East Nottingham Township Pollutant Reduction Plan

Little Elk Creek
East Branch Big Elk Creek
Chesapeake Bay

Prepared for:
East Nottingham Township
158 Election Road
Oxford, PA 19363

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Date: September 2017

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Introduction

East Nottingham Township, Chester County, PA, is subject to Pennsylvania Department of Environmental Protection (DEP) permitting requirements for the Municipal Separate Storm Sewer System (MS4) within the Township. The area of responsibility is defined by the portion of the Township, which has been designated as an Urbanized Area (UA) based upon 2010 U.S. Census data.

The pending MS4 permitting term will address the five year period from March 16, 2018 to March 15, 2023. Permit requirements for East Nottingham Township include implementation of stormwater Best Management Practices (BMPs) in order to reduce pollutant loads into waterways which receive flows from the municipal storm sewer system over the permit term. The term BMP applies to a wide range of structural improvements (e.g. stormwater basin) and non-structural activities (e.g. street sweeping) which can reduce pollutant loads.

The Township is required to reduce pollutant loadings, specifically, to the Little Elk Creek and the East Branch of the Big Elk Creek, which have been designated as “impaired” local waterways by DEP. It is also responsible for reducing pollutant loadings into locally unimpaired waters which ultimately drain to the Chesapeake Bay.

This Pollutant Reduction Plan (PRP) has been developed as a means to identify BMPs which would address the required reduction in pollutant loadings.

It should be noted that a PRP is a planning document, which may be revised as necessary over the term of the DEP permit. As a planning document, detailed site investigations and engineering efforts for BMP design are not addressed. In the event detailed engineering efforts conducted for PRP implementation identify the need for significant modifications to a proposed BMP, or if an alternate BMP which would meet the required load reductions is found to be preferable, the Township may prepare a revised PRP for DEP review and approval. Although changing BMP cost information would not necessarily require PRP revision, it is also noted that refinement to the specific BMP costs estimated herein will of necessity occur in the course of detailed efforts that will be required for PRP implementation.

The sections on the following pages address required PRP content in accordance with the DEP document “Pollutant Reduction Plan (PRP) Instructions (3800-PM-BCW0100k Rev. 3/2017).

1.0 Public Participation

East Nottingham Township made this PRP available to the public for review and comment for thirty (30) days, initiated by a public notice published in the Daily Local News. The PRP was also presented at the East Nottingham Township Board of Supervisors meeting on August 8, 2017. Comments were accepted by East Nottingham Township at this meeting from interested members of the public.

Copies of the public notice, all timely comments received, and a record of consideration of these comments by the Township can be found in Exhibit 1.

2.0 Mapping

Maps illustrating the Township's MS4 are located in Appendix A. The following sections describe associated data collection, analyses and map information.

Overview

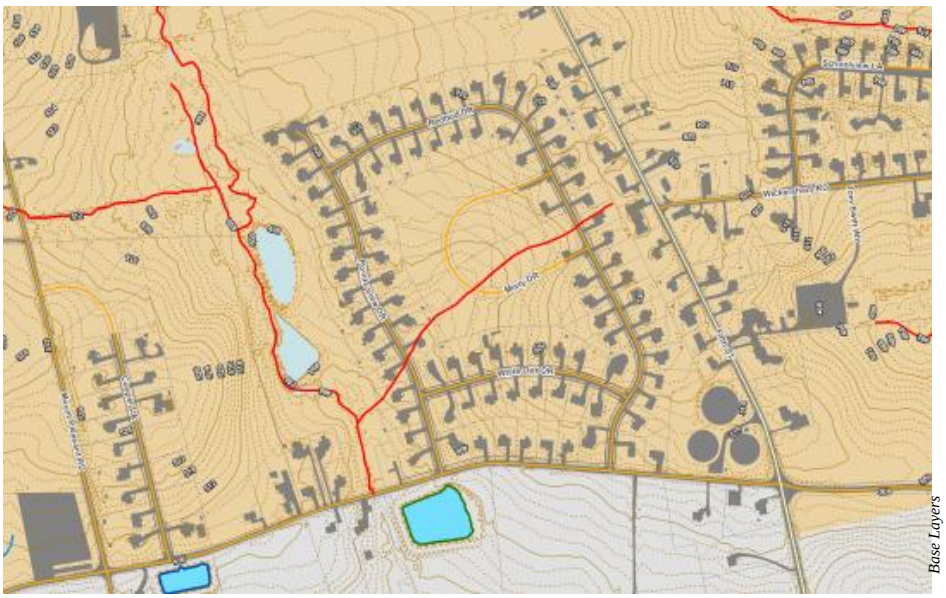
The overall goals of the Municipal Separate Storm Sewer System (MS4) GIS mapping and analysis process were three-fold: 1) Prepare an inventory database and map of the Township's storm sewer system, 2) Delineate storm sewersheds and identify outfalls that discharge into surface waters, and 3) Classify and calculate the land use/cover and impervious coverage within each sewershed. The mapping and database were used to calculate pollutant loads, determine necessary pollutant reductions, and determine new or retrofitted BMP type, size and location, with the end result of demonstrating compliance with PADEP's MS4 Program permit requirements.

Data Collection, Creation and Analysis

Base Data

The base map data layers used to prepare the maps and in spatial analysis were downloaded from the MS4 Base GIS Map Package provided on the Chester County Open Data Site. This base map includes:

- Municipal Boundaries
- Urbanized Areas, U.S. Census Bureau, 2010
- Impervious Surface, 2010
- Chester County Road Centerlines
- 2 Foot Contours - LiDAR - PAMAP Program 2006-2008
- Watersheds of Chester County
- Ponds, Lakes and Streams, 1993
- PADEP Integrated Water Quality Report, 2014



Stormwater System Inventory

The MS4 stormwater system network includes facilities and conveyances owned by or that flow to or from Township owned facilities and conveyances. The network inventory data was created by digitizing as-builts and approved land development plans, and then additional data (facility type and location) was collected through a GPS field survey to complete gaps in the system. The project specific inventory data includes stormwater point facilities (inlets, manholes), stormwater conveyances (gravity lines, swales, ditches), and stormwater basins.

Stormwater System Map

Outfalls and Sewershed Delineation

The MS4 regulated outfalls (discharge points into surface waters) and associated storm sewersheds were created by combining a manual and automated approach using GIS terrain/watershed processing and spatial analysis tools. The MS4 outfalls for each drainage area were located by identifying the lowest elevations near a stream, which is the flow path discharge point for the entire drainage area for each separate system.

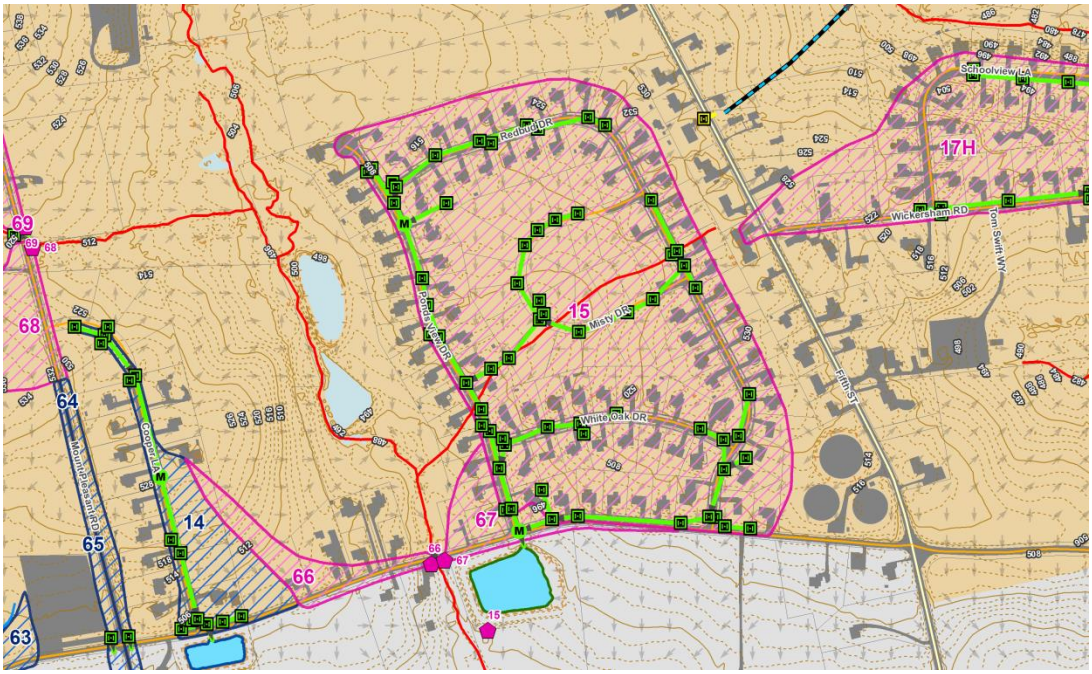
ArcGIS spatial and hydrology tools were used to prepare the digital elevation model (DEM) to be used in the analysis by assigning water flow direction and accumulation based on elevations. Terrain and hydrology raster data sets were created using the following ArcGIS spatial analysis and ArcHydro tools and process:

1) A surface raster digital elevation model (DEM) from 2' LiDAR elevations contours was created using the “Topo to Raster” tool.
2) Used “Fill” spatial analysis tool to remove small imperfections in the DEM by eliminating any gaps in the DEM where the elevation of the sink cells is much lower than all of the cells surrounding it. The flow of water gets trapped in sinks, and may have an impact on the model.

