MUNICIPAL STORMWATER MANAGEMENT PLAN

FOR

CITY OF BORDENTOWN
BURLINGTON COUNTY
NEW JERSEY

APRIL 2005

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INTRODUCTION

The following Municipal Stormwater Management Plan was prepared using the NJDEP "Sample Municipal Stormwater Management Plan" as a basis for preparation of the plan.

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

A "build-out" analysis was not included in this plan because of the small size of the City (less than 1 square mile). However, the plan addresses the review and update of existing ordinances, the City Master Plan, and other planning documents to allow for project designs that include low impact development techniques.

A mitigation plan is not anticipated at this point in time. However, should mitigation be needed or required for future development, this plan will be amended to include a viable mitigation strategy and then resubmitted to Burlington County and the New Jersey Department of Environmental Protection.

GOALS

The goals of this MSWMP are to:

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

to enhance the domestic, municipal, recreational, industrial, and other uses of water; and

- protect public safety through the proper design and operation of stormwater basins.

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

STORMWATER DISCUSSION

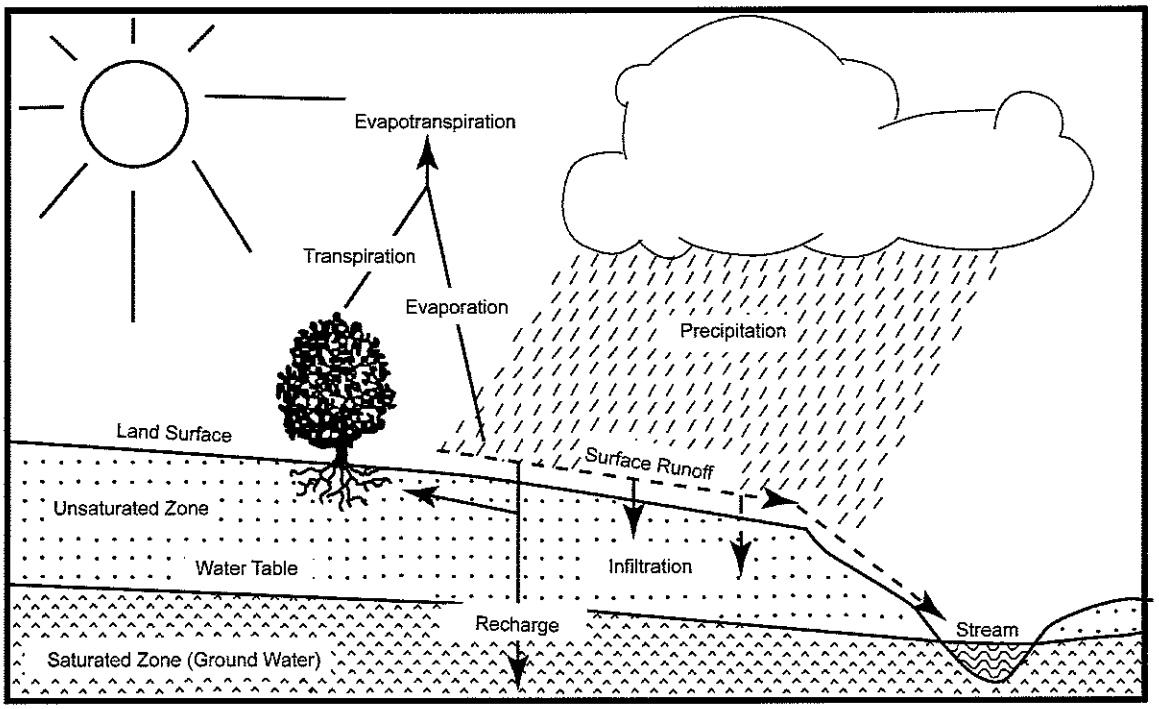
Land development can dramatically alter the hydrologic cycle (See Figure 1) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

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

from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients.

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

Figure 1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32.

