Mullica River Watershed
Stormwater Basin Assessment Project

September 2005

New Jersey Pinelands Commission
P.O. Box 7, New Lisbon, N.J. 08064

Summary

This report is presented to the New Jersey Department of Environmental Protection (NJDEP) Division of Watershed Management pursuant to Grant RP01-007 (updated April 7, 2003), entitled "Applying the Pinelands Comprehensive Management Plan and other Planning Tools to Comprehensively Address Water Quality Impairments and Water Supply Issues in the Mullica River Watershed."

In accordance with the work plan requirements, the New Jersey Pinelands Commission conducted visual assessments of selected stormwater infiltration basins within the Upper Mullica River Watershed. Priority was given to impaired subwatersheds, those listed on the NJDEP 303(d) List of Impaired Waterbodies. The purpose of these assessments was to record whether the selected basins were draining completely within 72 hours of cessation of rainfall and to the extent possible, determine why failures occurred. Based on the information collected from the visual assessments, the Commission identified two illustrative sites having inadequate stormwater infiltration systems based upon observed basin failures. The two priority sites selected were located in Winslow Township and Chesilhurst Borough.

The Pinelands Commission retained the services of a professional geotechnical engineering firm to conduct subsurface investigations at the two priority basins. The consultant concluded that improper maintenance, poor site selection and hydraulically restrictive soil layers were the primary causes for impeded infiltration. Interim retrofit measures were employed at the Chesilhurst basin to immediately restore basin infiltration function. The field investigation of the Chesilhurst basin, identified sump structures that terminated above marginally permeable soils. During the investigation, supplemental sumps were installed within the basin at a depth that penetrated the restrictive soils. As a result of this retrofit effort, the infiltration function of this basin has been restored. In the case of the Winslow basin, proposed retrofit procedures have been developed and the Commission has recommended that the basin owner (Winslow Township) retrofit the basin to restore groundwater recharge.

Lessons learned during the project were applied in the development of the Joint NJDEP/Pinelands Model Stormwater Control Ordinance for Pinelands Area Municipalities and in revisions to the Pinelands Comprehensive Management Plan (CMP) (likely adoption early 2006). Moreover, the Commission's findings continue to be integrated into the NJDEP's Phase II Municipal Stormwater Permitting Program through the Commission's continuing participation in the NJDEP's Stormwater Best Management Practices (BMP) Technical Committee.

Background

Stormwater Standards In the Pinelands Comprehensive Management Plan

- The Pinelands Comprehensive Management Plan (CMP) at N.J.A.C. 7:50-6.84(a) 6 requires that the total runoff generated from any net increase in impervious surfaces by a 10-year storm of a 24-hour duration be retained and infiltrated on-site. These standards apply to all major development in the Pinelands, defined as "any division of land into five or more lots; any construction or expansion of any housing development of five or more dwelling units; any construction or expansion of any commercial or

industrial use or structure on a site of more than three acres; or any grading, clearing or disturbance of an area in excess of 5,000 square feet." Additionally, the CMP requires that the rates of runoff generated from the parcel by a 2-year, 10-year and 100-year storm, each of a 24-hour duration, shall not increase as a result of the proposed development.

Site plans developed under these standards usually incorporate stormwater infiltration structures—typically, one or more infiltration basins—to meet Pinelands stormwater volume and runoff rate standards. Infiltration structures are designed to retain stormwater runoff and release it through the soil to recharge groundwater, helping to augment or preserve base flow in streams, and helping to minimize erosion and flooding downstream (Wisconsin Department of Natural Resources, 1994). Infiltration structures also provide filtration of stormwater runoff for removal of TSS and other pollutants, including toxic substances (NJDEP, 2004).

Pinelands Commission Regulatory Programs staff reports that a considerable number of basins constructed are larger and/or deeper than required by the CMP and as recommended by NJDEP guidance (NJDEP, 2004). This may be due to engineering designs that overcompensate in order to infiltrate flows from a 100-year storm. In spite of their increased size and depth, many of the basins do not infiltrate stormwater runoff at acceptable rates. (NJDEP, 2004; Sandra Blick, personal communication, January 30, 2004) A basin will fail to meet CMP requirements if water does not infiltrate from the basin quickly enough to retain the required volume for the next storm event (Kathy Swigon, personal communication, January 2003). The CMP does not specifically address construction standards for stormwater basins except to specify a minimum two-foot separation from the seasonal high water table. The Pinelands CMP is in the process of being amended as a result of lessons learned through this project and in response to the February 2, 2004 revisions to the NJDEP's Stormwater Management Rules. The stormwater basins, which are the subject of this report, predate both the proposed amendments to the CMP and the new NJDEP Stormwater Rules.

NJDEP and other Stormwater Drainage Requirements

Effective February 2, 2004, NJDEP promulgated new Stormwater Management Regulations at N.J.A.C. 7:8. These regulations establish requirements for stormwater management plans, stormwater control ordinances, regional and municipal stormwater management plans, stormwater management basin safety standards and design and performance standards for stormwater management measures. The stormwater regulations are supplemented by the April 2004, New Jersey Stormwater Best Management Practices (BMP) Manual which provides technical guidance for stormwater management measures. As indicated above, all of the basins that are the subject of this report predate the N.J.A.C. 7:8 Stormwater Management Rules and the Stormwater BMP Manual.

The New Jersey Stormwater BMP Manual specifies that an infiltration basin, defined as "a facility constructed within highly permeable soils that provides temporary storage of runoff during rain events... [which] does not normally have a structural outlet to discharge runoff from the Stormwater Quality Storm," should be designed to store and infiltrate the runoff volume generated by the 1.25-inch/2-hour "Stormwater Quality Storm". Likewise, for bio-retention systems, defined as "a soil bed planted with native vegetation located above an under-drained

sand layer," the BMP Manual specifies that the design infiltration rate through the planting soil bed must be sufficient to fully drain the 1.25-inch/2-hour storm runoff volume within 72 hours. It should be noted that the 72 hour drainage criteria is recommended through the BMP Manual and is not a required performance standard. According to the NJDEP recommendation, an infiltration facility should completely drain within 72 hours after any storm exceeding one inch of rainfall; moreover, since permeability may decrease over time due to soil bed consolidation or sediment accumulation, NJDEP requires basin permeability to be designed with a safety factor of two, resulting in an actual "drain time" of only 36 hours (NJDEP, 2004; Sandra Blick, personal communication, February 9, 2004). The NJDEP BMP Manual also specifies "if the water fails to infiltrate 72 hours after the end of the storm, corrective measures must be taken" (NJDEP, 2004).

Several other states take a similar approach. Wisconsin guidelines specify that "infiltration should be completed in not less than 6 hours or more than 48 to 72 hours" in order to "ensure adequate treatment of the stormwater for groundwater protection, protect vegetation and avoid the possibility of anaerobic soil conditions" (Wisconsin Department of Natural Resources, 1994). California's BMP handbook recommends an infiltration rate of 72 hours or less (California Stormwater Quality Association, January 2003). Minnesota recommends maximum drain time of 72 hours, although they note that certain types of vegetation (e.g., turfgrass) may require shorter ponding duration in order to survive storm events (Barr Engineering Company, 2001). Other states recommend an even more conservative drainage time. For example, Maryland's Department of the Environment requires all stormwater management practices not designed with a permanent pool to drain within 48 hours after a storm event (Center for Watershed Protection and the Maryland Department of the Environment, 2000). The North Central Texas BMP Manual recommends that infiltration systems drain within only 40 hours (North Central Texas Council of Governments, 1993).

Potential problems associated with failing stormwater infiltration basins

Infiltration basins, which routinely fail to infiltrate stormwater at an acceptable rate, pose significant environmental consequences. Such basins contribute to increased flooding and nonpoint source pollution and they also may create both public health and aesthetic problems, specifically:

- Flooding - In the Pinelands, infiltration basins are required to be designed to infiltrate the increase in stormwater runoff associated with development of impervious surfaces, and to prevent runoff rates from increasing. A basin that does not meet this design standard may fail to infiltrate the design storm(s) and contribute to downstream flooding from subsequent storms, resulting in potential soil erosion, pollutant transport and even water damage to homes and businesses. Ponded water within a basin displaces storage capacity for a subsequent storm event. This can result in inundation of downstream areas.

- Water quality - In a properly functioning basin, pathogens, nutrients, suspended solids and some toxic substances are captured in the first one to two feet of soil (pretreatment devices that include pre-settling basins, sand filters, bio-filtration swales and vegetative filter strips, are recommended to increase the life of the infiltration area (Wisconsin Department of Natural Resources, 1994)). Although a longer infiltration time may provide some water quality benefits, a basin that no longer infiltrates stormwater may

result in increased flooding and the discharge of concentrated pollutants into surface waterbodies.

- Aesthetic and public health concerns - There are several negative impacts a failing infiltration basin can cause, including:

  - Basins with excessive erosion, sediment accumulation and/or standing water are likely to be regarded as eyesores.

  - Ponded water may facilitate breeding by mosquitoes, which are both an annoyance and a potential carrier of West Nile virus.

  - Canada geese prefer to land on water and to graze on grassy areas within sight of water, making stormwater basins containing standing water attractive to geese. Goose feces damage property, decrease residents' perception of their overall "quality of life", harm water quality and may pose serious health threats due to the presence of disease-causing organisms (USDA APHIS Wildlife Services, 1999).

  - Ponded basins may serve as an "attractive nuisance", a potentially harmful condition that is inviting or interesting to a child and might encourage the child to come onto the property to investigate. A stormwater basin with open standing water or a frozen water surface has the potential to result in the injury or death of a child and the property owner could be held legally responsible.

  - Chain-link fencing is often used as a safety measure to keep children and pets out of flooded basins. However, these fences may be both aesthetically displeasing and require regular inspections and maintenance to ensure that they have not become damaged. In addition, the fences themselves may prove to be a magnet for curious children, who may very well be resourceful enough to get over or through them.

Purpose

The purpose of the Stormwater Basin Assessment Project was to determine the frequency of stormwater infiltration basins failures (based on timeliness of basin drainage) or alternatively, to determine if any single variable such as age, soil type, land use served, etc., could be used as a predictor of basin failure frequency. Another objective was to develop a standard geotechnical protocol that could be used to assess soil and groundwater conditions at the site of failing basins and to identify standardized basin retrofit recommendations and procedures that could be employed to renovate failing basins elsewhere in the Pinelands and Coastal Plain.

Methodology

Study Area and Basin Selection

Based upon selection criteria identified in the project scope of work, an assessment of existing stormwater basins was initiated in 2003 as part of the Mullica Watershed Planning Project. The study area was selected in consultation with NJDEP staff on the basis of existing or potential water quality impairments and available data. Three subwatersheds, Upper Mullica River, Sleeper Branch and Nescochague Creek (see Figure 1), in the northwest section of the Upper Mullica Basin were selected because they represent the most developed area of the Basin. Each of these subwatersheds is currently or projected to be at least 30% "disturbed" (defined here as the combination of urban or developed land and upland agriculture (Mullica Report)). As such, they are unlikely to exhibit characteristic Pinelands water quality.

Figures 2 and 3 compare current and projected levels of disturbance throughout the Basin. Pinelands Commission researchers have found that degraded waters, characterized by elevated pH, specific conductance, and nitrate-nitrogen concentrations, are associated with the more heavily developed and farmed basins in the western portion of the Mullica River Basin (Zampella et al. 2001). Several water quality impairments have been identified in these subwatersheds by both the NJDEP and the Pinelands Commission (303(d) and Mullica Report). All or portions of four municipalities (Chesilhurst, Hammonton, Waterford and Winslow) are located within these three subwatersheds and within the Pinelands defined study area.

A total of 100 stormwater basins are located throughout the four municipalities within the study area. Basins were identified using lists provided by the towns and their municipal engineers, by reviewing Pinelands Commission applications and by analyzing the 2000 aerial photographs. Utilizing ArcView, basin locations were matched to a parcel database by block and lot numbers, street addresses and the 2000 aerial photographs. In the event of a basin that could not be verified by observing the 2000 aerial photographs, staff field-verified the presence of the basin and recorded its location using a Global Positioning System. Seven basins were excluded from the total set either because access could not be gained to view the basins or they otherwise could not be field-verified. The location of all the stormwater basins identified in this study can be found in Appendix A.