3) Created a raster of water flow direction using "Flow Direction" tool. This process establishes the hydrologic flow direction for each cell in the DEM to its steepest downslope neighbor.

4) Converted flow direction raster into flow direction arrows (points); which were used to trace flow paths to inlets and surface conveyances that lead to outfalls.

The storm sewersheds were then manually delineated. Preliminary sketches were first created for sub-catchment areas for each inlet, which were combined into an overall catchment area for an individual stormwater network. These catchment areas along with elevation contours lines, flow direction arrows, and the flow path tracing tool in ArcHydro were all used to delineate the sewersheds for each outfall.



Land Use Categories

The next step was to classify and calculate the land use/cover within each storm sewersheds, which is used to estimate pollutant loads discharging at each outfall. The land uses with the study area were aggregated into the following categories:

- Pervious and Developed
- Impervious and Developed
- Pervious and Undeveloped

The impervious and pervious coverages for land within and outside the urbanized area were calculated for each storm sewershed. All land within the urbanized area is classified as developed, and then grouped into impervious developed or pervious developed. Pervious areas outside of the urbanized area that drain to an MS4 outfall are considered undeveloped. The total areas for each of these categories were calculated within each storm sewershed.

Format

The layer symbolizations and database organization generally follow the MS4 Map Standardization Guidelines for Chester County Municipalities (Chester County Water Resources Authority, February 2017). The County's MS4 Geodatabase model and dictionary was used as a starting point; however, the stormwater facilities were grouped by data type (points, lines and polygons) in one feature dataset, rather than provide an individual feature class and layers for each individual stormwater facility type. This organization allows for more streamlined data editing sessions and less room for data redundancies and errors. Data fields, definition queries, and symbolization were used to differentiate stormwater facility types. The coordinate system is NAD 1983 State Plane Pennsylvania South Feet.

Planning Area

The planning area for this PRP is comprised of all storm sewersheds as delineated on the Maps in Appendix A.

3.0 Pollutants of Concern

DEP has published a Municipal MS4 requirements table which illustrates pollutants of concern for individual waterways. Portions of this DEP table as it relates to East Nottingham Township have been recreated in the table below.

Table 1
Pollutants of Concern

Impaired Downstream Waters or Applicable TMDL Name	**Requirements**
Chesapeake Bay Nutrients/Sediment	Appendix D - Nutrients, Siltation (4a)
East Branch Big Elk Creek	Appendix E - Organic Enrichment/Low D.O. (5)
Little Elk Creek	Appendix E - Nutrients, Siltation (5)
North East Creek	Appendix E - Siltation (5)

Category 4a indicates that the waters are impaired and a TMDL has been completed. Category 5 indicates that the waters are impaired and a TMDL has not yet been completed, but is required.

As indicated in the East Nottingham Township mapping, there are no outfalls from the PRP Planning Area discharging to the North East Creek so that waterbody is not further considered in this PRP.

The objective of this PRP is to attain a 10% reduction in sediment for both the Chesapeake Bay requirements (Appendix D of the DEP Permit Requirements) and the requirements for locally Impaired Waters (Appendix E of the DEP permit requirements). This methodology utilizes the presumptive approach as allowed by DEP in its document Pollutant Reduction Plan (PRP) Instructions (3800-PM-BCW0100k Rev. 3/2017). That is to say that a 10% reduction in sediment is presumed to also accomplish required nutrient reductions of 3% in total nitrogen (TN) and 5% in total phosphorous (TP).

4.0 Existing Loading for Pollutants of Concern

The loading associated with outfalls from the Planning Area have been broken down into three categories: Little Elk Creek (Impaired), East Branch Big Elk Creek (Impaired), and Unimpaired Waterways, which comprises the remainder of the waterways tributary to the Chesapeake Bay. See Exhibit 2 for sediment loading calculations, which utilize BMP efficiencies derived from the DEP document "BMP Effectiveness Values" (3800-PM-BCW0100m 5/2016), incorporated herein as Exhibit 3. GIS analyses and methodologies to support the calculations are discussed in Section 2.

Existing structural BMPs within East Nottingham Township were identified by reviewing subdivision and land development plans furnished by the Township, interviews with Township officials, examination of online aerial mapping programs, and multiple site visits. Based upon this information, there are twelve (12) existing structural BMPs that appear to be appropriate for reduction of existing loads. Available data indicates all were permitted prior to 2003, have been well maintained and are operating as designed. Descriptions of these BMPs are provided below, and photographs are provided in Exhibit 4.

- Wiltshire at Oxford is a low-density development adjacent to Oxford Borough on either side of Wickersham Road. There are three (3) existing dry detention areas providing stormwater attenuation and water quality. Pre-PRP load reduction is applicable to storm sewersheds 17D, 17E and 17H (see maps in Appendix A). Each of these dry detention areas drains through a low-flow orifice, and eventually to Little Elk Creek. The Homeowners' Association is responsible for maintenance and a site visit indicates these BMPs have been well maintained and are operating as designed.

- The development of Morning Mist is located on the east side of Glendale Road, north of the intersection of Hickory Hill Road. The existing dry detention areas outfall through control structures to an unnamed tributary of Little Elk Creek, as indicated relative to outfalls 33A and 33B on the maps in Appendix A. Both of these basins are well maintained by the Homeowners' Association.

- Locksley Glen and Tweed Crossing are two adjacent low-density developments located off Baltimore Pike at Waterway Road. There are two (2) dry detention basins in Locksley Glen and one (1) in Tweed Crossing providing stormwater management for storm sewersheds 6A, 9A and 9B (see maps in Appendix A). These BMPs drain to Tweed Creek, a locally unimpaired waterway.

- Darlington Hunt is located on either side of Oxford Road at the east end of the Planning Area. Load reductions for three (3) of these basins (storm sewersheds 25B, 25C and 25I) are utilized. Areas 25B and 25C are served by dry detention areas outfalling through low-flow orifices to an unnamed tributary to the West Branch Big Elk Creek, a locally unimpaired waterway. They are well maintained and functioning. The two detention areas along Crowl Toot Road (storm sewershed 25I) are categorized as extended detention BMPs since there are large, well maintained check dams along the flow paths to the control structure. The check dams span the width of the basins and provide extended detention

times, thus improving water quality (See Exhibit 4). These BMPs drain to McDonald Run, a locally unimpaired waterway.

Operation and Maintenance (O&M) of the existing detention areas has been, and will continue to be, the responsibility of the respective neighborhood Homeowners' Associations (HOAs), with oversight from the Township. The following is a list of the minimum O&M activities required in accordance with the PA Stormwater Best Management Practices Manual:

- Mowing and/or trimming of vegetation should be performed as necessary to sustain the system, but all detritus should be removed from the basin.
- All catch basins and inlets draining to the detention area should be inspected and cleaned at least 2 times per year.
- All basin structures within the detention area should be inspected for clogging and excessive debris and sediment accumulation at least four times per year, as well as after every storm greater than 1 inch. Structures include basin bottoms, trash racks, outlet structures, riprap/gabion and inlets.
- Vegetated areas should be inspected annually for erosion. If vegetative cover has been reduced by 10%, vegetation should be reestablished.
- Sediment removal should be conducted when the basin is completely dry. Sediment should be disposed of properly and once sediment is removed, disturbed areas need to be immediately stabilized and revegetated.

The loading calculations in Exhibit 2 include load reductions for existing Township BMPs. The following tables summarize the existing BMP data and resultant total existing loadings respectively.