BACKGROUND

The City encompasses a 0.96 square mile area in Burlington County, New Jersey. The City is an older, established community where land use is fairly stable. The population of the City has decreased from 4,441 in 1980, to 4,341 in 1990, to 3,969 in 2000. Figure 2 illustrates the waterways in the City. Figure 3 depicts the City boundary on the USGS quadrangle maps.

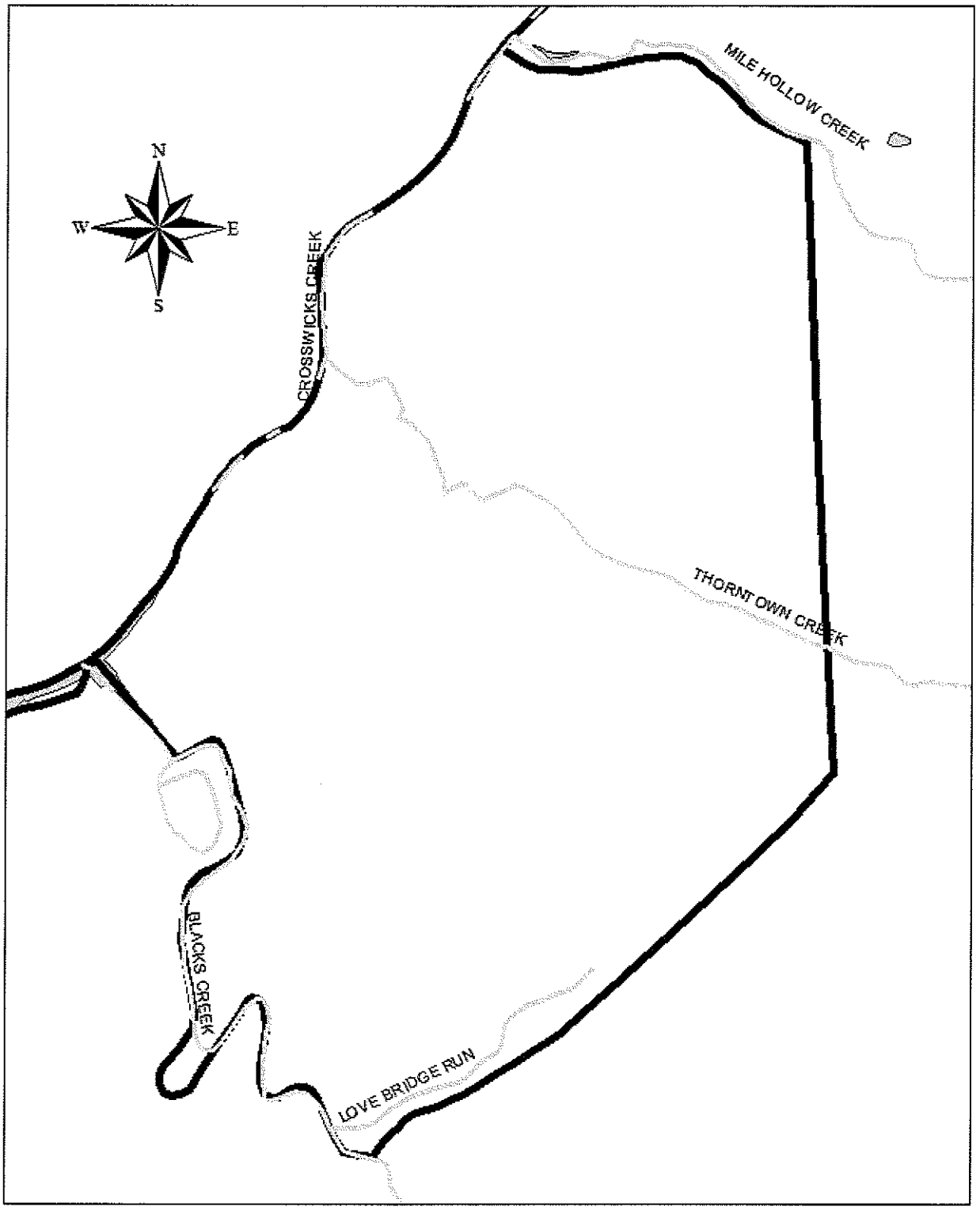
The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on 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.