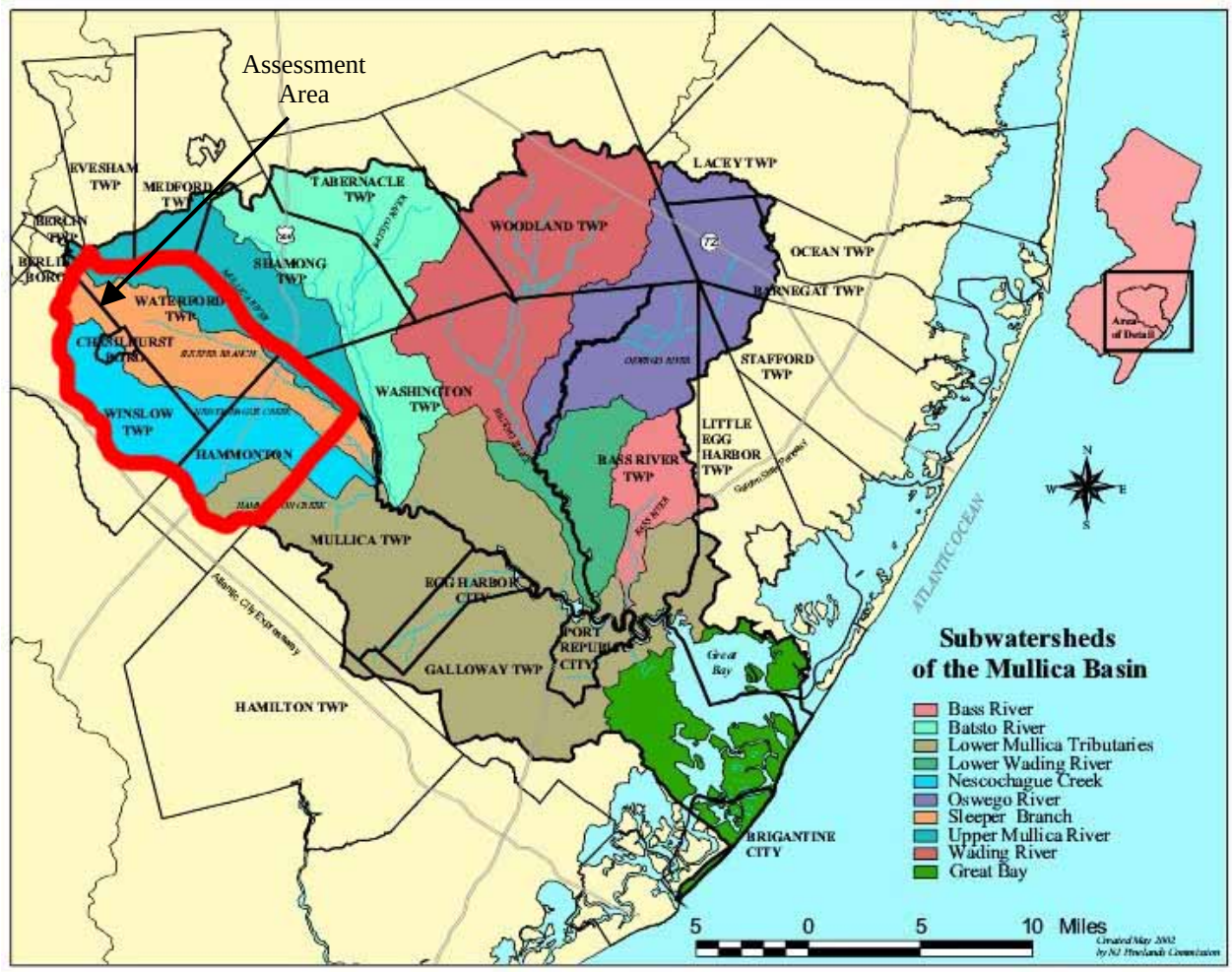


Figure 1. Municipalities and subwatersheds of the Mullica Watershed

From the reduced set of ninety-three basins, a sample of forty-seven basins was selected using a random stratified sampling method by soil type, with each municipality considered as a separate dataset. Soil types were identified using the Soil Survey Geographic (SSURGO) databases for Atlantic and Camden Counties (USDA-NRCS, 2003). For basins that included more than one soil type, only the dominant soil type was considered. For each soil type represented as the dominant soil type in four or more basins in the municipality, a sample of 25% of the basins was selected randomly. For each soil type represented as the dominant soil type in three basins, a sample of two basins was selected randomly. For each soil type dominant in only one or two basins, a sample of one basin was selected randomly. Because only six basins were identified in Chesilhurst, all were included in the study sample.

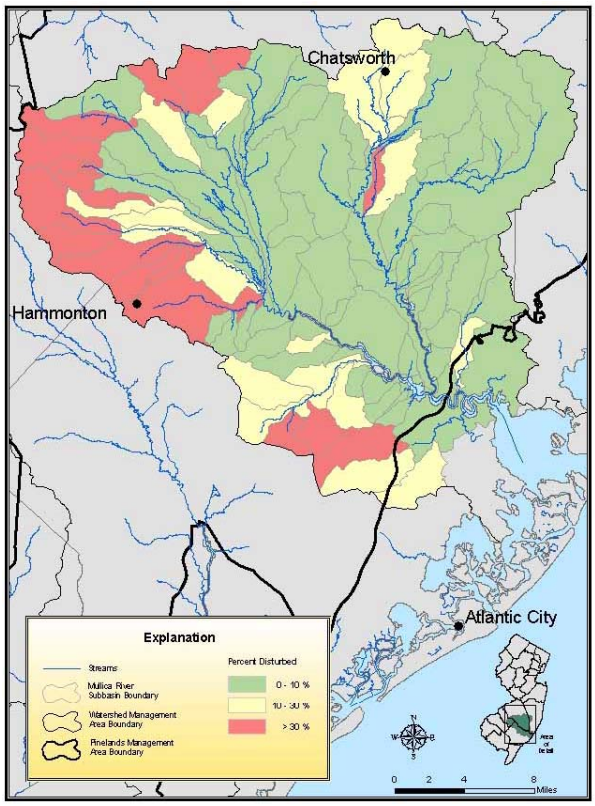


Figure 2. Percentage of disturbed land in the Mullica Watershed.

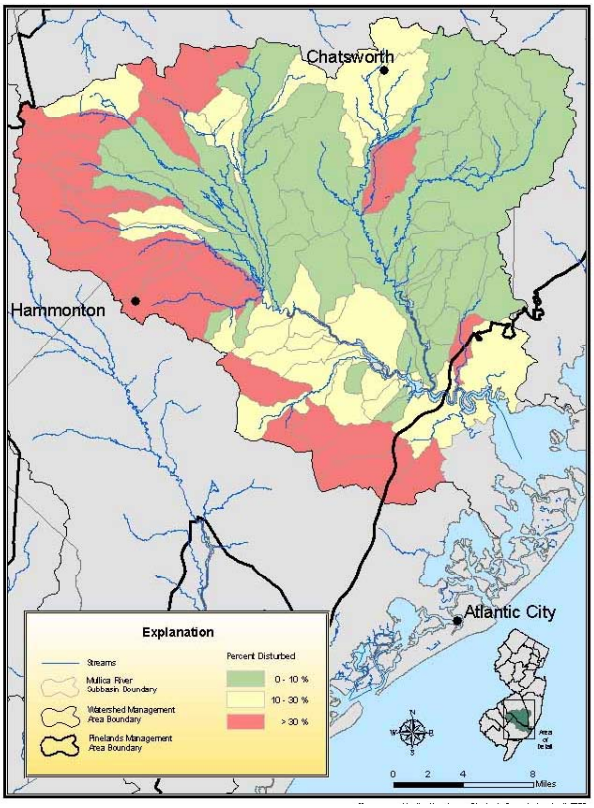


Figure 3. Potential percentage of disturbed land using an average of four ultimate growth scenarios in the Mullica Watershed.

The breakdown of basins by municipality is as follows:

Municipality	Total basins identified	Total basins assessed	% of total assessed
Chesilhurst	6	6	100%
Hammonton	31 (2 excluded)	19	61%
Waterford	30 (2 excluded)	10	33%
Winslow	33 (3 excluded)	12	36%
All	100 (7 excluded)	47	

Visual Assessments

The purpose of the visual assessment was to determine whether or not the selected stormwater basins are functioning properly (i.e., whether the basin completely drains within 72 hours of a storm exceeding one inch of rainfall). A team of two observers visually assessed each basin between June and December 2003. Assessments were conducted after at least 24 hours with no recorded rainfall and less than 1 inch of rainfall in the previous 72 hours (United States Geological Service Weather Data, 2003). All but ten assessments were done after at least 72 hours without any recorded rainfall; of these, six assessments were done after 0.64 inches of rainfall were recorded 25 to 72 hours prior to the day of the assessment and seven assessments were done after 0.82 inches of rainfall were recorded 25 to 72 hours prior to the day of the assessment. Digital photographs were taken of each basin and observations were recorded and are provided in Appendix B.

The initial purpose of the visual assessment was to determine whether or not stormwater basins were holding water longer than the desirable amount of time. Since access to every section of every basin was not available, staff attempted to estimate the portion of the basin floor covered by water using observation, rather than directly measuring water depth or area. This method allowed the observers to differentiate between a basin where water had ponded in one or two locations (e.g., at an inlet) versus one where the ponding appeared evenly distributed throughout the basin. The assessors placed each basin into one of five categories:

0)	0% (dry)
1)	< 25% of basin's floor surface area covered by water
2)	25 - 50% of basin's floor surface area covered by water
3)	50 - 75% of basin's floor surface area covered by water
4)	> 75% of basin's floor surface area covered by water

Discussion of Findings

Visual Assessments

Seventy percent (70%) of the forty-seven basins assessed (33 of 47) were observed to have standing water present on the basin bottom. Forty-seven percent (47%) of the basins (22 of 47) were estimated to have 75% or more of their floors covered by water. Other attributes that were observed and recorded in the field are summarized in Appendix C and are discussed in detail below:

Erosion and sedimentation

Storm events, wind action, construction activities and foot traffic within and/or around the basin have the potential to erode the soil. Erosion of the walls and floor of the infiltration basin can create excessive amounts of sediment, resulting in clogging, reduced infiltration rates and subsequent failure of the basin (NJDEP BMP Manual, 2003). Sediment may also be transported via stormwater runoff entering the basin.

Since access to most of the stormwater basins was limited due to fencing, sedimentation was difficult to observe and measure. Obvious evidence of erosion or sedimentation was documented in five of the forty-seven basins observed. These five basins had <25% water covering the basin floor or were completely dry. In this study, erosion and sedimentation did not appear to have a significant impact on basin hydraulic performance. However, the presence or absence of fine grained sediments (organics and inorganic silts) below ponded basins in these visually assessed basins could not be confirmed as at least contributing to the long-term presence of standing water. A muck layer (wet organic and inorganic silts) was observed in the two basins subjected to geotechnical investigation and appeared to play a role in the persistent ponding of those two facilities.

Debris

Trash, leaf litter and other debris may enter a stormwater basin via stormwater runoff, wind, improper waste disposal practices and/or littering. Not only does this create an

aesthetic problem, but it can also result in clogging and reduced infiltration rates. Matted leaves can effectively seal a basin bottom and lead to severely impeded drainage. The presence of leaves was not recorded during field observations, however, the absence of matted leaves on basin bottoms could not be confirmed due to ponded conditions.

Thirty-five basins contained debris, of which 71% had some amount of standing water. Types of debris found in stormwater basins varied from basic street litter to large trashcans. While no direct correlation was established between the presence of debris and basin failure, the presence of debris is indicative of inadequate basin maintenance. The geotechnical investigation cited lack of maintenance as one of the contributing causes of basin failures.

Evidence of recent mowing/maintenance

Commission staff observed evidence of landscape maintenance activity in and around 27 of the 47 (57%) basins visited. Landscape maintenance was typified by mowing of vegetation. Evidence of recent mowing in and around basins does not necessarily indicate that more time-consuming and/or costly maintenance such as dewatering and/or dredging occurs. No evidence of intensive maintenance measures such as tilling, disking, raking, scraping, aerating or scarification was observed at any of the 47 basins.

Even though 57% of the basins appeared to be mowed, 74% of those had standing water present, indicating that mere mowing provides little or no benefit to basin hydraulic performance. The complete absence of evidence of intensive basin bottom soil manipulation via tilling, disking, scraping, raking or other methods of scarification does suggest that in the absence of these maintenance activities, basin hydraulic performance is likely to diminish over time.

Wetland vegetation

Although wetland vegetation can remove a wide range of stormwater pollutants from land development sites, as well as providing wildlife habitat and aesthetic features, the presence of emergent wetland vegetation in the basin suggests that stormwater may not be infiltrating at an adequate rate to meet CMP standards and/or the seasonal high water table is too close to the basin floor (NJDEP BMP Manual, 2003), suggesting less than two feet of separation between the basin bottom and groundwater levels.

Wetland vegetation was witnessed at twenty-seven of the forty-seven basins (57%). Nearly all of the basins that exhibited wetland vegetation (96%) also had some standing water present. While the presence of vegetation is not considered to contribute to impeded drainage, the presence of hydrophytes indicates periodic and recurrent saturation of basin soils, due to either regional or perched zones of soil saturation. Any infiltration basin in which hydrophytes are present should be subjected to intensive soil health restoration measures to prevent or interrupt the development of zones of soil saturation.