Table 2
Existing BMP Load Reductions

Watershed	Outfall	Development Name	BMP Type	Drainage Area (Acres)	Load (lbs/yr)	Efficiency	Adjusted Load (lbs/yr)
Little Elk Creek	17D	Wiltshire	Dry Detention	4.70	3,245	10%	2,921
	17E	Wiltshire	Dry Detention	18.33	10,956	10%	9,861
	17H	Wiltshire	Dry Detention	14.63	8,755	10%	7,880
	33A	Morning Mist	Dry Detention	11.87	4,381	10%	3,943
	33B	Morning Mist	Dry Detention	11.71	4,930	10%	4,437
Unimpaired Waterways	9A	Locksley Glen	Dry Detention	25.33	13,835	10%	12,451
	9B	Locksley Glen	Dry Detention	28.11	15,003	10%	13,502
	6A	Tweed Crossing	Dry Detention	17.78	7,182	10%	6,464
	8	Tweed Crossing	Dry Detention	13.53	5,780	10%	5,202
	25B	Darlington Hunt	Dry Detention	11.46	4,653	10%	4,188
	25C	Darlington Hunt	Dry Detention	1.66	981	10%	883
	25I	Darlington Hunt	Extended Dry Detention	23.61	10,637	60%	4,225
Total Existing Load Reduction							14,381

Table 3
Total Adjusted Existing Load
for Pollutants of Concern

Watershed	Loading (lbs/yr)
Little Elk Creek	170,385
East Branch Big Elk Creek	31,037
Unimpaired Waterways	267,612

5.0 BMPs to Achieve Required Reductions in Pollutant Loading

Using the existing loading values described in Section 4, the minimum required 10% load reductions are provided in the table below.

Table 4
Minimum Required Load Reductions

Watershed	Loading (lbs/yr)
Little Elk Creek	17,039
East Branch Big Elk Creek	3,104
Unimpaired Waterways	26,761

The Planning Area of East Nottingham Township is mostly low-density residential neighborhoods with existing stormwater detention areas. Utilization of existing stormwater facilities as a basis for proposed BMPs is typically a cost effective means of realizing pollutant load reductions, since they are generally situate to capture loadings from drainage areas of concern and include some existing improvements that may facilitate incorporation of new BMPs. Therefore, the BMPs proposed herein consist of conversion of the existing detention areas to extended detention BMPs, as well as installation of bioretention or infiltration measures, where feasible, in order to achieve the required load reductions.

Existing BMPs which will be modified to incorporate proposed BMPs are on lands owned by the respective Homeowners Associations (HOAs). Easements presently exist which allow for Township access and maintenance, if necessary. The Township will coordinate with each HOA as needed to modify existing easement provisions in order to address BMP construction and O&M.

For the conversion of dry detention to extended dry detention areas, consideration was given to the configuration of the existing detention areas and proximity to homes. NRCS soils data was also evaluated to identify feasibility of providing additional storage and water quality via installation of infiltration BMPs within the existing basins. The feasibility of infiltration can be determined preliminarily by utilizing the Hydrologic Soil Group (HSG) mapping on the NRCS website. Infiltration capacity is generally graded from HSG A (good) to HSG D (poor). These classifications are referenced in the following discussions of the proposed BMPs.

For calculating load reduction, the drainage areas were generally split between pervious and impervious areas, with the impervious areas treated by infiltration and the pervious areas addressed by the extended detention.

Where extended dry detention conversions and/or installation of infiltration BMPs were found to be impractical or unnecessarily costly, retrofitting the existing dry detention areas with bioretention is proposed.

All proposed BMP calculations utilized efficiencies derived from the DEP document "BMP Effectiveness Values" (3800-PM-BCW0100m 5/2016), which is included as Exhibit 3.

Below is a discussion of each of the proposed BMPs. The associated outfall number for each BMP is indicated in parenthesis and corresponds to the number shown in the calculations (Exhibit 2) and maps (Appendix A). Location maps for each proposed BMP are included as Exhibit 5.

Little Elk Creek Watershed (Impaired)

- Twin Ponds (15) – This neighborhood is located on the north side of Waterway Road, just west of Oxford Area High School. The 1.86 acre detention basin for the neighborhood is on the south side of Waterway Road, and appears to be kept mowed. The original design included a narrow infiltration trench from the culvert under Waterway Road to the control structure. The location of the basin provides for an extended detention retrofit, without impacting adjacent residents. The existing infiltration trench will be retrofitted and expanded for additional load reduction. Soils are CdB (70% - HSG B) and GlB (30% - HSG C/D).

- Wiltshire (17F & 17G) – This is a large low-density neighborhood adjacent to Oxford Borough on either side of Wickersham Rd. There are several dry detention areas, which are well maintained. The drainage area of outfall 17G is currently served by a dry detention area at the corner of Wickersham Road and Cornerstone Court, and will be retrofitted with a bioretention area to reduce loading. Soils in the detention areas are generally HSG B/D.

The Table below summarizes calculations from Exhibit 2 as applicable to the proposed BMPs in the Little Elk Creek Watershed.

Table 5
Little Elk Creek Watershed Proposed BMPs

Outfall	Development	Impervious (Acres)	Pervious (Acres)	Total Load (lbs/yr)	Proposed BMP	Efficiency	Adjusted Load (lbs/yr)
15	Twin Ponds	5.16	30.16	13,352	Extended Detention	60%	5,341
15-x	Twin Ponds	5	0	7,524	Infiltration	95%	376
17F	Wiltshire	1.42	2.13	2,533	Bioswale	80%	507
17G	Wiltshire	2.15	4.91	4,143	Bioswale	80%	829

East Branch Big Elk Creek Watershed (Impaired)

- Darlington Hunt (25K) – This outfall is located within a dry detention area in the southeast corner of the Hillside Circle section of Darlington Hunt. The basin will be retrofitted with an infiltration BMP between the end of the culvert carrying runoff from this low-density neighborhood to the outfall. The soils in the area of proposed infiltration are HSG C.

The Table below summarizes calculations from Exhibit 2 as applicable to this BMP and watershed.

Table 6
East Branch Big Elk Creek Watershed Proposed BMP

Outfall	Development	Impervious (Acres)	Pervious (Acres)	Total Load (lbs/yr)	Proposed BMP	Efficiency	Adjusted Load (lbs/yr)
25K	Darlington Hunt	1.56	5.77	3,414	Infiltration	95%	171

Unimpaired Waterways

The unimpaired waterways include tributaries to Big Elk Creek, West Branch Big Elk Creek, Blackburn Run, McDonald Run, and Tweed Creek. The load reductions for these watersheds will be substantially provided in the Darlington Hunt development. This neighborhood is located on either side of Oxford Rd at the east end of the Planning Area. There are several dry detention areas with low-flow orifices that can be retrofitted with bioswales or another type of infiltration. Four of these existing structural BMPs are proposed to be retrofitted. The soils are generally HSG C (~60%), and about 25% HSG B. The remainder is HSG B/D or C/D.

Proposed BMPs are described below based upon applicable outfall numbers.

- Outfall 8 – The dry detention basin associated with this outfall is located in the Tweed Crossing development, draining to Tweed Creek. The basin has not been maintained and, although permitted prior to 2003, is still the responsibility of the developer. It will be restored and responsibility will be ultimately transferred to the HOA.

- Outfall 25A – The drainage area to this outfall is treated by a large detention are located near the intersection of Darlington Court and Sterling Drive and discharging directly to an unnamed tributary to the West Branch Big Elk Creek. The existing detention area will be retrofitted to provide extended detention. Also, a bioswale will be constructed within the BMP to provide additional load reduction. The soils in this area are HSG C and C/D.

- Outfall 25E – This drainage area is treated by a dry detention area on the west side of Quail Drive, south of Oxford Road which discharges to McDonald Run. The existing detention facility is proposed to be retrofitted with a bioretention BMP. Soils in the detention area are HSG C/D.

- Outfall 25G - The area between Quail Drive and Heron Drive contains a large detention area surrounded by houses, but with an approximate 150' distance to the homes, which discharges to McDonald Run. The proposed BMP is to retrofit this facility for extended detention and an infiltration BMP to facilitate drawdown and provide additional load reductions. Soils are HSG B/C.

- Outfall 25J - A dry detention area serving the western area of Hillside Circle and discharging to an unnamed tributary to the West Branch Big Elk Creek is proposed to be retrofitted with a bioretention BMP. Soils in the detention area are HSG B/C.

The Table below summarizes calculations from Exhibit 2 as applicable to the proposed BMPs in the unimpaired watersheds.

Table 7
Unimpaired Watershed Proposed BMPs

Outfall	Development	Impervious (Acres)	Pervious (Acres)	Total Load (lbs/yr)	Proposed BMP	Efficiency	Adjusted Load (lbs/yr)
8	Tweed Crossing	2.48	11.05	5,780	Dry Detention	10%	5,202
25A	Darlington Hunt	2.61	11.43	6,041	Extended Detention	60%	2,416
25A-x	Darlington Hunt	2.15	12.31	5,514	Bioswale	80%	1,103
25E	Darlington Hunt	2.22	7.85	4,797	Bioswale	80%	959
25G	Darlington Hunt	1.00	23.99	5,945	Extended Detention	60%	2,378
25G-x	Darlington Hunt	3.25	0	4,891	Infiltration	95%	245
25J	Darlington Hunt	1.56	7.72	3,777	Bioswale	80%	755

Exhibit 2 includes calculations which demonstrate that the required load reductions will be attained once the proposed BMPs are completed. All proposed BMPs will be implemented by March 15, 2023, with additional scheduling information to be provided in annual MS4 Status Reports.