A Total Maximum Daily Load (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 source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other Best Management Practices (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.

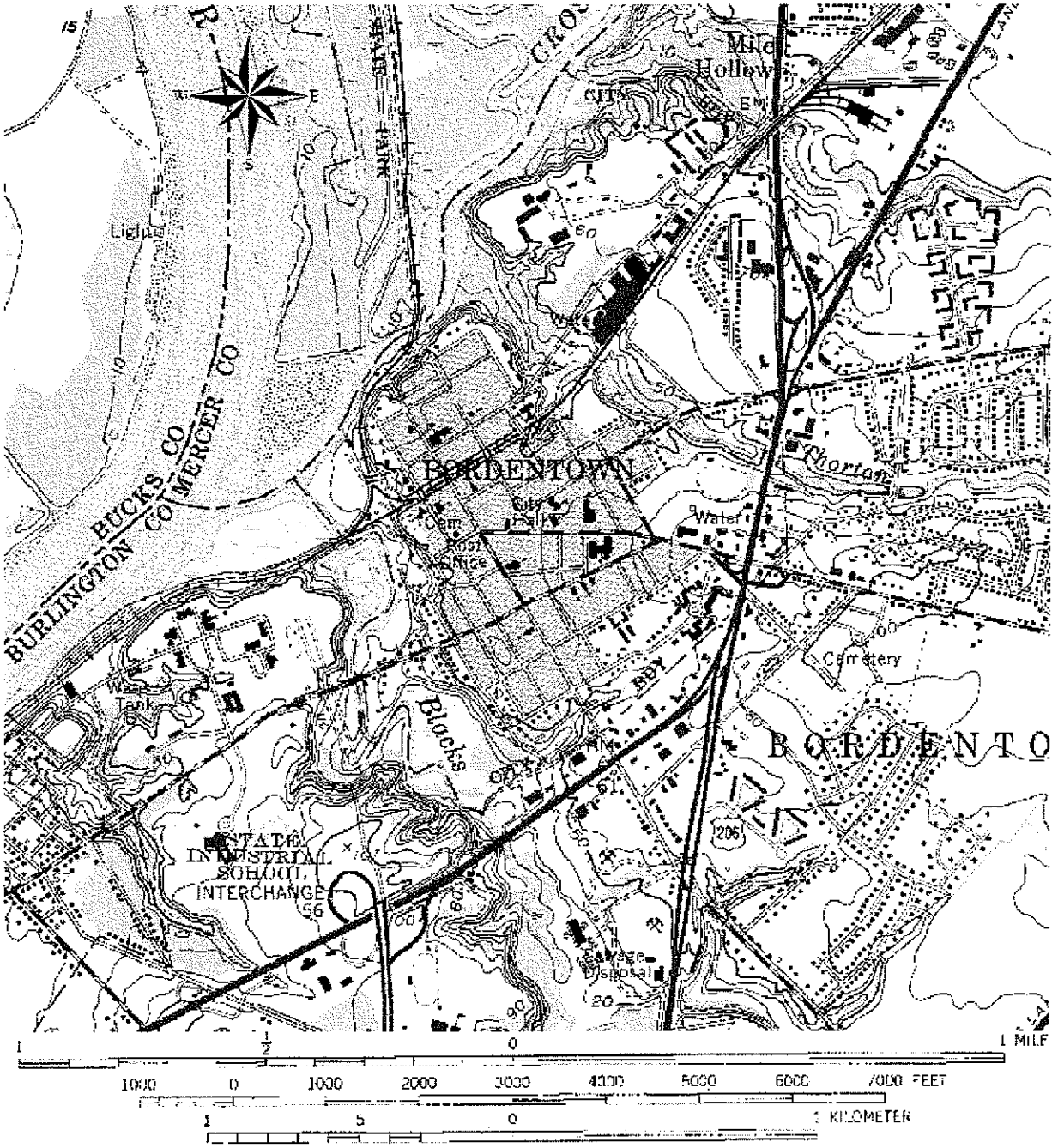
The five water bodies that border or are within the City are Blacks Creek, Thorntown Creek, Love Bridge Run, Mile Hollow Creek, and Crosswicks Creek. According to data from the New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report (305(B) And 303(D)), Crosswicks Creek is impaired. The NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. These data show that mercury in fish tissue and benthic macroinvertebrates exceed the state's criteria near the City. The following parameters exceed the state's criteria in other parts of Crosswicks Creek: phosphorus, fecal coliform, arsenic, cadmium, copper, temperature, pH,