Additional Assessments

Mapped Soil Type

Soil mapping of the forty-seven basin locations indicated that twenty-one soil types

were present at the ground surface prior to basin construction. Thirteen of these mapped soil types were associated with basins with at least 75% of the basin bottom being under water. As part of the study, basins were classified by mapped soil type and hydrologic soil group. Appendix D contains several tables that summarize basins by soil type.

Soil mapping units were determined to be a poor predictor of basin hydraulic performance. This is likely due to two principal reasons. The first is that soil mapping addresses only surficial soil properties and does not characterize deeper sediments. Since the majority of stormwater infiltration basins are located in earthen excavations, much if not all of the classified surficial soil is removed during the basin excavation process. This results in basins frequently being constructed in unclassified sediments. The second factor, which likely precludes using soil-mapping units to predict basin infiltration, is the scale at which soil maps are prepared. The soil maps may be used to draw preliminary conclusions regarding soil characteristics in a particular area; however, they should never be used to develop site suitability conclusions at the scale of individual lots.

Based on the above concerns, the Pinelands Commission is revising its regulations to require that a minimum number of soil tests pits be excavated at the site of a proposed infiltration basin, that the depth of each test pit characterize the soils underlying the proposed basin bottom to a minimum depth and that a minimum number of field permeability tests be conducted at each proposed basin location to establish hydraulic conductivity rates in the receiving soils located below each infiltration basin.

Hydrologic Soil Groups

The preferential placement of basins in various hydrologic soil groups relates to the ability of the soil to renovate stormwater prior to its release to water table aquifers. For water quality purposes, existing CMP requirements suggest basins not be placed in "excessively" or "somewhat excessively" drained soils but should instead be placed in slower draining soils.

The USDA Natural Resource Conservation Service classifies soils into four hydrologic soil groups:

Group A: low runoff potential, high infiltration rates
Group B: moderate infiltration rates
Group C: low infiltration rates
Group D: high runoff potential, low infiltration rates
(NRCS 210-VI-TR-55, Second Ed., June 1986)

As indicated earlier, revisions are underway to existing Pinelands CMP regulations. To address concerns with inadequate stormwater renovation in soils that drain too rapidly, a maximum permeability rate of 20 inches per hour has been established. This requirement will replace reference to "excessively" and "somewhat excessively" drained soils.

NJDEP guidance stipulates "the use of infiltration basins for stormwater quality control is feasible only in small drainage areas where soil is sufficiently permeable to allow for a reasonable rate of infiltration. Therefore, infiltration basins can be constructed only in areas with soils in Hydrologic Soil Groups A or B" (NJDEP, 2004). Of the eleven sample basins with a dominant mapped soil type in hydrologic group A, seven basins (64%) were observed to have standing water. Twenty-four basins with soils in hydrologic group B were also assessed, with a total of twenty (83%) observed to have standing water.

Three basins constructed in soils mapped as predominantly "C" soils were also assessed; two (67%) of these were observed to have standing water. Similarly, five basins with predominantly mapped "C/D" soils were assessed and three (60%) found to have standing water. Finally, three basins with predominantly mapped "B/D" soils were assessed and only one was observed to have standing water. For the same reasons cited for a lack of correlation between basin performance and mapped surficial soil mapping units, there was no significant correlation between mapped soil hydrologic group and the presence or absence of standing water.

Impact of Type of Development

Development types associated with each basin were also recorded. The sample included five development types: commercial, private institutional (e.g., nursing home), public - municipal or county (e.g., county library), residential subdivision, and residential & commercial (e.g., basin located adjacent to both development types and apparently receiving flow from both). As the following results suggest, there did not appear to be a significant correlation of development types with the presence or absence of standing water. Each development type was associated with at least 67% of the assessed basins having standing water.

# of basins assessed	Development type	# / % of basins with standing water
11	Commercial	8 / 73%
3	Private institutional	2 / 67%
4	Public (municipal & county)	3 / 75%
27	Residential subdivision	19 / 70%
2	Residential & commercial	2 / 100%

Age of Basins

Several studies have suggested that older basins tend to have a higher failure rate than newly constructed ones. For example, one New Jersey report estimated that infiltration structures have a lifespan of only two to five years (Van Orden and Kelly, 1999). Another study in St. Louis Missouri suggests that "infiltration basins can have a lifespan of five to ten years but failure can occur within five years due to rapid clogging," especially near roadways (East-West Gateway Coordinating Council, 2000). The United States Environmental Protection Agency (USEPA) also suggests that infiltration basins are prone to rapid clogging (Strassler et al., 1999).

Utilizing NJDEP Land Use/Landcover GIS data in conjunction with digital aerial photography, each stormwater basin was categorized into one of four age brackets (see table below). When grouped by age, the percentage of basins with standing water does not follow any particular pattern, therefore, ruling out age as a indicator of basin failure.

Age Group	Total Number of Basins	Number of Basins with Standing Water
2002 to Present	1	0 (0%)
1995 to 2002	22	17 (77%)
1986 to 1995	9	7 (78%)
Prior to 1986	14	9 (64%)

Other Contributing Factors

The high proportion of basins observed to be holding water, and the weak association of any particular pre-construction soil mapping data, pre-construction mapped soil hydrological group, development type or age with either the presence/absence or quantity of water found within the basins in this sample suggests that other, less visible factors may be responsible for the success or failure of individual infiltration basins.

Improper Construction

Soil compaction and sedimentation may impede basin infiltration rates. Basins are often vulnerable to both compaction and clogging due to sediment transport during construction. NJDEP's BMP Manual cautions that subgrade soils must be protected from compaction by heavy equipment and contamination and clogging by sediment during construction (NJDEP, 2004). EPA notes that "excessive compaction due to construction equipment may cause… reduced infiltrative capacity" and "excessive sediment generation during construction and site grading/stabilization may cause premature clogging of the system" (EPA, 1999). Research by the Ocean County Soil Conservation District suggests that soil infiltration rates are significantly reduced due to increases in bulk density associated with soil compaction during construction activities (Ocean County Soil Conservation District et al., 2001). The impact of construction equipment on soil bulk density and permeability may be nearly immediate; one report suggests, "the first pass by heavy machinery causes 70 to 90% of the total soil compaction that the implement is capable of achieving" (Schuler et al., 1986).

In addition, research by the Ocean County Soil Conservation District suggests that even “suitable” A and B hydrologic soils, which normally have good infiltration rates, can become compacted following grading and disturbance until they have characteristics of C or D soils (David B. Friedman, personal communication, June 2000). The Pinelands Commission was unable to document construction practices employed during the construction of the basins assessed in this report, as this information was not available. The Commission’s geotechnical engineer performed soil permeability testing on the two infiltration basins investigated. In both basins, impeded infiltration was attributed in part, to marginal permeability of basin soils. Reduced permeability is apparently due to fine soil textures (silts and clays). Poor permeability in these fine-

grained soils may be exacerbated by compaction during basin construction, especially under certain soil moisture conditions.

Soil compaction outside the basin, but within the drainage area, may also impact the basin's infiltration efficiency. For example, some research suggests that lawns in residential subdivisions may be rendered largely impermeable by compaction by construction equipment, resulting in increased runoff volume and rate that may not have been accounted for in the basin's design (Schuler et al., 1986; Ocean County Soil Conservation District et al., 2001).

As above, lessons learned through this assessment of failing stormwater infiltration basins have been incorporated in the proposed amendments to the stormwater management provisions of the Pinelands CMP and the Joint NJDEP/Pinelands Model Stormwater Management Ordinance for the Pinelands Area Municipalities. To address problems with basin compaction, the Commission has developed standards for construction equipment and construction methods. In addition, pre- and post construction permeability testing will be required to assure that assumed design permeability is attained in the basin, after construction is complete. To preclude sediment transport and resultant clogging of basin infiltrative surfaces, the Commission has developed standards to protect basins during the highly critical site construction activities. The new standards call for stormwater to be diverted either to temporary stormwater management facilities or into the final recharge basin provided that the infiltrative surface will be protected from sediment clogging by soil cover to be removed only upon complete stabilization of site areas.

Basin Maintenance Plans

Regular maintenance is critical to the effectiveness of any infiltration structure—or, indeed, any stormwater management practice (NJDEP, 2004; Woelkers, 2004; Wisconsin Department of Natural Resources, 1994; USEPA, 1999). One consulting firm notes that a maintenance program and schedule are important to ensure not only that the infiltration capacity of the basin is maintained, but also that the passage of pollutants into receiving streams is minimized (Maser Consulting, 2002). Regular basin inspections should include a check of the stability of slopes and embankments (including the emergency spillway), evidence of ponding on the basin floor, deterioration or obstruction of the low-flow channel, and the condition of trash racks, fencing and gates, and access ways (Maser Consulting, 2002). NJDEP recommends that basins be inspected for clogging and debris and sediment accumulation at least four times annually as well as after every storm exceeding 1 inch of rainfall (NJDEP, 2004).

The Pinelands CMP currently requires a 4 and 10-year maintenance agreement for every stormwater facility associated with a new development. The specific elements of this agreement are generally left to the discretion of the municipality, which also retains enforcement responsibility. In cases where stormwater basins have been employed for more than 10 years, it is likely that these agreements are not renewed. Moreover, a review of several sources suggests that the lifespan of an infiltration basin is between two and twenty years; this implies that "maintenance" should include replacement or major

renovation of the basin when it has outlived its usefulness. Current NJDEP regulations require municipalities to enter into maintenance agreements "in perpetuity" for stormwater facilities (NJDEP, 2004).

Commission staff reviewed the site plans of selected stormwater basins within the study sample. Each site plan contained some type of stormwater management maintenance program. These programs contain minimum requirements for both routine and long-term maintenance, including annual, visual inspections. One particular plan mandated, "every seven years, each basin bottom shall be scarified to a depth of four inches to remove sediments and silts." Many basins include stone trenches, sumps or seepage pits that need to be routinely cleaned or replaced. Follow up site visits to these same basins indicated that the required basin maintenance is not occurring. The geotechnical assessments of the Winslow and Chesilhurst basins echo the need for long-term maintenance and provide specific maintenance recommendations.

Site Selection

In addition to reviewing site plans for maintenance schedules, Pinelands Commission staff also reviewed the soil logs and percolation tests that were conducted prior to construction. Evidence of potentially hydraulically restrictive soils immediately below the basin floor was observed in some plans; however, the infiltration basin designs did not address the potential adverse impact of these soils. In other instances, site selection evaluations did not address soil morphological properties (e.g. soil mottling indicating periodic and recurrent soil saturation) and/or employed inaccurate assessment of soil permeability. Improper or inadequate testing before construction of stormwater basins may lead to improper site selection, which could be potential cause of basin failure at these particular sites.

Again, the Commission employed lessons learned in this study to the development of amendments to the Pinelands CMP and the Joint NJDEP/Pinelands Model Stormwater Management Ordinance for Pinelands Area Municipalities.

Staff identified that the majority of site assessments for the infiltration basin placement were performed using a single manual soil auger boring. Soil auger borings severely limit the site evaluator's ability to observe critical soil morphological features such as structure and consistency and were determined by the Commission to be inadequate for site selection of infiltration basins. New site selection standards developed by the Commission require that a minimum of two backhoe test pits be performed. Test pit minimum depth requirements are based upon the maximum water level within a basin, such that deeper basins require deeper test pit explorations.

The Commission has developed minimum permeability test requirements that specify select field test methodologies to be employed at each proposed infiltration basin. In addition, the Commission is incorporating a requirement for a ground water mounding analyses to ensure that groundwater mounds, should they develop as a result of stormwater infiltration, will not adversely effect adjacent subsurface structures, cause down gradient seepage, or result in inadequate basin drainage time. All soil evaluation

data, which serves as the basis for infiltration basin design, must be certified by licensed professional engineers under the Commission's standards.

Stormwater Basin Pilot Study

Selection Process

The second objective of this project was to identify one or two basins appropriate for further inspection and possible retrofitting or remediation. Pinelands staff narrowed the possible field to the twenty-two stormwater basins that were observed having 75% or more of its floor covered by standing water. As noted earlier, preliminary analysis of soil type, soil hydrological group and land use did not produce any definitive example of a failing basin, therefore another method of selecting a pilot basin was needed. Staff decided to limit the pilot study to basins located at public facilities that were easily accessible. Three stormwater basins fit this criterion: the Chesilhurst Public Works garage (Chesilhurst), the Lower Camden County Regional Library (Winslow) and the Edward Duble Senior Center (Winslow). A map of the locations can be found in Appendix D).

Pinelands staff revisited each of the three sites during the summer of 2004 to perform a more thorough visual assessment. Again, all three basins exhibited a significant amount of standing water (>75%) at the time of the 2004 visit. Using a hand auger, soil borings were done to a depth of ten feet to assess the following conditions: soil compaction, soil layer type and depth to seasonally high water table. At all three locations, the water table was not encountered but intermittent clay lenses were present. Visual observations of the surrounding environs, such as plant types, land use, topography, inlets, outlets and overall design did not reveal any obvious obstructions to infiltration. Interviews with the entities responsible for the maintenance of the property revealed that only minimum upkeep (lawn mowing on the banks of the basin) was completed. Site plans of the basins were reviewed and evidence of restrictive clay layers and mottling were recorded during the initial soil tests. From these observations, wetland conditions (a high water table) were ruled out as a cause of basin failure at all three sites.