6.0 Funding

Projected costs for proposed BMPs were computed based on values provided in the University of Maryland Center for Environmental Science publication "Costs of Stormwater Management Practices in Maryland Counties" and data from the Chesapeake Assessment Scenario Tool (CAST) model. Costs from these data sources vary substantively in some cases, so an average cost for each proposed BMP was computed to refine estimates of projected costs for this PRP. Actual costs will vary, and will be established in the course of BMP implementation.

Costs are provided in two categories: capital costs (including planning, surveying, design, and permitting) and annual maintenance costs.

The retrofits and BMPs proposed herein were found to have the cost implications as summarized in Table 8 below. It is anticipated that East Nottingham Township will be funding all proposed BMPs except restoration of the dry detention basin in Tweed Crossing, funding for which is expected to be the responsibility of the developer and/or the HOA (at this writing, the BMP has not yet been conveyed from the developer to the HOA). Grant funding will be pursued to mitigate Township costs.

Table 8
Proposed BMP Funding

Watershed	Outfall	Proposed BMP	Property Owner (HOA)	Estimated Capital Costs	Estimated Annual O&M Costs
Little Elk Creek	15	Extended Detention	Twin Ponds	$173,000	$4,000
	15-x	Infiltration	Twin Ponds	$186,500	$3,000
	17F	Bioswale	Wiltshire	$47,000	$1,000
	17G	Bioswale	Wiltshire	$79,000	$2,000
East Branch Big Elk Creek	25K	Extended Detention	Darlington Hunt	$97,000	$1,500
Unimpaired Watersheds	8	Dry Detention	Tweed Crossing	N/A*	N/A*
	25A	Extended Detention	Darlington Hunt	$80,000	$2,000
	25A-x	Bioswale	Darlington Hunt	$114,500	$3,500
	25E	Bioswale	Darlington Hunt	$95,000	$2,500
	25G	Extended Detention	Darlington Hunt	$70,500	$1,000
	25G-x	Infiltration	Darlington Hunt	$121,500	$2,000
	25J	Bioswale	Darlington Hunt	$77,500	$2,000
Totals				$1,141,500	$24,500

* Developer/HOA funding

7.0 Operation and Maintenance of BMPs

O&M of all proposed BMPs except the Tweed Crossing basin will be the responsibility of the Township. O&M responsibility for the Tweed Crossing BMP will ultimately remain the responsibility of the HOA. Information regarding actual O&M activities will be identified in annual MS4 Status Reports. The following is a list of the minimum O&M activities required in accordance with the PA Stormwater Best Management Practices Manual:

Dry and Extended Dry Detention Areas

- Mowing and/or trimming of vegetation should be performed as necessary to sustain the system, but all detritus should be removed from the basin.
- All catch basins and inlets draining to the detention area should be inspected and cleaned at least 2 times per year.
- All basin structures within the detention area should be inspected for clogging and excessive debris and sediment accumulation at least four times per year, as well as after every storm greater than 1 inch. Structures include basin bottoms, trash racks, outlet structures, riprap/gabion and inlets.
- Vegetated areas should be inspected annually for erosion. If vegetative cover has been reduced by 10%, vegetation should be reestablished.Sediment removal should be conducted when the basin is completely dry.
- Sediment should be disposed of properly and once sediment is removed, disturbed areas need to be immediately stabilized and revegetated.

Infiltration BMPs

- Catch Basins and Inlets (upgradient of infiltration basin) should be inspected and cleaned at least two times per year and after runoff events.
- The vegetation along the surface of the Infiltration basin should be maintained in good condition, and any bare spots revegetated as soon as possible.
- Vehicles should not be parked or driven on an Infiltration Basin, and care should be taken to avoid excessive compaction by mowers.
- Inspect the basin after runoff events and make sure that runoff drains down within 72 hours. Also, inspect for accumulation of sediment, damage to outlet control structures, erosion control measures, signs of water contamination/spills, and slope stability in the berms.
- Mow only as appropriate for vegetative cover species.
- Remove accumulated sediment from basin as required. Restore original cross section and infiltration rate. Properly dispose of sediment.

Bioretention/Rain Garden

- While vegetation is being established, pruning and weeding may be required. Detritus may also need to be removed every year. Perennial plantings may be cut down at the end of the growing season.
- Mulch should be re-spread when erosion is evident and be replenished as needed. Once every 2 to 3 years, the entire area may require mulch replacement.
- Areas should be inspected at least 2 times per year for sediment buildup, erosion, vegetative conditions, etc. During extended drought, areas may require watering.

Exhibits

Exhibit 1. Public Notice, Comments and Responses

21ST CENTURY media

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AFFIDAVIT OF PUBLICATION

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EAST NOTTINGHAM TOWNSHIP
158 ELECTION ROAD
OXFORD, PA 19363
Attention:

STATE OF PENNSYLVANIA,
COUNTY OF MONTGOMERY

The undersigned Kathy Vincent, being duly sworn the he/she is the principal clerk of Daily Local News, Daily Local News Digital, published in the English language for the dissemination of local or transmitted news and intelligence of a general character, which are duly qualified newspapers, and the annexed hereto is a copy of certain order, notice, publication or advertisement of:

EAST NOTTINGHAM TOWNSHIP

Published in the following edition(s):

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COMMONWEALTH OF PENNSYLVANIA
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MAUREEN SCHMID, Notary Public
Lansdale Boro., Montgomery County
My Commission Expires March 31, 2021

Sworn to the subscribed before me this 7/31/2017.

Maureen Schmid

Notary Public, State of Pennsylvania
Acting in County of Montgomery

EAST NOTTINGHAM TOWNSHIP

NOTICE OF PUBLIC COMMENT PERIOD AND PUBLIC MEETING FOR MS4 POLLUTANT REDUCTION PLAN

Public notice is given that the MS4 Pollutant Reduction Plan for East Nottingham Township will be available for 30 days for the public to review and submit written comments from August 1, 2017 until August 31, 2017. The document may be reviewed during the comment period at the East Nottingham Township Building located at 158 Election Road, Oxford, Pennsylvania, 19363, during regular business hours Monday – Thursday from 8:00 a.m. to 4:00 p.m. Written comments should be submitted to the above address with a notation "Public Comment on MS4 Pollutant Reduction Plan". In addition public comment will be received at the East Nottingham Township Board of Supervisors regular meeting at 7:00 p.m. on Tuesday, August 8, 2017 at the above address.

The PRP outlines the measures the Township of East Nottingham intends to implement to reduce certain pollutants discharged from the Township of East Nottingham storm sewer system (MS4). The PRP includes a calculation of the existing loading of the pollutants of concern, a calculation of the minimum reduction required, and a selection of potential Best Management Practices (BMPs) intended to achieve the minimum required reduction.

If you are a person with a disability and wish to attend the meeting identified above and require an auxiliary aide, service or other accommodation to participate in the proceedings, please contact East Nottingham Township at (610) 932-8494 to discuss how East Nottingham Township may best accommodate your needs.

WINIFRED MORAN SEBASTIAN, ESQUIRE
SOLICITOR
EAST NOTTINGHAM TOWNSHIP
dln. 7/31 - 1a.

Advertisement Information

Client Id: 884810 **Ad Id:** 1395888 **PO:** PollutantRedPlan **Sales Person:** 093304

EAST NOTTINGHAM TOWNSHIP

NOTICE OF PUBLIC COMMENT PERIOD AND PUBLIC MEETING FOR MS4 POLLUTANT REDUCTION PLAN

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dln. 7/31 - 1a.

EAST NOTTINGHAM TOWNSHIP
158 Election Road
Oxford, PA 19363
610-932-8494
(Fax) 610-932-9441

September 8, 2017

REPORT- Re: MS4

The availability of the MS4 plan was advertised on July 31, 2017 and it was available for public review and comment from August 1 to August 31, 2017. East Nottingham Township received no written comments on the plan.

Meeting Report- Please note, one comment was received at the public Board of Supervisors Meeting on August 8, 2017 as follows:
Resident, Joe Raffa commented on concrete. He has experience in this area and feels that concrete is preferred and much easier to maintain. Every year he has to bring in large equipment in the area and people get upset with the large equipment on their property.

Pat Brady, Secretary
East Nottingham Township

East Nottingham Township Response to Public Comment

East Nottingham Township received one public comment on the Pollutant Reduction Plan regarding the use of concrete as a medium along a trench proposed within an extended detention BMP.

The desire to reduce required maintenance for the trench by using concrete is understood and appreciated. However, the trench incorporated into the proposed BMP is intended to promote infiltration into the ground and is not solely intended for conveyance. Therefore, no revision to the Pollutant Reduction Plan has been made to address this comment.