Figure 2: City and Its Waterways



Source: www.nj.gov/dep/gis

Figure 3: City Boundary on USGS Quadrangle



CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET DATUM IS MEAN LOW WATER
THE RELATIONSHIP BETWEEN THE TWO DATUMS IS VARIABLE
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 6.3 FEET

Source: USGS Topographic Quadrangle Trenton East, NJ-PA, Photorevised 1981

dissolved oxygen, nitrate, dissolved solids, total suspended solids, unionized ammonia, chromium, copper, lead, nickel, selenium, and zinc. This means that this creek is an impaired waterway and the NJDEP is required to develop a TMDL for these pollutants for this waterway.There are very few areas of the City that are impacted by flooding. Flooding does occur along the Bordentown Beach area (adjacent to the Delaware River). Another area of flooding is at the end of Limekiln Alley along Blacks Creek. There are four residences at the bottom of the street that have been impacted by flooding from Blacks Creek over the years. Those four homes are going to be purchased and the area will be preserved as open space. Other areas of the City, besides the floodplains along Blacks Creek and Thorntown Creek, are not impacted by flooding.

Neither the frequency nor magnitude of flood events in the City of Bordentown has changed to a noticeable degree during the past 20-year period of land development. The use of best management practices, including prohibition of construction within floodplains, must be continued.