The Pinelands Commission determined that the stormwater basin located at the Southern Camden County Regional Library would not be included in further investigations based upon field observations and discussions with the library superintendent. While otherwise a candidate for further study and remediation, it was learned that the library uses this ponded basin, which supports numerous fish, frogs, turtles, invertebrates and birds, for field ecology lessons. The two remaining sites, the Chesilhurst Public Works garage and Edward Duble Senior Center were selected for the pilot study. The Commission offered each municipality the opportunity to participate in the study and agreed to share the consultant's findings, including recommended retrofit procedures. The municipalities were requested to provide site access and to provide a backhoe and operator to facilitate test pit explorations. In both cases, the municipalities also arranged to permit equipment and personnel access to the infiltrative surfaces of the inundated basins (Letters are included in Appendix F).

Results

Retrofit demonstration basins

The contract between the Pinelands Commission and the NJDEP called for retrofitting/remediating one or two failing stormwater basins, as funding permited. Princeton Hydro, LLC, was retained on the basis of a competitive bidding process to provide a detailed a geotechnical evaluation of two failing basins, to identify the cause(s) for basin failure and to provide remediation strategies. Elements of the geotechnical study included:

- Determination of the age of the basin, types of soil tests that were performed before construction, what types of construction practices were used and what practices were applied during the basin design.
  - Was the basin used as a sediment basin during construction?
  - Was the bottom layer of soil removed upon completion of construction?
  - What other factors influencing basin performance?

- Perform soil permeability and/or percolation tests to determine if basin was sited appropriately.

- Determine if the depth to seasonal high water table was documented correctly.
  - Was determination made based upon apparent saturation or from observations of redoximorphic features?
  - Were methods appropriate for the soil type?

- Determine whether mounding of the water table has occurred.

In the winter of 2005, Princeton Hydro, LLC performed a detailed review of plan documents and undertook an extensive field investigation with assistance from the Pinelands Commission, Chesilhurst Borough and Winslow Township Public Works Departments. Princeton Hydro, LLC submitted a report entitled, "Subsurface Investigation of Recharge Basins – Edward Duble Senior Center, Winslow Township and Chesilhurst Public Works Building, Chesilhurst Borough" in the spring of 2005 and accompanies this document (Appendix E). It is the Commission's belief that this report not only provides the information necessary to retrofit the two basins investigated but that the methodology employed in the investigation and detailed in the report can serve as a valuable protocol for others to follow in investigating similar basin failures.

Based upon stormwater basin plan review and prior field investigations, the Commission purchased geo-textile fabric and secured a donation of clean stone from a local business for use in the renovation/supplementation of the infiltration sumps that help drain the Chesilhurst Public Works basin. During the field assessment of the Chesilhurst basin, supplemental sumps were installed adjacent to the existing sumps in a manner that penetrated hydraulically restrictive soils left in place below the original sumps. As a result of these supplemental sump installations, the Chesilhurst basin is now draining adequately. Both Winslow Township and Chesilhurst were informed that they would be requested to implement retrofit measures identified by the geotechnical

consultant. Since retrofit of these basins will be the responsibility of the local governing bodies, implementation of these measures will be subject to local availability of funding.

Consider changes to Pinelands regulations

The information gathered from the visual assessments, staff research and the Princeton Hydro report has assisted the Pinelands Commission during its review of the CMP regulations and the development of the Joint NJDEP/Pinelands Model Stormwater Control Ordinance. Currently, the CMP does not address specific elements of basin construction and maintenance that are referenced in NJDEP stormwater regulations at N.J.A.C. 7:8, however, the Commission has proposed to incorporate new provisions to ensure the successful construction and maintenance of stormwater structures in the Pinelands. Provisions include requirements for regular inspections and maintenance (including dewatering and removal of accumulated sediment) in perpetuity. The Commission will also consider encouraging the creation of stormwater utilities, i.e., entities that would retain responsibility for maintenance (including remediation of failing basins).

Address existing basins

Based on the findings of this assessment, research by others and similar construction techniques, it is reasonable to assume that many other stormwater infiltration facilities throughout the Pinelands are also currently failing and require maintenance or remediation. The Commission continues to work with the NJDEP and its Stormwater BMP Technical Committee to prevent future failures and to address existing failures. It will be useful once the Pinelands Area counties and municipalities compile inventories of stormwater basins where one does not exist (required by the NJPDES Phase II Municipal Stormwater Permitting Program at N.J.A.C. 7:14) to assess the condition of these basins and to require remediation of these basins.

Entities proposing to assess existing basin failures would benefit from reviewing and implementing the investigation methods employed by Princeton Hydro, LLC in their assessment of the two priority basins addressed in this report.

Conclusion

Visual assessments conducted in 2003 revealed seventy percent (70%) of sampled stormwater basins in the study area did not infiltrate water within the proper time period. These field visits alone, however, were not comprehensive enough to conclusively determine the causes of basin failure. A professional geotechnical engineering firm with the proper resources had the ability to investigate the subsurface characteristics of these two priority basins, determine the impediments to infiltration and suggest corrective measures. The results of this study will be shared with the owners of the basins and have provided guidance to Pinelands Commission staff during CMP revisions. In addition, background research for this report revealed severe deficiencies in the site selection and soil assessment methodologies, construction practices, post construction performance verification and long-term basin infiltration surface maintenance. The methods utilized in the investigation and detailed in the Princeton Hydro Report can serve as a model protocol for other entities investigating similar basin failures.

References Cited

Barr Engineering Company. 2001. Urban Small Sites Best Management Practice Manual. Metropolitan Council Environmental Services, St. Paul, MN. <www.metrocouncil.org/environment/watershed/bmp/manual.htm>

California Stormwater Quality Association. 2003. California Stormwater BMP Handbook: Municipal. Livermore, CA. <www.cabmphandbooks.com/Documents/Municipal/TC-11.pdf>

Center for Watershed Protection and the Maryland Department of the Environment. 2000. Maryland Stormwater Design Manual, Volumes I & II. Baltimore, MD.

East-West Gateway Coordinating Council. 2000. Highway Runoff and Water Quality Impacts. St. Louis, MO. <www.ewgateway.org/pdffiles/library/aq/wqhwywords.pdf>

Galli, J. 1992. Analysis of Urban BMP Performance and Longevity in Prince George's County, Maryland. Metropolitan Washington Council of Governments, Washington, DC.

Maser Consulting, P.A. 2002. "Stormwater Management Facilities Inventory and Mapping. Operation and Maintenance Manual for the Township of Mendham, Morris County, New Jersey." Prepared for the Mendham Township Environmental Commission under a grant from the NJDEP Environmental Services Program (Grant ES01-048).

North Central Texas Council of Governments. 1993. Stormwater Quality Best Management Practices for Residential and Commercial Land Uses. Arlington, TX. <www.highwaybmp.dfwinfo.com/NCTCOG_PDF/Infiltration.pdf>

Ocean County Soil Conservation District, Schnabel Engineering Associates, Inc. and USDA Natural Resources Conservation Service. 2001. Impact of Soil Disturbance During Construction on Bulk Density and Infiltration in Ocean County, New Jersey. <www.ocscd.org/soil.pdf>

Orden, George Van and Fred Kelly. 1999. A Cleaner Whippany River Watershed: Nonpoint Source Pollution Control Guidance Manual for Municipal Officials, Engineers, and DPW Personnel. NJDEP Division of Watershed Management, Trenton, NJ.

Schuler, R., B. Lowery, R. Wolkowski and L. Bundy. 1986. Soil Compaction: Causes, Concerns and Cures. University of Wisconsin-Extension Report A3367. Madison, WI.

Strassler, E., J Pritts, and K. Strellec. 1999. Preliminary Data Summary of Urban US Stormwater Best Management Practices (EPA-821-R-99-012). Environmental Protection Agency: Washington, DC. <www.epa.gov/OST/stormwater/usw_c.pdf>

United States Department of Agriculture, Natural Resources Conservation Service. 2003. Soil Survey Geographic (SSURGO) databases for Atlantic County, and Camden County, New Jersey.

United State Department of Agriculture, Natural Resources Conservation Service: Fort Worth, Texas.

United States Department of Agriculture, Natural Resources Conservation Service Conservation Engineering Division. 1986. Technical Release 55: Urban Hydrology for Small Watersheds (TR-55). Washington, DC. <ftp://ftp.wcc.nrcs.usda.gov/downloads/hydrology_hydraulics/tr55/tr55.pdf>

United States Geological Service Weather Data, recorded at Station # 01411000, "Great Egg Harbor River at Folsom, NJ." <http://waterdata.usgs.gov/nj/nwis/current?type=weather> Accessed September 17, 2003; September 26, 2003; October 3, 2003; December 3, 2003; December 22, 2003; December 23, 2003.

Virginia Department of Conservation and Recreation. 1999. Virginia Stormwater Management Handbook. Richmond, VA. <http://www.dcr.state.va.us/sw/docs/swm/Chapter_3-10.pdf>

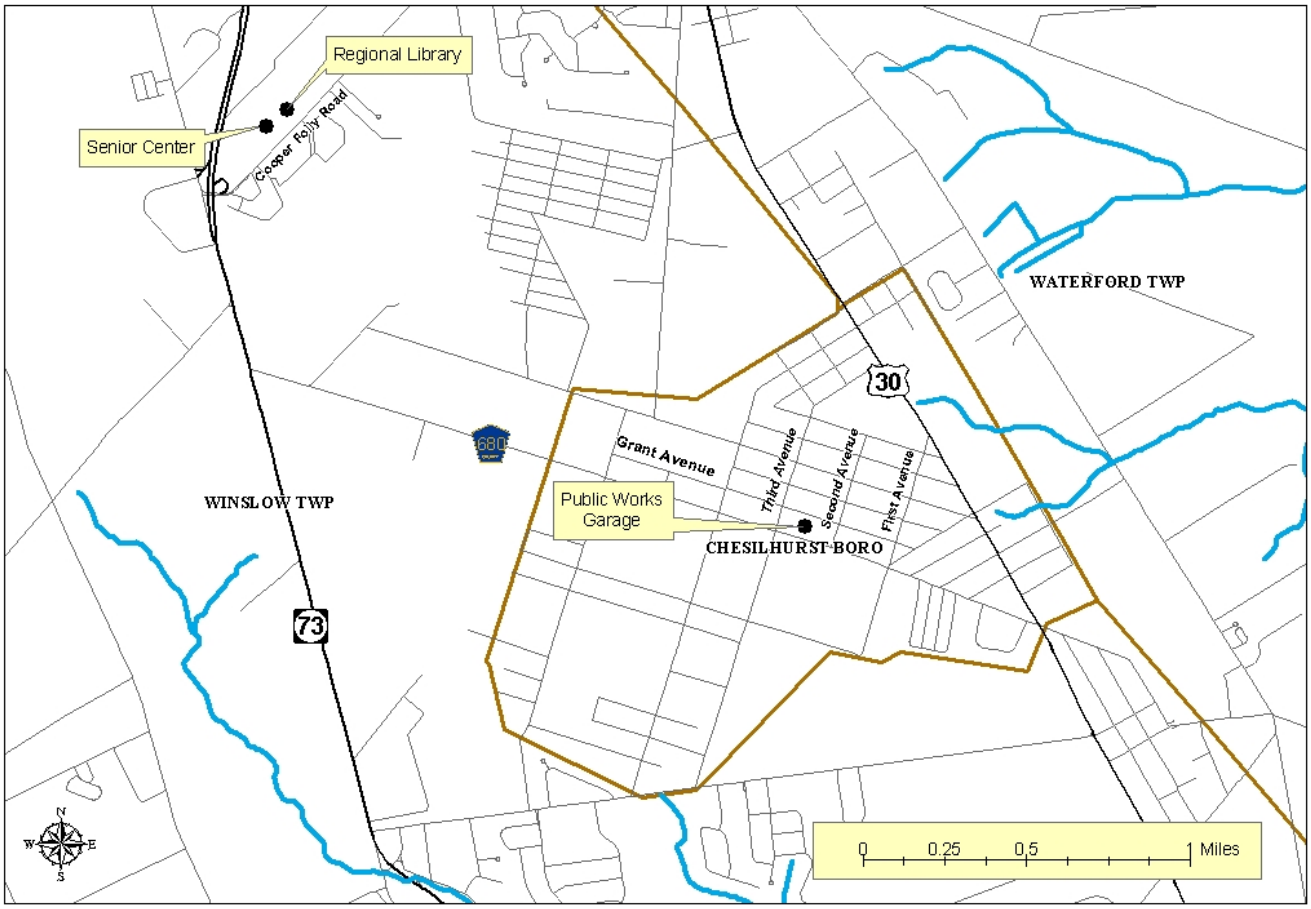
Wisconsin Department of Natural Resources. 1994. The Wisconsin Storm Water Manual: Infiltration Basins and Trenches. Madison, WI.