Exhibit 2. Sediment Loading and Load Reduction Calculations

EAST NOTTINGHAM TOWNSHIP POLLUTANT REDUCTION PLAN (PRP)

Outfall	Impervious Area (acres)	Impervious Load (lbs/yr)	Pervious Area (acres)	Pervious Load (lbs/yr)	Undeveloped Area (acres)	Undeveloped Load (lbs/yr)	Total Load (lbs/yr)	Development	Existing BMPs Basin or BMP	Number	Efficiency (%)	Credit?	Adjusted Load (lbs/yr)	Proposed BMPs Number	Type	Efficiency (%)	Adjusted Load (lbs/yr)	CAST PA data Capital Cost ($)	CAST PA data Annual Cost ($)	MDE guidance Capital Cost ($)	MDE guidance Annual Cost ($)	Average Capital Cost ($)	Average Annual Cost ($)
LITTLE ELK CREEK																							
14	0.50	752	3.52	651	0.00	0	1,403	Cooper Farm	Detention Basin	3	10%	N	1,403	23		0%	1,403	$0	$0	$0	$0	$0	$0
15	5.16	7,769	30.16	5,583	0.00	0	13,352	Twin Ponds	Detention Basin	3	10%	N	13,352	4	Extended Detention Basin	60%	5,341	$145,000	$2,000	$201,000	$6,000	$173,000	$4,000
15-x	5.00	7,524	0.00	0	0.00	0	7,524	Twin Ponds	Detention Basin	3	10%	N	7,524	5	Infiltration Practices	95%	376	$67,000	$1,000	$306,000	$5,000	$186,500	$3,000
17D	1.80	2,709	2.90	537	0.00	0	3,245	Wiltshire at Oxford	Detention Basin	3	10%	Y	2,921	23		0%	2,921	$0	$0	$0	$0	$0	$0
17E	5.73	8,624	12.60	2,332	0.00	0	10,956	Wiltshire at Oxford	Detention Basin	3	10%	Y	9,861	23		0%	9,861	$0	$0	$0	$0	$0	$0
17F	1.42	2,139	2.13	394	0.00	0	2,533	Wiltshire at Oxford	Detention Basin	3	10%	N	2,533	12	Bioswale	80%	507	$34,000	$1,000	$60,000	$1,000	$47,000	$1,000
17G	2.15	3,234	4.91	908	0.00	0	4,143	Wiltshire at Oxford	Detention Basin	3	10%	N	4,143	12	Bioswale	80%	829	$68,000	$2,000	$90,000	$2,000	$79,000	$2,000
17H	4.58	6,895	10.05	1,860	0.00	0	8,755	Wiltshire at Oxford	Detention Basin	3	10%	Y	7,880	23		0%	7,880	$0	$0	$0	$0	$0	$0
31A	12.69	19,092	91.92	17,016	0.00	0	36,108	Autumn Hill	Detention Basin	3	10%	N	36,108	23		0%	36,108	$0	$0	$0	$0	$0	$0
33A	1.66	2,492	10.21	1,889	0.00	0	4,381	Morningmist	Detention Basin	3	10%	Y	3,943	23		0%	3,943	$0	$0	$0	$0	$0	$0
33B	2.09	3,149	9.62	1,781	0.00	0	4,930	Morningmist	Detention Basin	3	10%	Y	4,437	23		0%	4,437	$0	$0	$0	$0	$0	$0
39A	1.01	1,513	2.39	443	0.00	0	1,956	Elk Creek Reserve	Detention Basin	3	10%	N	1,956	23		0%	1,956	$0	$0	$0	$0	$0	$0
39b	3.33	5,010	11.43	2,116	13.25	3,109	10,234	Elk Creek Reserve	Detention Basin	3	10%	N	10,234	23		0%	10,234	$0	$0	$0	$0	$0	$0
39C	0.64	956	1.07	198	0.00	0	1,153	Elk Creek Reserve	Detention Basin	3	10%	N	1,153	23		0%	1,153	$0	$0	$0	$0	$0	$0
17A	1.13	1,698	2.17	401	0.00	0	2,099	Wiltshire at Oxford					2,099	23		0%	2,099	$0	$0	$0	$0	$0	$0
17B	0.62	926	0.89	164	0.00	0	1,090	Wiltshire at Oxford					1,090	23		0%	1,090	$0	$0	$0	$0	$0	$0
17C	0.19	285	0.28	51	0.00	0	337	Wiltshire at Oxford					337	23		0%	337	$0	$0	$0	$0	$0	$0
17I	0.25	378	0.28	52	0.00	0	430	Wiltshire at Oxford					430	23		0%	430	$0	$0	$0	$0	$0	$0
17J	0.27	401	0.39	73	0.00	0	473	Wiltshire at Oxford					473	23		0%	473	$0	$0	$0	$0	$0	$0
17K	0.26	388	0.58	107	0.00	0	495	Wiltshire at Oxford					495	23		0%	495	$0	$0	$0	$0	$0	$0
37	2.24	3,370	34.31	6,351	0.00	0	9,721	Wilson Mill Estates					9,721	23		0%	9,721	$0	$0	$0	$0	$0	$0
39D	2.10	3,157	14.04	2,600	0.00	0	5,757	Wilson Mill Estates					5,757	23		0%	5,757	$0	$0	$0	$0	$0	$0
62	0.92	1,382	1.29	239	0.00	0	1,621						1,621	23		0%	1,621	$0	$0	$0	$0	$0	$0
63	0.10	147	0.69	127	0.00	0	275						275	23		0%	275	$0	$0	$0	$0	$0	$0
64	0.34	506	0.75	139	0.14	33	678						678	23		0%	678	$0	$0	$0	$0	$0	$0
65	0.36	539	0.50	92	0.29	69	700						700	23		0%	700	$0	$0	$0	$0	$0	$0
66	0.42	635	1.68	311	0.00	0	945						945	23		0%	945	$0	$0	$0	$0	$0	$0
67	0.65	975	1.39	257	0.00	0	1,232						1,232	23		0%	1,232	$0	$0	$0	$0	$0	$0
68	0.27	405	3.65	675	0.00	0	1,080						1,080	23		0%	1,080	$0	$0	$0	$0	$0	$0
69	0.68	1,025	1.11	205	0.00	0	1,231						1,231	23		0%	1,231	$0	$0	$0	$0	$0	$0
70	0.61	917	0.91	169	0.00	0	1,086						1,086	23		0%	1,086	$0	$0	$0	$0	$0	$0
71	1.50	2,264	3.59	665	0.00	0	2,929						2,929	23		0%	2,929	$0	$0	$0	$0	$0	$0
72	0.84	1,261	3.90	723	0.00	0	1,983						1,983	23		0%	1,983	$0	$0	$0	$0	$0	$0
73	1.25	1,880	6.91	1,279	0.00	0	3,158						3,158	23		0%	3,158	$0	$0	$0	$0	$0	$0
74A	0.18	266	0.25	46	0.00	0	312						312	23		0%	312	$0	$0	$0	$0	$0	$0
74B	0.32	482	6.21	1,150	0.00	0	1,632						1,632	23		0%	1,632	$0	$0	$0	$0	$0	$0
75	0.47	703	0.88	163	0.00	0	866						866	23		0%	866	$0	$0	$0	$0	$0	$0
76	1.08	1,625	2.39	443	0.00	0	2,068						2,068	23		0%	2,068	$0	$0	$0	$0	$0	$0
77	1.26	1,889	0.46	86	21.79	5,113	7,088						7,088	23		0%	7,088	$0	$0	$0	$0	$0	$0
78	1.18	1,779	0.39	72	12.32	2,890	4,740						4,740	23		0%	4,740	$0	$0	$0	$0	$0	$0
79	0.33	493	9.55	1,768	0.00	0	2,261						2,261	23		0%	2,261	$0	$0	$0	$0	$0	$0
80	0.19	293	2.03	376	0.00	0	669						669	23		0%	669	$0	$0	$0	$0	$0	$0
81	1.85	2,791	9.60	1,778	0.00	0	4,569						4,569	23		0%	4,569	$0	$0	$0	$0	$0	$0
82	0.51	765	3.49	647	0.00	0	1,412						1,412	23		0%	1,412	$0	$0	$0	$0	$0	$0
Base loads							**173,612**	**Adjusted loads existing BMPs**					**170,385**	**Adjusted loads proposed BMPs**			**149,886**	**$314,000**	**$6,000**	**$657,000**	**$14,000**	**$485,500**	**$10,000**
								Required load reduction					**17,039**	**Load reduction from BMPs**			**20,499**						
														Load reductions met?			**Yes**						
EAST BRANCH BIG ELK CREEK																							
25K	1.56	2,345	5.77	1,068	0.00	0	3,414	Darlington Hunt	Detention Basin	3	10%	N	3,414	5	Infiltration Practices	95%	171	$99,000	$2,000	$95,000	$1,000	$97,000	$1,500
26	2.73	4,113	16.36	3,028	0.00	0	7,141	Elk Valley	Detention Basin	3	10%	N	7,141	23		0%	7,141	$0	$0	$0	$0	$0	$0
27	0.65	976	1.18	218	0.00	0	1,194	Heather Fields	Detention Basin	3	10%	N	1,194	23		0%	1,194	$0	$0	$0	$0	$0	$0
27A	1.88	2,825	10.58	1,959	0.00	0	4,784	Heather Fields	Detention Basin	3	10%	N	4,784	23		0%	4,784	$0	$0	$0	$0	$0	$0

