Article shall not create liability on the part of the Township of Cranford or by any officer or employee thereof for any flood damages that result from reliance on this Article or any administrative decision lawfully made thereunder.