Woelkers, D. 2004. Preparing for the Storm: BMP Selection for Phase II Compliance. Stormwater 56 No. 1. <http://www.forester.net/sw_0105_preparing.html>

Zampella, R., J. Bunnell, K. Laidig and C. Dow. 2001. The Mullica River Basin: A Report to the Pinelands Commission on the Status of the Landscape and Selected Aquatic and Wetland Resources. New Jersey Pinelands Commission: New Lisbon, NJ.

APPENDIX A - MAPS OF STORMWATER BASINS

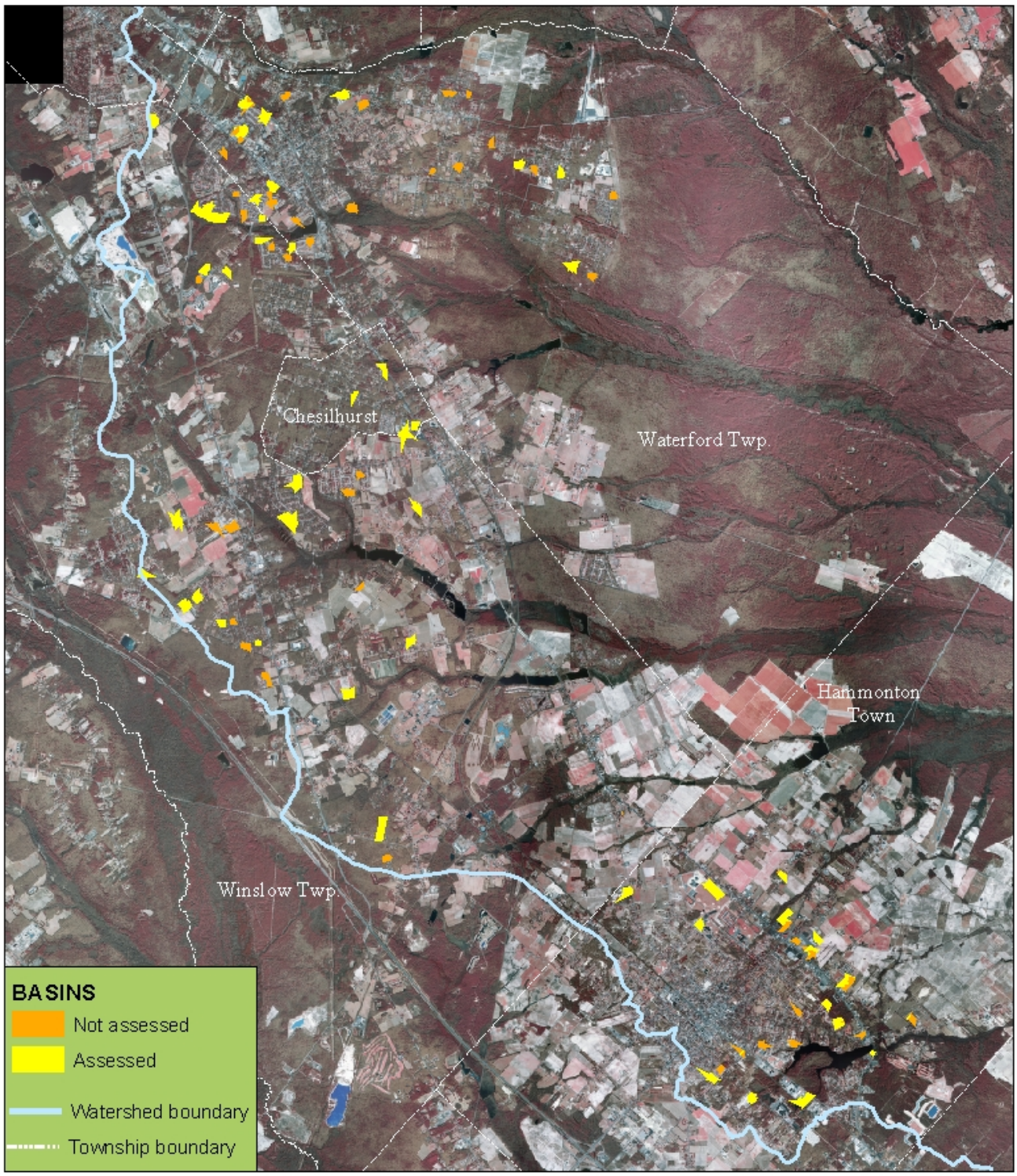
Location of Selected Stormwater Basins



Map Prepared By: NJ Pinelands Commission, November 2004

Data Sources: NJPC, NJDOT, NJDEP

Location of all Stormwater Basins



APPENDIX B – DESCRIPTIONS, OBSERVATIONS AND PHOTOS OF INDIVIDUAL BASINS

APPENDIX B:
DESCRIPTIONS, OBSERVATIONS AND PHOTOS OF INDIVIDUAL BASINS

CHESILHURST

Basin ID#: C-1


Location: White Horse Pike (B'nai B'rith senior home)
Block, Lot: 802, 2
Development type: Private institutional
Date assessed: 12/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.477 ac
Estimated portion of basin floor covered by water: <25%
Dominant soil hydrogroup: A
Dominant soil type: Lakewood sand, 0-5% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: several plastic bags
Chain link fence: N
Other observations: This basin is divided into one small basin (possibly designed as a forebay) with an inlet, connected by a pipe conduit to the larger basin. The conduit passes under a small footbridge. The basin is located parallel to the White Horse Pike and lies between the road and the senior home parking lot. A narrow strip of lawn/ turfgrass separates the basin from the pavement on all sides. Slight sedimentation is apparent on the basin floor.

Basin ID#: C-2


Location: off Center Ave. (industrial area)
Block, Lot: 1301, 4
Development type: Commercial
Date assessed: 12/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00

Basin size: 0.212 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: C
Dominant soil type: Matawan sandy loam, 0-2% slopes
Emergent wetland vegetation observed: phragmites, cattails (some over 5 to 6' tall)
Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: N
Other observations: This basin is located between a truck parking lot and a road. It apparently receives overland flow only. The basin appears entirely filled with water and vegetation and not recently maintained.

Basin ID#: C-3

Location: Grant Ave., between Second and Third Streets (next to municipal maintenance building)
Block, Lot: 703, 7
Development type: Public (municipal building)
Date assessed: 12/3/03
Previous 24-hour rainfall: 0.00
Previous 72-hour rainfall: 0.00
Basin size: 0.094 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: Aura loamy sand, 0-5% slopes
Emergent wetland vegetation observed: cattails, sedges, rushes
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: N
Other observations: This basin is located directly adjacent to a parking lot on one side and a road on the other, with a wooded area adjance to a third side. It appears relatively shallow and completely filled with water. A trench is visible which appears to conduct water from the road into one corner of the basin.

Basin ID#: C-4
Location: off Center Ave. (industrial area)
Block, Lot: 1302, 1
Development type: Commercial
Date assessed: 12/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.463 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: A
Dominant soil type: Evesboro fine sand, firm substratum, 0-5% slopes
Emergent wetland vegetation observed: cattails, woolgrass rush, red maple
Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: Y
Other observations: This basin contains several trees and shrubs growing on the side slopes. The grass on the sides appears overgrown and not recently maintained.


Basin ID#: C-5
Location: off Center Ave. (industrial area)
Block, Lot: 1302, 7
Development type: Commercial
Date assessed: 12/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.552 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: C
Dominant soil type: Matawan sandy loam, 0-2% slopes
Emergent wetland vegetation observed:
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin contained shrubs, tall grasses and 15-20-foot trees. There was no evidence of recent maintenance/mowing. The basin had shallow, vegetated side slopes. Evidence of dumping was observed outside of basin.



Basin ID#: C-6
Location: off Center Ave. (industrial area)
Block, Lot: 1302, 8
Development type: Commercial
Date assessed: 12/3/03
Previous 24-hour rainfall: 0.00
Previous 72-hour rainfall: 0.00
Basin size: 0.463 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: C
Dominant soil type: Matawan sandy loam, 0-2% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: Y

Other observations: The floor of this basin appears to be mostly bare earth, with scattered grass, pine saplings and shrubs on the sides. A stone area appears to admit overland flow. An stone overflow structure and weir were also observed.

HAMMONTON

Basin ID#: H-1

Location: Moss Mill Road (Caterpillar site)
Block, Lot: 3702, 7
Development type: Commercial
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 2.330 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: C/D
Dominant soil type: Atsion sand
Emergent wetland vegetation observed: phragmites, red maple, sweet pepperbush, smooth holly, blueberry
Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: N
Other observations: This basin is located off a relatively busy road, next to an industrial facility. Opposite the industrial site, a sand roads runs along the edge of the basin to a wooded area in back. This basin appears to be completely filled with relatively deep, open water. Mature wetland vegetation and 2-3-foot-high panic grass was observed around edges of basin.

Basin ID#: H-2
Location: Golf Dr. (corner of Golf and Winding Way)
Block, Lot: 3904, 95
Development type: Residential subdivision
Date assessed: 6/13/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.661 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: C/D
Dominant soil type: Atsion sand
Emergent wetland vegetation observed: n/a

Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: Y
Other observations: The basin floor and sides appear overgrown with weeds, especially at the single visible inlet.

Basin ID#: H-3
Location: Carriage Way
Block, Lot: 1705, 10
Development type: Residential subdivision
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.840 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: DocB
Emergent wetland vegetation observed: cattails
Basin sides appear recently mowed: Y
Debris in basin: N
Chain link fence: Y
Other observations: This basin appeared to be entirely filled with standing water. Approximately 45% of the basin floor appeared to be covered with cattails. A grate was visible between the basin and the street; this grate apparently provides a connection to a submerged (not visible) inlet.

Basin ID#: H-5
Location: off White Horse Pike and Middle Rd. (in supermarket/strip mall parking lot)
Block, Lot: 4604, 32
Development type: Commercial
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.866 ac
Estimated portion of basin floor covered by water: >75%

Dominant soil hydrogroup: B
Dominant soil type: Downer sandy loam, 0-2% slopes
Emergent wetland vegetation observed: cattails, juncus
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: The sides of this basin appear to be covered with turfgrass recently mowed to a height of approximately 2-4 inches. The basin floor appears to be completely submerged under mostly open water.



Basin ID#: H-7
Location: next to 16 Golf Dr.
Block, Lot: 3904, 119
Development type: Residential subdivision
Date assessed: 6/13/03
Previous 24-hour rainfall (in): 1.04
Previous 72-hour rainfall (in): 1.04
Basin size: 1.279 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: C/D
Dominant soil type: Galloway loamy sand, 0-5% slopes
Emergent wetland vegetation observed: rushes
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: The floor of this basin appeared to be covered with water and not recently maintained (6-12 inch-high


weeds, dandelions observed).

Basin ID#: H-11
Location: Main Rd. (Plymouth Place apartment complex)
Block, Lot: 4801, 7
Development type: Residential apartment complex
Date assessed: 12/22/03

Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 4.055 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: C/D
Dominant soil type: GamB
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin appears completely filled with open water, which completely covers the pipes at all inlets.

Apparent three-pipe outlet structure observed.

Basin ID#: H-12
Location: corner of Centennial Dr. and Yorktown Blvd (Whispering Pines)
Block, Lot: 4912, 1
Development type: Residential subdivision
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.171 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: C/D
Dominant soil type: Galloway loamy sand, 0-5% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter and one large garbage can
Chain link fence: N
Other observations: This basin is located adjacent to two residential streets and surrounded by single-family houses. There appears to be an overflow structure with a sewer grate on top, but no other basin was observed to which it might drain. Minor sedimentation was observed in the low-flow channel and minor erosion gullies were visible between inlets 1 and 2.

Basin ID#: H-14

Location: Off US206, north of intersection with US30/White Horse Pike (medical office building complex)
Block, Lot: 4601, 22
Development type: Private institutional
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.764 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup:
Dominant soil type: HbmB
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter
Chain link fence: N
Other observations: This appears to be a relatively shallow basin. No fence was observed. Grates in the low-flow channel appear to transport stormwater to a larger basin on the other side of the parking lot.

Basin ID#: H-15
Location: off US206, north of intersection with US30/White Horse Pike (Greenbriar Assisted Living)

Block, Lot: 4601, 26.01
Development type: Private institutional
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.699 ac
Estimated portion of basin floor covered by water: 2
Dominant soil hydrogroup: ?
Dominant soil type: HbmB
Emergent wetland vegetation observed: cattails, rushes, willows
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: N

Other observations: This basin appears to be large, irregularly shaped and relatively shallow. No fence was observed. Clumps of tall grasses were visible throughout the basin. One eroded area was visible on one side. Inlet appears to have minor sediment buildup.