EAST NOTTINGHAM TOWNSHIP POLLUTANT REDUCTION PLAN (PRP)

Outfall	Impervious Area (acres)	Impervious Load (lbs/yr)	Pervious Area (acres)	Pervious Load (lbs/yr)	Undeveloped Area (acres)	Undeveloped Load (lbs/yr)	Total Load (lbs/yr)	Existing BMPs: Development	Basin or BMP	Number	Efficiency (%)	Credit?	Adjusted Load (lbs/yr)	Proposed BMPs: Number	Type	Efficiency (%)	Adjusted Load (lbs/yr)	CAST PA data: Capital Cost ($)	CAST PA data: Annual Cost ($)	MDE guidance: Capital Cost ($)	MDE guidance: Annual Cost ($)	Average: Capital Cost ($)	Average: Annual Cost ($)
27E	0.97	1,454	2.98	552	0.00	0	2,007	Heather Fields	Detention Basin	3	10%	N	2,007	23		0%	2,007	$0	$0	$0	$0	$0	$0
28	1.87	2,821	9.52	1,762	0.00	0	4,583	Nottingham Estates	Detention Basin	3	10%	N	4,583	23		0%	4,583	$0	$0	$0	$0	$0	$0
27C	0.33	501	0.77	142	0.00	0	643	Heather Fields					643	23		0%	643	$0	$0	$0	$0	$0	$0
27D	1.20	1,812	3.79	701	0.00	0	2,512	Heather Fields					2,512	23		0%	2,512	$0	$0	$0	$0	$0	$0
102	0.42	632	0.90	167	0.00	0	799						799	23		0%	799	$0	$0	$0	$0	$0	$0
103	0.08	123	0.17	32	0.00	0	155						155	23		0%	155	$0	$0	$0	$0	$0	$0
104	0.51	763	1.31	242	0.00	0	1,005						1,005	23		0%	1,005	$0	$0	$0	$0	$0	$0
105	0.58	870	10.43	1,931	0.00	0	2,801						2,801	23		0%	2,801	$0	$0	$0	$0	$0	$0
Base Loads	12.78		63.75		0.00		**31,037**						**31,037**				**27,795**	**$99,000**	**$2,000**	**$95,000**	**$1,000**	**$97,000**	**$1,500**
										Required load reduction			**3,104**	**Load reductions from BMPs**			**3,243**						
														10% reduction met?			**Yes**						
UNIMPAIRED WATERWAYS																							
BIG ELK CREEK																							
31B	1.22	1,842	3.93	727	0.00	0	2,569	Autumn Hill	Detention Basin	3	10%	N	2,569	23		0%	2,569	$0	$0	$0	$0	$0	$0
31C	1.31	1,968	4.76	880	0.00	0	2,849	Autumn Hill	Detention Basin	3	10%	N	2,849	23		0%	2,849	$0	$0	$0	$0	$0	$0
32	0.63	951	8.63	1,598	0.00	0	2,549	Saginaw Village				N	2,549	23		0%	2,549	$0	$0	$0	$0	$0	$0
106	0.90	1,353	3.20	593	0.00	0	1,946						1,946	23		0%	1,946	$0	$0	$0	$0	$0	$0
BLACKBURN RUN																							
1A	2.25	3,379	12.28	2,273	0.00	0	5,652	Blackburn Knoll	Detention Basin	3	10%	N	5,652	23		0%	5,652	$0	$0	$0	$0	$0	$0
1B	0.86	1,300	2.84	527	0.00	0	1,827	Blackburn Knoll	Detention Basin	3	10%	N	1,827	23		0%	1,827	$0	$0	$0	$0	$0	$0
1C	5.23	7,869	28.98	5,365	3.57	837	14,072	Forge Crossing	Detention Basin	3	10%	N	14,072	23		0%	14,072	$0	$0	$0	$0	$0	$0
50	0.79	1,182	3.50	647	0.00	0	1,829						1,829	23		0%	1,829	$0	$0	$0	$0	$0	$0
51	0.60	906	3.96	732	0.00	0	1,638						1,638	23		0%	1,638	$0	$0	$0	$0	$0	$0
McDONALD RUN																							
25C	0.51	767	1.15	213	0.00	0	981	Darlington Hunt	Detention Basin	3	10%	Y	883	23		0%	883	$0	$0	$0	$0	$0	$0
25E	2.22	3,343	7.85	1,454	0.00	0	4,797	Darlington Hunt	Detention Basin	3	10%	N	4,797	12	Bioswale	80%	959	$97,000	$3,000	$93,000	$2,000	$95,000	$2,500
25G	1.00	1,505	23.99	4,440	0.00	0	5,945	Darlington Hunt	Detention Basin	3	10%	N	5,945	4	Extended Detention Basin	60%	2,378	$102,000	$1,000	$39,000	$1,000	$70,500	$1,000
25G-x	3.25	4,891	0.00	0	0.00	0	4,891	Darlington Hunt	Detention Basin	3	10%	N	4,891	5	Infiltration Practices	95%	245	$44,000	$1,000	$199,000	$3,000	$121,500	$2,000
25I	4.75	7,146	18.86	3,491	0.00	0	10,637	Darlington Hunt	Detention Basin	4	60%	Y	4,255	23		0%	4,255	$0	$0	$0	$0	$0	$0
41E	0.82	1,229	1.94	360	0.00	0	1,588	Duck Farm					1,588	23		0%	1,588	$0	$0	$0	$0	$0	$0
25F	1.84	2,762	9.89	1,831	0.00	0	4,593	Darlington Hunt					4,593	23		0%	4,593	$0	$0	$0	$0	$0	$0
TWEED CREEK																							
3	5.11	7,682	43.00	7,961	0.00	0	15,643	Country Meadows	Wet Pond	1	60%	N	15,643	23		0%	15,643	$0	$0	$0	$0	$0	$0
6A	2.95	4,437	14.83	2,745	0.00	0	7,182	Tweed Crossing	Detention Basin	3	10%	Y	6,464	23		0%	6,464	$0	$0	$0	$0	$0	$0
8	2.48	3,734	11.05	2,045	0.00	0	5,780	Tweed Crossing	Detention Basin	3	10%	N	5,780	3	Detention Basin	10%	5,202	$0	$0	$0	$0	$0	$0
9A	6.93	10,428	18.40	3,407	0.00	0	13,835	Locksley Glen	Detention Basin	3	10%	Y	12,451	23		0%	12,451	$0	$0	$0	$0	$0	$0
9B	7.43	11,174	20.68	3,828	0.00	0	15,003	Locksley Glen	Detention Basin	3	10%	Y	13,502	23		0%	13,502	$0	$0	$0	$0	$0	$0
4	1.44	2,173	5.45	1,009	0.00	0	3,182	Bethany Christian School					3,182	23		0%	3,182	$0	$0	$0	$0	$0	$0
52	0.46	692	1.42	264	0.00	0	956						956	23		0%	956	$0	$0	$0	$0	$0	$0
53	3.14	4,729	9.88	1,829	0.00	0	6,557						6,557	23		0%	6,557	$0	$0	$0	$0	$0	$0
54	0.83	1,242	3.87	716	0.00	0	1,958						1,958	23		0%	1,958	$0	$0	$0	$0	$0	$0
56	1.08	1,621	10.97	2,031	0.00	0	3,652						3,652	23		0%	3,652	$0	$0	$0	$0	$0	$0
57	0.56	846	4.86	901	4.76	1,116	2,863						2,863	23		0%	2,863	$0	$0	$0	$0	$0	$0
58	0.41	615	4.51	834	0.00	0	1,449						1,449	23		0%	1,449	$0	$0	$0	$0	$0	$0
59	0.83	1,255	4.84	896	0.00	0	2,151						2,151	23		0%	2,151	$0	$0	$0	$0	$0	$0
60	1.75	2,632	21.27	3,938	0.00	0	6,570						6,570	23		0%	6,570	$0	$0	$0	$0	$0	$0
61	0.34	514	5.14	951	0.00	0	1,465						1,465	23		0%	1,465	$0	$0	$0	$0	$0	$0
6B	0.19	285	0.23	43	0.00	0	328	Tweed Crossing				N	328	23		0%	328	$0	$0	$0	$0	$0	$0
6C	0.15	220	0.28	51	0.00	0	271	Tweed Crossing				N	271	23		0%	271	$0	$0	$0	$0	$0	$0
6D	1.08	1,618	3.12	578	0.00	0	2,196	Tweed Crossing				N	2,196	23		0%	2,196	$0	$0	$0	$0	$0	$0
7	2.29	3,450	11.55	2,138	0.00	0	5,589	Tweed Crossing				N	5,589	23		0%	5,589	$0	$0	$0	$0	$0	$0