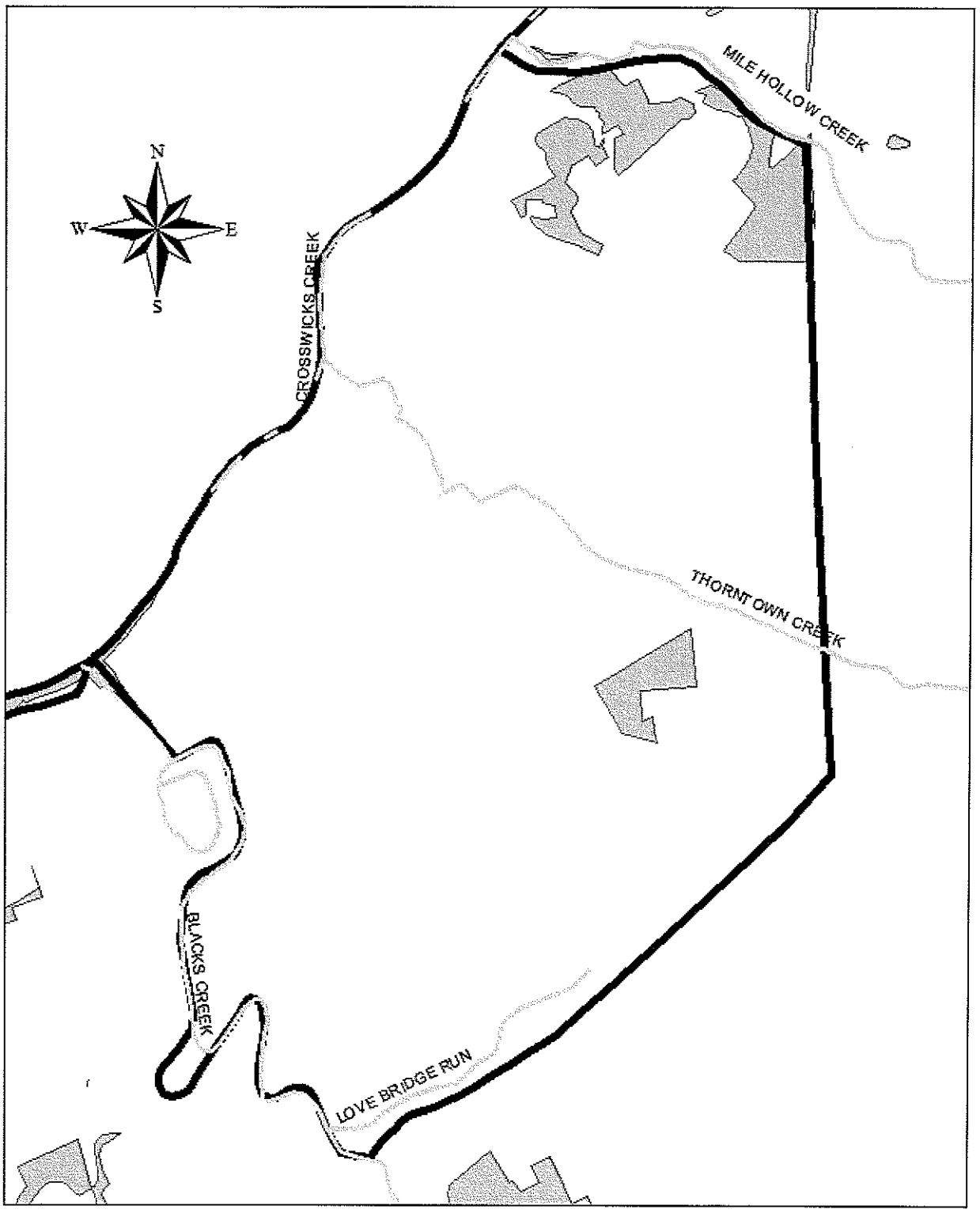
Groundwater recharge is necessary to resupply the aquifers from which potable water wells draw. All of the groundwater for potable consumption in the City is drawn from the Magothy-Raritan geological formation. Wells are located off Route 206 adjacent to the Crosswicks Creek. The characteristics and magnitude of groundwater recharge is dependent on many factors. Land development (including farming) can substantially impact groundwater recharge. Residential and commercial development thwarts recharge by covering the soil, compacting the soil, and piping away runoff. These negative impacts can be substantially mitigated by appropriate zoning and implementation of NJDEP best management practices. These could include vegetated buffers, appropriate native plantings, preservation of natural areas, filter strips, pervious pavement and minimizing soil disturbance, among others. A map of the groundwater recharge areas are shown in Figure 4. Wellhead protection areas, also required as part of the MSWMP, are shown in Figure 5. There are no Wellhead protection areas in the City, according to data retrieved from the NJ Geological Survey website (http://www.state.nj.us/dep/njgs/geodata/dgs02-2.htm#image).

DESIGN AND PERFORMANCE STANDARDS

The City will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and 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 by October 2005.