Basin ID#: H-18

Location: off White Horse Pike and Middle Rd. (behind Applebees in supermarket/strip mall parking lot)
Block, Lot: 4604, 2.02
Development type: Commercial
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.920 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: HboA
Emergent wetland vegetation observed: cattails
Basin sides appear recently mowed: Y
Debris in basin: N
Chain link fence: Y
Other observations: This basin appeared to be completely filled with open water. Basin sides appeared to have been recently mowed to a height of about 2-4 inches. The basin is surrounded by a chain link fence approximately 3 feet high; no padlock was observed and the gate appeared to be secured only with a bike cable.

Basin ID#: H-19

Location: off White Horse Pike and Middle Rd. (in supermarket/ strip mall parking lot)
Block, Lot: 4604, 29.01
Development type: Commercial
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.168 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: Hammonton sandy loam, 0-2% slopes
Emergent wetland vegetation observed: phragmites, carex, juncus
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin appears abandoned and completely overgrown on floor and sides with weedy vegetation approximately 2-4 feet high. A significant amount of street litter was observed around the outside of the basin fence. The entire basin floor appears to be either submerged or covered with tall vegetation.

Basin ID#: H-21



Location: corner of Walmer St. & Egg Harbor Rd. (Harborwood condos)
Block, Lot: 3001, 1.01
Development type: Residential subdivision
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.342 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: A
Dominant soil type: LakB
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin is located adjacent to a wooded area on one side, parking lots on two sides and single family houses on the remaining side. Apparently drains to an unknown area via outlet grate in basin floor. Clumps of panic grass were observed throughout the basin.

Basin ID#: H-22

Location: Atlantic County Library
Block, Lot: 3001, 41.01
Development type: Public institutional
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.322 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: A
Dominant soil type: LakB
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin is located adjacent to a wooded area on one side, single family houses on one side, a parking lot on one side and turfgrass/lawn on the remaining side.

Basin ID#: H-23



Location: next to 30 Samuel Dr.
Block, Lot: 3801, 17.21
Development type: Residential subdivision
Date assessed: 6/13/03
Previous 24-hour rainfall (in): 1.04
Previous 72-hour rainfall (in): 1.04
Basin size: 0.571 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: A
Dominant soil type: LakB
Emergent wetland vegetation observed: cattails, rushes, willows
Basin sides appear recently mowed: Y
Debris in basin: N
Chain link fence: Y
Other observations: The floor of this basin appears to be completely covered by relatively deep, open water except for several clumps of emergent wetland vegetation. Two ducks were observed swimming in the basin.

Basin ID#: H-24


Location: White Horse Pike (next to Hammonton Lake)
Block, Lot: 3801, 75
Development type: Commercial
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.124 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: A
Dominant soil type: Lakewood sand, 0-5% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: N
Chain link fence: N
Other observations: This basin is located within 50 feet of a parking lot and adjacent to a major road. The basin is triangular in shape and relatively shallow. It appears to have been recently maintained and mowed.

Basin ID#: H-26

Location: Grand St
Block, Lot: 3714, 12.01
Development type: Residential subdivision
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 1.242 ac
Estimated portion of basin floor covered by water: <25%
Dominant soil hydrogroup: A
Dominant soil type: LasC
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: Localized ponding was observed in two areas of the basin.

Basin ID#: H-29
Location: Basin Rd, off US30/White Horse Pike
Block, Lot: 4501, 33
Development type: Residential subdivision
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.284 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: B/D
Dominant soil type: WoeA
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: N
Other observations: This is a shallow basin surrounded by a wooden split-rail fence, lawn/turfgrass and single-family houses on two sides. One cement overflow structure/access ramp was observed at one end of the basin.

Basin ID#: H-30

Location: off White Horse Pike and Middle Rd. (behind Commerce Bank and Superfresh parking lot)
Block, Lot: 4604, 30
Development type: Commercial
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.226 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: Hammonton sandy loam, 0-2% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: significant amount of street litter
Chain link fence: Y
Other observations: The sides of this basin appear to have been recently mowed to a height of approximately 2-3 inches. A padlocked chain link fence approximately 3 feet high was observed.

Basin ID#: H-31

Location: Corner of Kay and Grand Streets
Block, Lot: 2609, 7
Development type: Residential subdivision
Date assessed: 12/22/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.739 ac
Estimated portion of basin floor covered by water: 25-50%
Dominant soil hydrogroup: C/D
Dominant soil type: Galloway loamy sand, 0-5% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin is L-shaped and surrounded by residential streets on two sides and houses on all other sides. Clumps of panic grass were observed throughout the basin except where the floor was covered by water. Two inlets were visible. One cement access ramp/ overflow structure was also observed.

WATERFORD

Basin ID#: W-2
Location: 5th St. (behind Medical Arts bldg & parking lot)
Block, Lot: 35, 1
Development type: Commercial
Date assessed: 9/26/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.82
Basin size: 1.611 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: A
Dominant soil type: Evesboro sand, 0-5% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: Y
Other observations: This basin appeared to be dry and completely vegetated with tall grasses and a variety of trees (apparently all upland species). It did not appear to have been mowed for some time.

Basin ID#: W-6

Location: Shoreline Drive (across from Beach Drive)
Block, Lot: 95.01, 48
Development type: Residential subdivision
Date assessed: 9/17/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.64
Basin size: 0.222 ac
Estimated portion of basin floor covered by water: <25%
Dominant soil hydrogroup: B
Dominant soil type: WOUB
Emergent wetland vegetation observed: few sedges near outlet
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: Minor ponding, which appears permanently wet, was observed near the single overflow structure. The overflow structure appeared to have a hole at ground level which would cause it to function as an outlet.

Basin ID#: W-13

Location: Columbia Ave, south of intersection with Maple Island Rd. (end of street, behind trees)
Block, Lot: 199, 1
Development type: Residential subdivision
Date assessed: 9/26/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.82
Basin size: 1.185 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: A
Dominant soil type: Lakehurst-Lakewood sands, 0-5% slopes
Emergent wetland vegetation observed: phragmites, rushes, red maple, sycamore, willows (some saplings, some more mature)
Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: N
Other observations: This basin appeared to be almost completely filled with vegetation, but there appeared to be a clear area of deeper water in the middle. Redwing blackbirds and frogs were heard.

Basin ID#: W-16

Location: Willow Way (between 2 houses, woods and sand trails in rear)
Block, Lot: 241.A, 6
Development type: Residential subdivision
Date assessed: 9/26/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.82
Basin size: 0.692 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: A
Dominant soil type: Evesboro sand, 0-5% slopes
Emergent wetland vegetation observed: phragmites, polyganum spp., smartweed, milkweed
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter, several plastic gallon milk jugs
Chain link fence: Y
Other observations: A large hole in the rear of the chain link fence was observed. Frogs were also observed in the basin.

Basin ID#: W-17

Location: corner of Tremont & Chateau
Block, Lot: 242, 9.A
Development type: Residential subdivision
Date assessed: 9/26/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.532 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: B
Dominant soil type: AveB
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: N
Chain link fence: Y
Other observations: This basin appeared to have been recently mowed/maintained and appeared very clean. A few eroded patches on the side nearest the street were observed. One inlet (with grate) was visible.

Basin ID#: W-22

Location: corner of Whispering Pines & Pamela
Block, Lot: 401, 13.A
Development type: Residential subdivision, Commercial
Date assessed: 9/26/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.82
Basin size: 3.198 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: Downer loamy sand, 0-5% slopes
Emergent wetland vegetation observed: cattails
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: N
Other observations: This a large, L-shaped basin located adjacent to a strip mall parking lot on one side, with residential streets on two other sides. The basin floor appeared to be largely covered with cattails and completely covered with water, with some areas of open water; frogs and ducks observed.

Basin ID#: W-23

Location: corner of West Atlantic & Cooper (next to RR tracks)
Block, Lot: 401, 64
Development type: Residential subdivision
Date assessed: 9/26/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.82
Basin size: 1.350 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: AugA
Emergent wetland vegetation observed: cattails
Basin sides appear recently mowed: Y
Debris in basin: N
Chain link fence: Y
Other observations: Water appeared to be permanently ponded, covering the entire basin floor up to the sides. A few bare patches of dirt were visible on one side of the basin. Tall stands of cattails were observed within the basin at each corner.

Basin ID#: W-26

Location: Todd Court (off parking lot, behind townhouses)
Block, Lot: 401.J, 6
Development type: Residential subdivision
Date assessed: 9/26/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 1.908 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: AugB
Emergent wetland vegetation observed: cattails, rushes, carex spp.
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: The basin is L-shaped. A portion of this basin is behind townhouses and not visible from the access point on the cul-de-sac. Several ducks were observed in the visible portion of the basin.

Basin ID#: W-29

Location: Coopers Folly Road (between Bartel Court & White Horse Pike)
Block, Lot: 1601.A, 31
Development type: Residential subdivision, Commercial
Date assessed: 9/17/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.64
Basin size: 1.930 ac
Estimated portion of basin floor covered by water: 3
Dominant soil hydrogroup: B
Dominant soil type: Downer loamy sand, 0-5% slopes
Emergent wetland vegetation observed: smartweed, small phragmites
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin is located adjacent to a street on one side, residential single family houses on two sides, and commercial buildings and a parking lot on the remaining side.

Basin ID#: W-30
Location: Corner of Hayes Mill and Coopers Folly Rd. (off cul de sac)
Block, Lot: 1602, 3
Development type: Residential subdivision
Date assessed: 9/17/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.64
Basin size: 0.431 ac
Estimated portion of basin floor covered by water: <25%
Dominant soil hydrogroup: B
Dominant soil type: WOUB
Emergent wetland vegetation observed: 7 to 8' phragmites, 15' willows, milkweed covering center of basin
Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: Y
Other observations: This basin is located adjacent to residential single family houses on two sides, a street cul-de-sac in

front, and a wooded area on the remaining side.

WINSLOW

Basin ID#: Wi-2
Location: Old Farm Road (Treecroft) (at end of cul-de-sac)
Block, Lot: 5207, 26
Development type: Residential subdivision
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.598 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: Aura sandy loam, 0 to 2 percent slopes
Emergent wetland vegetation observed: cattails, rushes
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter, large blue recycling bin
Chain link fence: Y
Other observations: The basin floor appeared to be completely covered by open water. Several clumps of cattails were observed at the edges of the water.

Basin ID#: Wi-4
Location: Edward "Bud" Duble Senior Center, Cooper Folly Road
Block, Lot: 2504, 7
Development type: Public institutional
Date assessed: 10/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.787 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: Aura sandy loam, 2-5% slopes
Emergent wetland vegetation observed: carex, cattails, phragmites, willows
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin appeared to be entirely filled with tall herbaceous vegetation and tree. The sides of the basin appear to have been recently mowed to a height of approximately 4 inches. Significant sediment buildup was observed at the inlet pipe. Damage to the back side of the chain-link fence was observed.

Basin ID#: Wi-5

Location: Maiese Ave. (off Waterford Rd)
Block, Lot: 4808, 4 and 5
Development type: Residential subdivision
Date assessed: 10/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.687 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: B
Dominant soil type: Aura-Downer loamy sands, 0-5% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin appeared to be entirely dry, with a layer of gravel over the floor and sides mowed to a height of approximately 3-4 inches. One cement access point that appears to admit sheet flow from the street was observed.

Basin ID#: Wi-10

Location: Sherry Lyn (middle) (access from Washington Ave.; behind Beebetown Rd)
Block, Lot: 4907, 32
Development type: Residential subdivision
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 6.588 ac
Estimated portion of basin floor covered by water: <25%
Dominant soil hydrogroup: B
Dominant soil type: AveB
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: The entire basin was not visible from the easement access point, but the visible portion appeared entirely dry, covered with turfgrass and recently mowed.

Basin ID#: Wi-17

Location: Lakeside Court, off Coopers Folly Rd. (Tally Hoe)
Block, Lot: 2410.01, 16
Development type: Residential subdivision
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.296 ac
Estimated portion of basin floor covered by water: 2
Dominant soil hydrogroup: B
Dominant soil type: Downer loamy sand, 0-5% slopes
Emergent wetland vegetation observed: cattails, willows, rushes
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter, three basketballs
Chain link fence: Y
Other observations: Basin floor appeared entirely covered by wetland vegetation (mostly cattails).

Basin ID#: Wi-18

Location: Near Old Egg Harbor Rd.
Block, Lot: 4504, 7.B
Development type: Residential subdivision
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 2.627 ac
Estimated portion of basin floor covered by water: <25%
Dominant soil hydrogroup: B
Dominant soil type: Downer loamy sand, 0-5% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: n/a (bare dirt)
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: Basin appears to have been constructed relatively recently as part of a new residential subdivision. Small landscape trees and turfgrass appear to have been recently planted on basin sides.

Basin ID#: Wi-19

Location: Off Waterford Rd.
Block, Lot: 2402.01, 1.06
Development type: Residential subdivision
Date assessed: 10/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 1.035 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: B
Dominant soil type: Downer loamy sand, 0-5% slopes
Emergent wetland vegetation observed: cattails, willows, rushes
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter, large piece of corrugated plastic pipe (approximately 1 foot in diameter)
Chain link fence: Y
Other observations: Tall grass (1-4 feet) was observed within basin (no evidence of recent mowing). Some construction debris was visible on the sides of the basin.