EAST NOTTINGHAM TOWNSHIP POLLUTANT REDUCTION PLAN (PRP)

Outfall	Impervious Area (acres)	Impervious Load (lbs/yr)	Pervious Area (acres)	Pervious Load (lbs/yr)	Undeveloped Area (acres)	Undeveloped Load (lbs/yr)	Total Load (lbs/yr)	Development	Existing BMPs Basin or BMP	Number	Efficiency (%)	Credit?	Adjusted Load (lbs/yr)	Proposed BMPs Number	Type	Efficiency (%)	Adjusted Load (lbs/yr)	CAST PA data Capital Cost ($)	CAST PA data Annual Cost ($)	MDE guidance Capital Cost ($)	MDE guidance Annual Cost ($)	Average Capital Cost ($)	Average Annual Cost ($)
WEST BRANCH BIG ELK CREEK																							
19	0.62	936	1.41	261	0.00	0	1,197	Mill Pond Farm	Detention Basin	3	10%	N	1,197	23		0%	1,197	$0	$0	$0	$0	$0	$0
21A	0.74	1,109	2.14	396	0.00	0	1,505	Woods at Nottingham	Detention Basin	3	10%	N	1,505	23		0%	1,505	$0	$0	$0	$0	$0	$0
21B	1.03	1,549	7.97	1,475	0.00	0	3,023	Woods at Nottingham	Wet Pond	1	60%	N	3,023	23		0%	3,023	$0	$0	$0	$0	$0	$0
23A	1.27	1,916	8.08	1,497	0.00	0	3,413	Partridge at Oxford	Detention Basin	3	10%	N	3,413	23		0%	3,413	$0	$0	$0	$0	$0	$0
25A	2.61	3,925	11.43	2,116	0.00	0	6,041	Darlington Hunt	Detention Basin	3	10%	N	6,041	4	Extended Detention Basin	60%	2,416	$58,000	$1,000	$102,000	$3,000	$80,000	$2,000
25A-x	2.15	3,235	12.31	2,279	0.00	0	5,514	Darlington Hunt	Detention Basin	3	10%	N	5,514	12	Bioswale	80%	1,103	$139,000	$5,000	$90,000	$2,000	$114,500	$3,500
25B	1.92	2,886	9.54	1,766	0.00	0	4,653	Darlington Hunt	Detention Basin	3	10%	Y	4,188	23		0%	4,188	$0	$0	$0	$0	$0	$0
25J	1.56	2,349	7.72	1,428	0.00	0	3,777	Darlington Hunt	Detention Basin	3	10%	N	3,777	12	Bioswale	80%	755	$89,000	$3,000	$66,000	$1,000	$77,500	$2,000
29B	1.28	1,932	3.65	675	0.00	0	2,607	Paper Mill Woods	Detention Basin	3	10%	N	2,607	23		0%	2,607	$0	$0	$0	$0	$0	$0
30	2.24	3,376	14.04	2,599	0.00	0	5,975	Alvin Miller	Detention Basin	3	10%	N	5,975	23		0%	5,975	$0	$0	$0	$0	$0	$0
31D	4.93	7,416	20.38	3,772	0.00	0	11,188	Autumn Hill	Detention Basin	3	10%	N	11,188	23		0%	11,188	$0	$0	$0	$0	$0	$0
31E	1.54	2,318	7.88	1,460	0.00	0	3,777	Autumn Hill, Phase III	Detention Basin	3	10%	N	3,777	23		0%	3,777	$0	$0	$0	$0	$0	$0
34A	3.01	4,523	15.22	2,818	0.00	0	7,341	Hunter Knoll Estates	Detention Basin	3	10%	N	7,341	23		0%	7,341	$0	$0	$0	$0	$0	$0
34B	1.69	2,538	4.35	805	0.00	0	3,343	Hunter Knoll Estates	Detention Basin	3	10%	N	3,343	23		0%	3,343	$0	$0	$0	$0	$0	$0
35	0.57	853	2.58	477	0.00	0	1,330	Tommy Tinker Too					1,330	23		0%	1,330	$0	$0	$0	$0	$0	$0
41A	1.14	1,718	1.79	331	0.00	0	2,049	Duck Farm					2,049	23		0%	2,049	$0	$0	$0	$0	$0	$0
41C	2.81	4,233	11.73	2,171	0.00	0	6,404	Duck Farm					6,404	23		0%	6,404	$0	$0	$0	$0	$0	$0
41D	1.00	1,503	6.04	1,119	0.00	0	2,622	Duck Farm					2,622	23		0%	2,622	$0	$0	$0	$0	$0	$0
100	0.07	99	1.30	240	0.00	0	339						339	23		0%	339	$0	$0	$0	$0	$0	$0
101	0.78	1,172	3.51	651	0.00	0	1,823						1,823	23		0%	1,823	$0	$0	$0	$0	$0	$0
20A	0.57	862	3.33	616	0.00	0	1,478	Meadowcroft					1,478	23		0%	1,478	$0	$0	$0	$0	$0	$0
20B	0.67	1,013	3.71	686	0.00	0	1,700	Meadowcroft					1,700	23		0%	1,700	$0	$0	$0	$0	$0	$0
25D	0.71	1,066	4.78	885	0.00	0	1,951	Darlington Hunt					1,951	23		0%	1,951	$0	$0	$0	$0	$0	$0
25M	0.39	584	0.60	111	0.00	0	695	Darlington Hunt					695	23		0%	695	$0	$0	$0	$0	$0	$0
29A	1.53	2,306	8.88	1,645	0.00	0	3,950	Paper Mill Woods					3,950	23		0%	3,950	$0	$0	$0	$0	$0	$0
84	0.44	664	1.03	191	0.00	0	855						855	23		0%	855	$0	$0	$0	$0	$0	$0
85	1.35	2,026	13.09	2,424	0.00	0	4,450						4,450	23		0%	4,450	$0	$0	$0	$0	$0	$0
86	0.49	744	2.59	479	0.00	0	1,223						1,223	23		0%	1,223	$0	$0	$0	$0	$0	$0
87	0.26	393	0.76	141	0.00	0	534						534	23		0%	534	$0	$0	$0	$0	$0	$0
88	0.39	586	0.71	132	0.00	0	719						719	23		0%	719	$0	$0	$0	$0	$0	$0
91	0.43	653	0.97	180	0.00	0	833						833	23		0%	833	$0	$0	$0	$0	$0	$0
92	3.15	4,740	11.90	2,202	0.00	0	6,942						6,942	23		0%	6,942	$0	$0	$0	$0	$0	$0
93	0.53	803	3.21	594	0.00	0	1,397						1,397	23		0%	1,397	$0	$0	$0	$0	$0	$0
94	0.34	513	2.30	425	0.00	0	938						938	23		0%	938	$0	$0	$0	$0	$0	$0
95	0.86	1,301	5.69	1,053	0.00	0	2,354						2,354	23		0%	2,354	$0	$0	$0	$0	$0	$0
96	0.73	1,103	3.03	561	0.00	0	1,665						1,665	23		0%	1,665	$0	$0	$0	$0	$0	$0
97	0.53	793	4.85	898	0.00	0	1,691						1,691	23		0%	1,691	$0	$0	$0	$0	$0	$0
98	0.44	655	3.07	568	0.00	0	1,224						1,224	23		0%	1,224	$0	$0	$0	$0	$0	$0
99	0.23	346	1.63	302	0.00	0	648						648	23		0%	648	$0	$0	$0	$0	$0	$0
Base loads							**278,160**	**Adjusted loads existing BMPs**					**267,612**	**Adjusted loads proposed BMPs**			**243,926**	**$529,000**	**$14,000**	**$589,000**	**$12,000**	**$559,000**	**$13,000**
								Required load reduction					**26,761**	**Load reduction from BMPs**			**23,686**						
														Load reductions met?			**No**						
TOTAL TO CHESAPEAKE BAY																							
Total							**482,809**	**Adjusted loads existing BMPs**					**469,035**	**Adjusted loads proposed BMPs**			**421,606**	**942,000**	**22,000**	**1,341,000**	**27,000**	**1,141,500**	**24,500**
								Required load reduction					**46,903**	**Load reduction from BMPs**			**47,428**						
														10% reduction met?			**Yes**						

Exhibit 3. BMP Effectiveness Values

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
STORMWATER DISCHARGES FROM
SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS
BMP EFFECTIVENESS VALUES