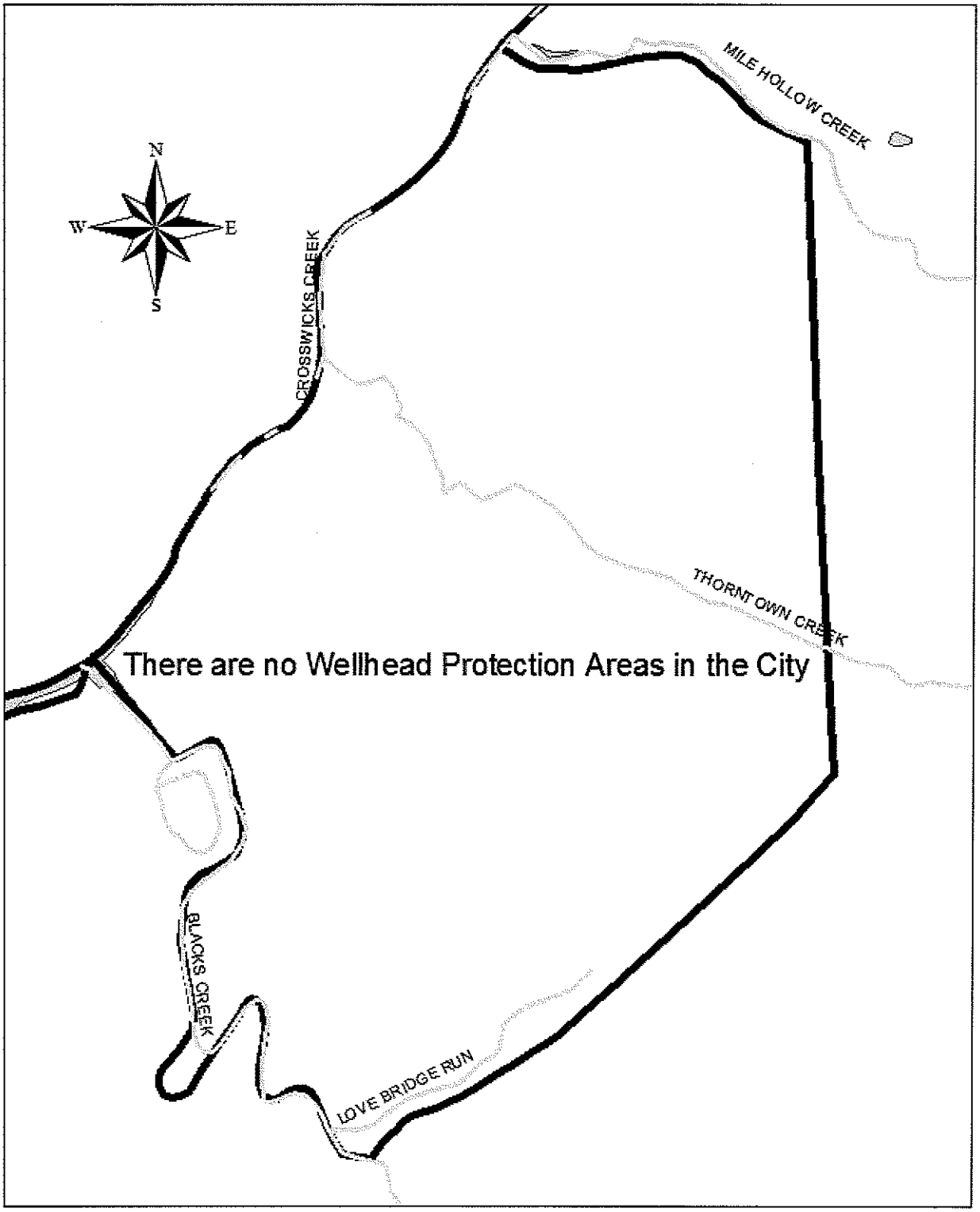
During construction, City inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed.

Figure 4: Groundwater Recharge Areas in the City



Source: www.nj.gov/dep/njgs

Figure 5: Wellhead Protection Areas in the City



Source: www.nj.gov/dep/njgs

PLAN CONSISTENCY

The City is not within a Regional Stormwater Management Planning Area and no TMDLs currently exist for waters within the City; therefore this plan does not need to be consistent with any regional stormwater management plans (RSWMPs) nor any TMDLs. If any RSWMPs or TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent.

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

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

NONSTRUCTURAL STORMWATER MANAGEMENT STRATEGIES

The City is reviewing the master plan and ordinances, and will provide a list of the sections in the City land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. These will be the ordinances identified for revision. Once the ordinance texts are completed, they will be submitted to the county review agency for review and approval by October 2005. A copy will be sent to the Department of Environmental Protection at the time of submission.

Ordinances are now being reviewed by the Planning Board and will be sent to City Council for ultimate approval and passage. Completion expected by October 1, 2005.

LAND USE/BUILD-OUT ANALYSIS

The total area of the City is 0.96 square miles. Therefore, since it has a combined total of less than one square mile of vacant or agricultural lands, the municipality is not required to complete the build-out analysis.

MITIGATION PLANS

A mitigation plan is required to grant a variance or exemption from the design and performance standards of a municipal stormwater management plan. A mitigation plan is not anticipated at this point in time. However, should mitigation be needed or required for future development, this plan will be amended to include a viable mitigation strategy and then resubmitted to Burlington County and the New Jersey Department of Environmental Protection.