Basin ID#: Wi-20
Location: Oakton Dr., near corner of Hayes Mill Rd.
Block, Lot: 2402.01, 1.06
Development type: Residential subdivision
Date assessed: 10/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.280 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: Downer loamy sand, 0-5% slopes
Emergent wetland vegetation observed: cattails, rushes, phragmites
Basin sides appear recently mowed: N
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: The majority of the basin floor appeared to be covered by open water, with clumps of vegetation at the edges. The sides of this basin do not appear to have been recently mowed (2-4 foot tall grass). The gate was unlocked. Some muck/sediment was visible on basin floor. The inlet appeared to be obscured by a large stand of phragmites. One

eroded strip was visible on one side at the rear of the basin. Several frogs were observed within the basin.



Basin ID#: Wi-21
Location: South County Regional Branch Library, Coopers Folly Road, between Route 73/Blue Anchor Road and US30/White Horse Pike (behind library parking lot)
Block, Lot: 2504, 7
Development type: Public institutional
Date assessed: 10/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.518 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: B
Dominant soil type: Downer loamy sand, 0-5% slopes
Emergent wetland vegetation observed: rushes, cattails
Basin sides appear recently mowed: N
Debris in basin: N
Chain link fence: Y
Other observations: Fence approximately 3' high (possible safety hazard); water appears deep and permanently ponded; fish and frogs visible; wetland vegetation at edges of open water

Basin ID#: Wi-22
Location: Susan Lane, between Mauriello Dr. and Midili Dr. (twp considers "detention basin")
Block, Lot: 4809.01, 21
Development type: Residential subdivision
Date assessed: 10/3/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.911 ac
Estimated portion of basin floor covered by water: <25%
Dominant soil hydrogroup: B
Dominant soil type: Downer loamy sand, 0-5% slopes
Emergent wetland vegetation observed: cattails
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: The sides of this basin appear to have been recently mowed to a height of approximately 3-4 inches. Sedimentation was observed in front of one of the two inlets.

Basin ID#: Wi-27

Location: Sherry Lyn (front) (off Waterford Rd., near Whiting St.)
Block, Lot: 4909, 5
Development type: Residential subdivision
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.508 ac
Estimated portion of basin floor covered by water: 0 (dry)
Dominant soil hydrogroup: B
Dominant soil type: Downer-Aura complex, 5-10% slopes
Emergent wetland vegetation observed: n/a
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: This basin appeared dry and recently mowed.

Basin ID#: Wi-30

Location: Baker Ave. (Waterford Green)
Block, Lot: 3102.04, 29
Development type: Residential subdivision
Date assessed: 12/23/03
Previous 24-hour rainfall (in): 0.00
Previous 72-hour rainfall (in): 0.00
Basin size: 0.317 ac
Estimated portion of basin floor covered by water: >75%
Dominant soil hydrogroup: A
Dominant soil type: Lakewood sand, 0-5% slopes
Emergent wetland vegetation observed: phragmites, cattails, rushes
Basin sides appear recently mowed: Y
Debris in basin: few pieces street litter
Chain link fence: Y
Other observations: The sides of this basin are covered with turfgrass, with several patches of bare earth. The basin floor appeared to be completely covered with phragmites, cattails and rushes.

APPENDIX C – REFERENCE TABLE

Basin ID	Block	Lot	Total Acres	Basin Acres	Erosion/ Sediment	Debris?	Wetland Vegetation?	Mowed?
C-01	00802	00002	1.0	0.47	slight	y	n/a	y
C-02	01301	00004	1.8	0.21		n	y	n
C-03	00703	00007	0.8	0.09		y	y	y
C-04	01302	00001	0.5	0.46		n	y	n
C-05	01302	00007	1.0	0.55		y		n
C-06	01302	00008	6.9	0.46		n	n/a	n
H-01	03702	00007	6.3	2.33		n	y	n
H-02	03904	00095	3.3	0.67		n	n/a	n
H-03	01705	00010	14.0	0.84		n	y	y
H-05	04604	00032	9.3	0.86		y	y	y
H-07	03904	00119	2.3	1.27		y	y	n
H-11	04801	00007	9.8	4.05		y	n/a	y
H-12	04912	00001	10.5	0.17	minor	y	n/a	y
H-14	04601	00022	5.0	0.76		y	n/a	n
H-15	04601	00026.01	4.6	0.69	yes	y	y	y
H-18	04604	00002.02	14.9	0.92		n	y	y
H-19	04604	00029.01	1.7	0.16		y	y	n
H-21	03001	00001.01	3.8	0.34		y	n/a	y
H-22	03001	00041.01	2.2	0.32		y	n/a	n
H-23	03801	00017.21	1.5	0.57		n	y	y
H-24	03801	00075	4.7	0.12		n	n/a	y
H-26	03714	00012.01	16.2	1.24		y	n/a	y
H-29	04501	00033	33.7	0.28		y	n/a	y
H-30	04604	00030	1.9	0.22		y	n/a	y
H-31	02609	00007	0.9	0.73		y	n/a	n
W-02	00035	00030	1.6	1.61		n	n/a	n
W-06	00095.01	00048	0.2	0.22		y	y	y
W-13	00219	00009	3.5	1.18		y	y	n
W-16	00241.01	00006	0.7	0.69		y	y	n
W-17	00242	00015	0.5	0.53	few	n	n/a	y
W-22	00401.14	00013.01	3.2	3.19		y	y	y
W-23	00401	00064		1.35		y	y	y
W-26	00401.10	00006	1.9	1.91		y	y	n
W-29	01601	00081	1.9	1.93		y	y	y
W-30	01602	00003	4.8	0.43		n	y	n
Wi-02	05207	00026		0.59		y	y	y
Wi-04	02504	00007	23.3	0.78		y	y	y
Wi-05	04808	00004 & 5	0.4	0.68		y	n/a	y
Wi-10	04907	00032	6.6	6.58		y	n/a	y
Wi-17	02410.01	00016	0.3	0.29		y	y	n
Wi-18	04504	00007.B				y	n/a	n/a
Wi-19	02402.01	00001.06		1.035		y	y	n
Wi-20	02402.01	00001.06	17.7	0.28	yes	y	y	n
Wi-21	02504	00007		0.51		y	y	y
Wi-22	04809.01	00021	3.0	0.91		y	y	y
Wi-27	04909	00005	2.8	0.51		y	n/a	y
Wi-30	03102.04	00029	0.3	0.31		y	y	y

Basin ID	Fenced?	Water Coverage	Land Use	LU1	Wetland Buffer?	Soil Type
C-01	n	<25%	Assisted Living	PI	y	Variable
C-02	n	>75%	Industrial	C		Transitional
C-03	n	>75%	Municipal Garage	P		Upland
C-04	y	>75%	Industrial	C		Upland
C-05	y	>75%	Industrial	C		Transitional
C-06	y	Dry	Industrial	C		Transitional
H-01	n	>75%	Industrial	C	y	hydric
H-02	y	Dry	Single Family Residential	R	y	hydric
H-03	y	>75%	Single Family Residential	R		Upland
H-05	y	>75%	Retail	C		Transitional
H-07	y	>75%	Single Family Residential	R	y	Transitional
H-11	y	>75%	Multifamily Residential	R		Transitional
H-12	n	Dry	Multifamily Residential	R		Transitional
H-14	n	Dry	Business Office	PI		Transitional
H-15	n	<25%	Assisted Living	PI		Transitional
H-18	y	>75%	Retail	C		Transitional
H-19	y	>75%	Retail	C		Transitional
H-21	y	Dry	Multifamily Residential	R		Transitional
H-22	y	Dry	County Library	PI	y	Transitional
H-23	y	>75%	Single Family Residential	R	y	Transitional
H-24	n	Dry	Business Office	C	y	Upland
H-26	y	<25%	Single Family Residential	R		Upland
H-29	y	Dry	Single Family Residential	R		Upland
H-30	y	>75%	Retail	C		Transitional
H-31	y	25-50	Single Family Residential	R		Transitional
W-02	y	Dry	Commercial Building	C	y	Upland
W-06	y	<25%	Multifamily Residential	R	y	Upland
W-13	n	>75%	Water	R	y	hydric
W-16	y	>75%	Single Family Residential	R	y	Upland
W-17	y	Dry	Single Family Residential	R		Upland
W-22	n	>75%	Multifamily Residential	RC	y	Upland
W-23	y	>75%	Single Family Residential	R		Upland
W-26	y	>75%	Multifamily Residential	R		Transitional
W-29	y	<25%	Multifamily Residential	RC		Upland
W-30	y	<25%	Multifamily Residential	R		Upland
Wi-02	y	>75%	Single Family Residential	R		Upland
Wi-04	y	>75%	Senior Center	PI		Upland
Wi-05	y	Dry	Single Family Residential	R		Upland
Wi-10	y	<25%	Single Family Residential	R	y	Upland
Wi-17	y	<25%	Multifamily Residential	R	y	Upland
Wi-18		<25%		R	y	
Wi-19		Dry	Single Family Residential	R	y	Upland
Wi-20	y	>75%	Single Family Residential	R		Upland
Wi-21	y	>75%	County Library	PI		Upland
Wi-22	y	<25%	Single Family Residential	R	y	Upland
Wi-27	y	Dry	Single Family Residential	R		Upland
Wi-30		>75%	Multifamily Residential	R	y	Upland

Basin ID	Soil Hydrogroup	Year Built	Age Group	Owner
C-01	A		1995-02	Private
C-02	C	1987	1986-95	Private
C-03	B		1995-02	Public
C-04	A		< 1986	Public
C-05	C		< 1986	Public
C-06	C		1995-02	Private
H-01	C/D	1981	< 1986	Private
H-02	C/D	1993	1986-95	Public
H-03	B	2000	1995-02	Home Assoc
H-05	B	1995	1995-02	Private
H-07	C/D	1995	1995-02	Private
H-11	C/D	1999	1995-02	Private
H-12	C/D	2001	1995-02	Private
H-14		1999	1995-02	Private
H-15		1995	1995-02	Private
H-18	B	1995	1995-02	Private
H-19	B	1976	< 1986	Private
H-21	A	1988	1986-95	Private
H-22	A	1980	< 1986	Public
H-23	A	2001	1995-02	Home Assoc
H-24	A	1996	1995-02	Private
H-26	A	2002	1995-02	Private
H-29	B/D	2002	> 2002	
H-30	B	1995	1995-02	Private
H-31	C/D	1998	1995-02	Home Assoc
W-02	A		< 1986	Private
W-06	B		1986-95	Public
W-13	A		< 1986	Public
W-16	A		< 1986	Public
W-17	B		< 1986	Public
W-22	B		< 1986	Public
W-23	B	1996	1995-02	Private
W-26	B	1997	1995-02	Public
W-29	B		1986-95	Public
W-30	B	1996	1995-02	Public
Wi-02	B	1990	1986-95	Public
Wi-04	B		1986-95	Public
Wi-05	B	1978	< 1986	Public
Wi-10	B	1986	< 1986	Private
Wi-17	B	1993	1986-95	Public
Wi-18	B			
Wi-19	B		1995-02	Private
Wi-20	B		1995-02	Private
Wi-21	B		1995-02	Public
Wi-22	B	1978	< 1986	Public
Wi-27	B	1980	< 1986	Public
Wi-30	A	1991	1986-95	Public

APPENDIX D – SUMMARY DATA

Table 1: Total Soil Types Represented (99 basins identified)

Total # each soil type	# Assessed (percentage of total)
28 Downer loamy sand, 0-5% slopes (DocB)	9 assessed (32%)
8 Galloway loamy sand, 0-5% slopes (GamB)	4 assessed (44%)
5 Hammonton sandy loam, 0-2% slopes (HboA)	3 assessed (60%)
6 Lakewood sand, 0-5% slopes (LasB)	3 assessed (50%)
3 Matawan sandy loam, 0-2% slopes (MbtA)	3 assessed (100%)
2 Aura sandy loam, 0-2% slopes (AugA)	2 assessed (100%)
4 Aura sandy loam, 2-5% slopes (AugB)	2 assessed (50%)
2 Aura-Downer sandy loams, 0-5% slopes (AveB)	2 assessed (100%)
4 Evesboro sand, 0-5% slopes (EveB)	2 assessed (50%)
3 Hammonton loamy sand, 0-5% slopes (HbmB)	2 assessed (67%)
3 Lakehurst sand 0-5% slopes (LakB)	3 assessed (100%)
4 Woodstown and Klej loamy sands, clayey substratum, 0-5% slopes (WOUB)	2 assessed (50%)
3 Atsion sands (Ats)	2 assessed (67%)
2 Aura loamy sand, 0-5% slopes (AucB)	1 assessed (50%)
5 Aura-Downer loamy sands, 0-5% slopes (AvdB)	1 assessed (20%)
2 Downer sandy loam, 0-2% slopes (DoeA)	1 assessed (50%)
2 Downer-Aura Complex, 5-10% slopes (DonC)	1 assessed (50%)
2 Evesboro fine sand, firm substratum, 0-5% slopes (EvfmB)	1 assessed (50%)
1 Lakehurst-Lakewood sands, 0-5% slopes (LanB)	1 assessed (100%)
2 Lakewood sand, 5-10% slopes (LasC)	1 assessed (50%)
1 Woodstown, sandy loam, 0-2% slopes (WoeA)	1 assessed (100%)
3 Woodstown & Glassboro sandy loams, 0-5% slopes (WORB)	0 assessed - no access
1 Atsion-Berryland sands, rarely flooded (Attxr)	0 assessed - no access
1 Sassafras sandy loam, 0-2% slopes (SacA)	0 assessed - no access
1 water	0 assessed - no access
1 Manahawkin muck, frequently flooded	0 assessed - no access

Out of a total of 47 basins assessed, 33 (70%) were observed to have standing water. Twenty-two basins (48% of assessed total) were observed to contain standing water in 75% or more of the basin floor. Soil types:

4 DocB
3 HboA
2 MbtA
2 AugB
2 AugA
1 LasB
1 LanB
2 GamB
1 EvfmB
1 EveB
1 DoeA
1 AucB
1 Ats

1 (2.1%) basin floor was covered 50-75% by water.
1 DocB

3 (7%) were covered 25-50% by water.
1 HbmB
1 GamB
1 DocB

7 (16%) were covered less than 25% by water.
2 WOUB
2 DocB
1 LasC
1 LasB
1 AveB

13 (27%) were observed to have no standing water(dry).
2 LakB
1 WoeA
1 MbtA
1 LasB
1 HbmB
1 GamB
1 EveB
1 DonC
1 DocB
1 AveB
1 AvdB
1 Ats

Table 2. Stormwater Basins by Hydrologic Soil Group

Hydrogroup	Basin Id #s	%covered by water
A - 11 samples	W-2	0% Dry
36% dry (4 basins)	H-21	0% Dry
64% wet (7 basins)	H-22	0% Dry
	H-24	0% Dry
	H-26	< 25%
	C-1	< 25%
	Wi-30	> 75%
	H-23	> 75%
	W-13	> 75%
	W-16	> 75%
	C-4	> 75%
B - 26 samples	Wi-5	0% Dry
19% dry (5 basins)	W-17	0% Dry
81% wet (21 basins)	Wi-19	0% Dry
	Wi-27	0% Dry
	H-14	0% Dry
	Wi-10	< 25%
	Wi-18	< 25%
	Wi-22	< 25%
	W-30	< 25%
	W-6	< 25%
	Wi-17	25 - 50%
	H-15	25 - 50%
	W-29	50 - 75%
	C-3	> 75%
	W-23	> 75%
	Wi-2	> 75%
	W-26	> 75%
	Wi-4	> 75%
	H-3	> 75%
	W-22	> 75%
	Wi-20	> 75%
	Wi-21	> 75%
	H-18	> 75%
	H-19	> 75%
	H-30	> 75%
	H-5	> 75%
C - 3 samples	C-6	0% Dry
33% dry (1 basin)	C-2	> 75%
67% wet (2 basins)	C-5	> 75%
C/D - 5 samples	H-2	0% Dry
40% dry (2 basins)	H-12	0% Dry
60% wet (3 basins)	H-31	25 - 50%
	H-1	> 75%
	H-11	> 75%
B/D - 1 sample (dry)	H-29	0% Dry

Table 3. Stormwater Basins by Soil Type

Soil Name	Soil Description	Basin Id #s	% covered by water
Lakewood sand 4 samples 25% dry (1 basin) 75% wet (3 basins)	excessively drained	H-24 C-1 H-26 Wi-30	0% Dry < 25% < 25% > 75%
Evesboro sand 3 samples 33% dry (1 basin) 67% wet (2 basins)	excessively drained	W-2 W-16 C-4	0% Dry > 75% > 75%
Aura loamy sand 1 sample - wet	well drained	C-3	> 75%
Aura sandy loam 4 samples 100% wet (4 basins)	well drained well drained	W-23 Wi-2 W-26 Wi-4	> 75% > 75% > 75% > 75%
Aura-Downer loamy sands 1 sample - dry	well drained	Wi-5	0% Dry
Aura-Downer sandy loams 2 samples 50% dry (1 basin) 50% wet (1 basins)	well drained	W-17 Wi-10	0% Dry < 25%
Downer loamy sand 9 samples 11% dry (1 basin) 89% wet (8 basins)	well drained	Wi-19 Wi-18 Wi-22 Wi-17 W-29 H-3 W-22 Wi-20 Wi-21	0% Dry < 25% < 25% 25 - 50% 50 - 75% > 75% > 75% > 75% > 75%
Downer sandy loam 1 sample - wet	well drained	H-5	> 75%
Downer-Aura complex 1 sample - dry	well drained	Wi-27	0% Dry
Lakehurst-Lakewood sands 1 sample - wet	moderately well drained, somewhat poorly drained, excessively drained	W-13	> 75%
Matawan sandy loam 3 samples 33% dry (1 basin)	moderately well drained	C-6 C-2 C-5	0% Dry > 75% > 75%

67% wet (2 basins)			
Woodstown sandy loam 1 sample - dry	moderately well drained	H-29	0% Dry
Hammonton sandy loam 5 samples 20% dry (1 basin) 80% wet (4 basins)	moderately well drained, somewhat poorly drained	H-14 H-15 H-18 H-19 H-30	0% Dry 25 - 50% > 75% > 75% > 75%
Lakehurst sand 3 samples 67% dry (2 basins) 33% wet (1 basin)	moderately well drained, somewhat poorly drained	H-21 H-22 H-23	0% Dry 0% Dry > 75%
Woodstown and Klej loamy sands 2 samples 100% wet (2 basins)	moderately well drained, somewhat poorly drained	W-30 W-6	< 25% < 25%
Atsion sand (Hydric AC) 2 samples 50% dry (1 basin) 50% wet (1 basin)	poorly drained	H-2 H-1	0% Dry > 75%
Galloway loamy sand 3 samples 33% dry (1 basin) 67% wet (2 basins)	?	H-12 H-31 H-11	0% Dry 25 - 50% > 75%

APPENDIX E – CORRESPONDENCES WITH CHESILHURST BOROUGH AND WINSLOW TOWNSHIP

July 21, 2004

Honorable Mayor Arland W. Poindexter
Chesilhurst Borough
201 Grant Avenue
Chesilhurst, New Jersey 08089

Re: Chesilhurst Borough Public Works Facility
Existing Stormwater Management Basin
Block 703, Lot 3, Chesilhurst Borough

Dear Mayor Poindexter:

The Pinelands Commission would like to extend an offer to Chesilhurst Borough to work together with Commission staff to improve the drainage function of the Borough's stormwater basin located at the Public Works Building site on Grant Avenue.

The Commission is in receipt of a grant from the New Jersey Department of Environmental Protection (DEP) to assess the performance of stormwater management basins in the Mullica watershed and to retrofit a small number of those which appear to be holding water for extended periods of time.

Stormwater management basins are designed to collect stormwater runoff and to allow it to infiltrate into the soil to replenish groundwater supplies and to reduce nonpoint source pollution. In New Jersey, stormwater basins are generally required to fully drain within 72 hours after a rainfall event. In cases where drainage does not occur in a timely manner, the stormwater may stagnate and become a source for mosquito breeding and/or create conditions which may lead to flooding and surface water pollution.

During our recent area-wide assessment of existing basins, the Chesilhurst Public Works Garage stormwater basin was identified as one which appears to hold water long after the 72 hour drainage period. The Commission has selected this basin, as well as several other publically owned basins in other Pinelands area towns, as a potential recipient of DEP funds to help offset the expense of restoring the basins drainage function. We would like to offer the Borough an opportunity to participate in this DEP grant funded project.

Because the DEP funding is limited, we're asking selected municipalities to contribute in-kind services in the retrofit effort such as public works manpower, excavation/trucking equipment and construction materials (sand, stone, compost, drainage pipe and geotextile filter fabric). We've briefly discussed with Mr. Robinson the possibility that Chesilhurst might be able to provide manpower, equipment and materials for this project and he indicated that such participation may indeed be possible.

The basin retrofit project would likely entail one day of test pits to allow an engineer, hired by the Commission, to evaluate soil and groundwater conditions at the basin and to subsequently develop a basin restoration plan. Restoration plans typically include the removal of sediment from the basin bottom and the loosening of dense soils below the basin or the removal of clayey or silty soils (if present) and replacement of these soils with sand, stone, and/or compost.

Ideally, the Borough would provide a backhoe/excavator with operator for one day of test pits and subsequently provide a backhoe/excavator with operator, dump truck, construction materials (sand, stone, drainage pipe, etc.) and one or two laborers for the basin restoration project, likely to require up to one week.

Please note that due to the limited amount of available grant funding, not all municipalities to which this offer is being made will be selected and that awarding of grant funds will be weighted based upon each municipalities offer to provide in-kind services.

Kindly reply to the undersigned at your earliest opportunity and indicate to what extent the Borough would be willing to provide in-kind support of the proposed basin retrofit. Please feel free to call me if you have any questions or would like additional information.

Sincerely,

Edward Wengrowski
Wastewater Management Coordinator

c: Mr. Robinson, Director of Public Works
Mr. Chris Rehmann, Municipal Engineer
Mr. Larry Liggett, NJPC
Mr. Tom Stanuikynas, NJPC

July 21, 2004

Honorable Mayor Sue Ann Metzner
Winslow Township
125 S. Route 73
Winslow Township, New Jersey 08037-9422

Re: Edward "Bud" Duble Senior Center
Existing Stormwater Management Basin
Block 2504, Lot 7, Winslow Township

Dear Mayor Metzner:

The Pinelands Commission would like to extend an offer to work together with Winslow Township to improve the drainage function of the Township's stormwater basin located adjacent to the Edward "Bud" Duble Senior Center on Cooper Folly Road.

The Commission is in receipt of a grant from the New Jersey Department of Environmental Protection (DEP) to assess the performance of stormwater management basins in the Mullica watershed and to retrofit a small number of those which appear to be holding water for extended periods of time.

Stormwater management basins are designed to collect stormwater runoff and to allow it to infiltrate into the soil to replenish groundwater supplies and to reduce nonpoint source pollution. In New Jersey, stormwater basins are generally required to fully drain within 72 hours after a rainfall event. In cases where drainage does not occur in a timely manner, the stormwater may stagnate and become a source for mosquito breeding and/or create conditions which may lead to flooding and surface water pollution.

During our recent area-wide assessment of existing basins, the Edward "Bud" Duble Senior Center stormwater basin was identified as one which appears to hold water long after the 72 hour drainage period. The Commission has selected this basin, as well as several other publically owned basins in other Pinelands area towns, as a potential recipient of DEP funds to help offset the expense of restoring the basins drainage function. We would like to offer the Township an opportunity to participate in this DEP grant funded project.

Because the DEP funding is limited, we're asking selected municipalities to contribute in-kind services in the retrofit effort such as public works manpower, excavation/trucking equipment and construction materials (sand, stone, compost, drainage pipe and geotextile filter fabric). We've briefly discussed with Mr. McGlinchey the possibility that Winslow might be able to provide manpower, equipment and materials for this project and he indicated that such participation may indeed be possible.

The basin retrofit project would likely entail one day of test pits to allow an engineer, hired by the Commission, to evaluate soil and groundwater conditions at the basin and to subsequently develop a basin restoration plan. Restoration plans typically include the removal of sediment from the basin bottom and the loosening of dense soils below the basin or the removal of clayey or silty soils (if present) and replacement of these soils with sand, stone, and/or compost.

Ideally, the Township would provide a backhoe/excavator with operator for one day of test pits and subsequently provide a backhoe/excavator with operator, dump truck, construction materials (sand, stone, drainage pipe, etc.) and one or two laborers for the basin restoration project, likely to require up to one week.

Please note that due to the limited amount of available grant funding, not all municipalities to which this offer is being made will be selected and that awarding of grant funds will be weighted based upon each municipalities offer to provide in-kind services.

Kindly reply to the undersigned at your earliest opportunity and indicate to what extent the Township would be willing to provide in-kind support of the proposed basin retrofit. Please feel free to call me if you have any questions or would like additional information.

Sincerely,

Edward Wengrowski
Wastewater Management Coordinator

c: Mr. Edward McGlinchey, Director of Public Works
Mr. Robert Churchill, Municipal Engineer
Mr. Larry Liggett, NJPC
Mr. Tom Stanuikynas, NJPC

APPENDIX F – See Attached Document

SUBSRURFACE INVESTIGATION OF RECHARGE BASINS (PRINCETON HYDRO REPORT)