This table of BMP effectiveness values (i.e., pollutant removal efficiencies) is intended for use by MS4s that are developing and implementing Pollutant Reduction Plans and TMDL Plans to comply with NPDES permit requirements. The values used in this table generally consider pollutant reductions from both overland flow and reduced downstream erosion, and are based primarily on average values within the Chesapeake Assessment Scenario Tool (CAST) (www.casttool.org). Design considerations, operation and maintenance, and construction sequences should be as outlined in the Pennsylvania Stormwater BMP Manual, Chesapeake Bay Program guidance, or other technical sources. The Department of Environmental Protection (DEP) will update the information contained in this table as new information becomes available. Interested parties may submit information to DEP for consideration in updating this table to DEP's MS4 resource account, RA-EPPAMS4@pa.gov. Where an MS4 proposes a BMP not identified in this document or in Chesapeake Bay Program expert panel reports, other technical resources may be consulted for BMP effectiveness values. Note – TN = Total Nitrogen and TP = Total Phosphorus.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Wet Ponds and Wetlands	20%	45%	60%	A water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. Until recently, these practices were designed specifically to meet water quantity, not water quality objectives. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Nitrogen reduction is minimal.
Dry Detention Basins and Hydrodynamic Structures	5%	10%	10%	Dry Detention Ponds are depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Hydrodynamic Structures are devices designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads that are designed to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.
Dry Extended Detention Basins	20%	20%	60%	Dry extended detention (ED) basins are depressions created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Dry ED basins are designed to dry out between storm events, in contrast with wet ponds, which contain standing water permanently. As such, they are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, theoretically improving treatment effectiveness.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Infiltration Practices w/ Sand, Veg.	85%	85%	95%	A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration. Design specifications require infiltration basins and trenches to be built in good soil, they are not constructed on poor soils, such as C and D soil types. Engineers are required to test the soil before approval to build is issued. To receive credit over the longer term, jurisdictions must conduct yearly inspections to determine if the basin or trench is still infiltrating runoff.
Filtering Practices	40%	60%	80%	Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. There are various sand filter designs, such as above ground, below ground, perimeter, etc. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter. These systems require yearly inspection and maintenance to receive pollutant reduction credit.
Filter Strip Runoff Reduction	20%	54%	56%	Urban filter strips are stable areas with vegetated cover on flat or gently sloping land. Runoff entering the filter strip must be in the form of sheet-flow and must enter at a non-erosive rate for the site-specific soil conditions. A 0.4 design ratio of filter strip length to impervious flow length is recommended for runoff reduction urban filter strips.
Filter Strip Stormwater Treatment	0%	0%	22%	Urban filter strips are stable areas with vegetated cover on flat or gently sloping land. Runoff entering the filter strip must be in the form of sheet-flow and must enter at a non-erosive rate for the site-specific soil conditions. A 0.2 design ratio of filter strip length to impervious flow length is recommended for stormwater treatment urban filter strips.
Bioretention – Raingarden (C/D soils w/ underdrain)	25%	45%	55%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in C or D soil.
Bioretention / Raingarden (A/B soils w/ underdrain)	70%	75%	80%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in A or B soil.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Bioretention / Raingarden (A/B soils w/o underdrain)	80%	85%	90%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has no underdrain and is in A or B soil.
Vegetated Open Channels (C/D Soils)	10%	10%	50%	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in C or D soil.
Vegetated Open Channels (A/B Soils)	45%	45%	70%	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in A or B soil.
Bioswale	70%	75%	80%	With a bioswale, the load is reduced because, unlike other open channel designs, there is now treatment through the soil. A bioswale is designed to function as a bioretention area.
Permeable Pavement w/o Sand or Veg. (C/D Soils w/ underdrain)	10%	20%	55%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in C or D soil.
Permeable Pavement w/o Sand or Veg. (A/B Soils w/ underdrain)	45%	50%	70%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in A or B soil.
Permeable Pavement w/o Sand or Veg. (A/B Soils w/o underdrain)	75%	80%	85%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, no sand or vegetation and is in A or B soil.
Permeable Pavement w/ Sand or Veg. (A/B Soils w/ underdrain)	50%	50%	70%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in A or B soil.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Permeable Pavement w/ Sand or Veg. (A/B Soils w/o underdrain)	80%	80%	85%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, has sand and/or vegetation and is in A or B soil.
Permeable Pavement w/ Sand or Veg. (C/D Soils w/ underdrain)	20%	20%	55%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in C or D soil.
Stream Restoration	0.075 lbs/ft/yr	0.068 lbs/ft/yr	44.88 lbs/ft/yr	An annual mass nutrient and sediment reduction credit for qualifying stream restoration practices that prevent channel or bank erosion that otherwise would be delivered downstream from an actively enlarging or incising urban stream. Applies to 0 to 3rd order streams that are not tidally influenced. If one of the protocols is cited and pounds are reported, then the mass reduction is received for the protocol.
Forest Buffers	25%	50%	50%	An area of trees at least 35 feet wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation that is adjacent to a body of water. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals. (Note – the values represent pollutant load reductions from stormwater draining through buffers).
Tree Planting	10%	15%	20%	The BMP effectiveness values for tree planting are estimated by DEP. DEP estimates that 100 fully mature trees of mixed species (both deciduous and non-deciduous) provide pollutant load reductions for the equivalent of one acre (i.e., one mature tree = 0.01 acre). The BMP effectiveness values given are based on immature trees (seedlings or saplings); the effectiveness values are expected to increase as the trees mature. To determine the amount of pollutant load reduction that can credited for tree planting efforts: 1) multiply the number of trees planted by 0.01; 2) multiply the acreage determined in step 1 by the pollutant loading rate for the land prior to planting the trees (in lbs/acre/year); and 3) multiply the result of step 2 by the BMP effectiveness values given.
Street Sweeping	3%	3%	9%	Street sweeping must be conducted 25 times annually. Only count those streets that have been swept at least 25 times in a year. The acres associated with all streets that have been swept at least 25 times in a year would be eligible for pollutant reductions consistent with the given BMP effectiveness values.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Storm Sewer System Solids Removal	0.0027 for sediment, 0.0111 for organic matter	0.0006 for sediment, 0.0012 for organic matter	1 – TN and TP concentrations	This BMP (also referred to as "Storm Drain Cleaning") involves the collection or capture and proper disposal of solid material within the storm system to prevent discharge to surface waters. Examples include catch basins, stormwater inlet filter bags, end of pipe or outlet solids removal systems and related practices. Credit is authorized for this BMP only when proper maintenance practices are observed (i.e., inspection and removal of solids as recommended by the system manufacturer or other available guidelines). The entity using this BMP for pollutant removal credits must demonstrate that they have developed and are implementing a standard operating procedure for tracking the material removed from the sewer system. Locating such BMPs should consider the potential for backups onto roadways or other areas that can produce safety hazards. To determine pollutant reductions for this BMP, these steps must be taken: 1) Measure the weight of solid/organic material collected (lbs). Sum the total weight of material collected for an annual period. Note – do not include refuse, debris and floatables in the determination of total mass collected. 2) Convert the annual wet weight captured into annual dry weight (lbs) by using site-specific measurements (i.e., dry a sample of the wet material to find its weight) or by using default factors of 0.7 (material that is predominantly wet sediment) or 0.2 (material that is predominantly wet organic matter, e.g., leaf litter). 3) Multiply the annual dry weight of material collected by default or site-specific pollutant concentration factors. The default concentrations are shown in the BMP Effectiveness Values columns. Alternatively, the material may be sampled (at least annually) to determine site-specific pollutant concentrations. DEP will allow up to 50% of total pollutant reduction requirements to be met through this BMP. The drainage area treated by this BMP may be no greater than 0.5 acre unless it can be demonstrated that the specific system proposed is capable of treating stormwater from larger drainage areas. For planning purposes, the sediment removal efficiency specified by the manufacturer may be assumed, but no higher than 80%.

Exhibit 4. Photographs of Existing BMPs

Twin Ponds

	
Looking west along Wickersham Rd at culvert from neighborhood	Looking south at outfall structure

Morning Mist

	
Morning Mist – Typical Dry Detention	Morning Mist – Typical Dry Detention

Wiltshire

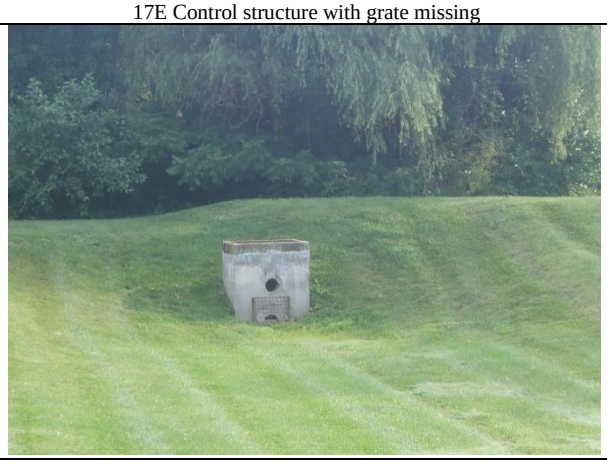
17E Dry detention looking east

17E Dry detention looking south towards control structure

17E Dry detention looking south towards control structure

17E Control structure with grate missing

Typical Dry detention area



Typical Control Structure

Darlington Hunt

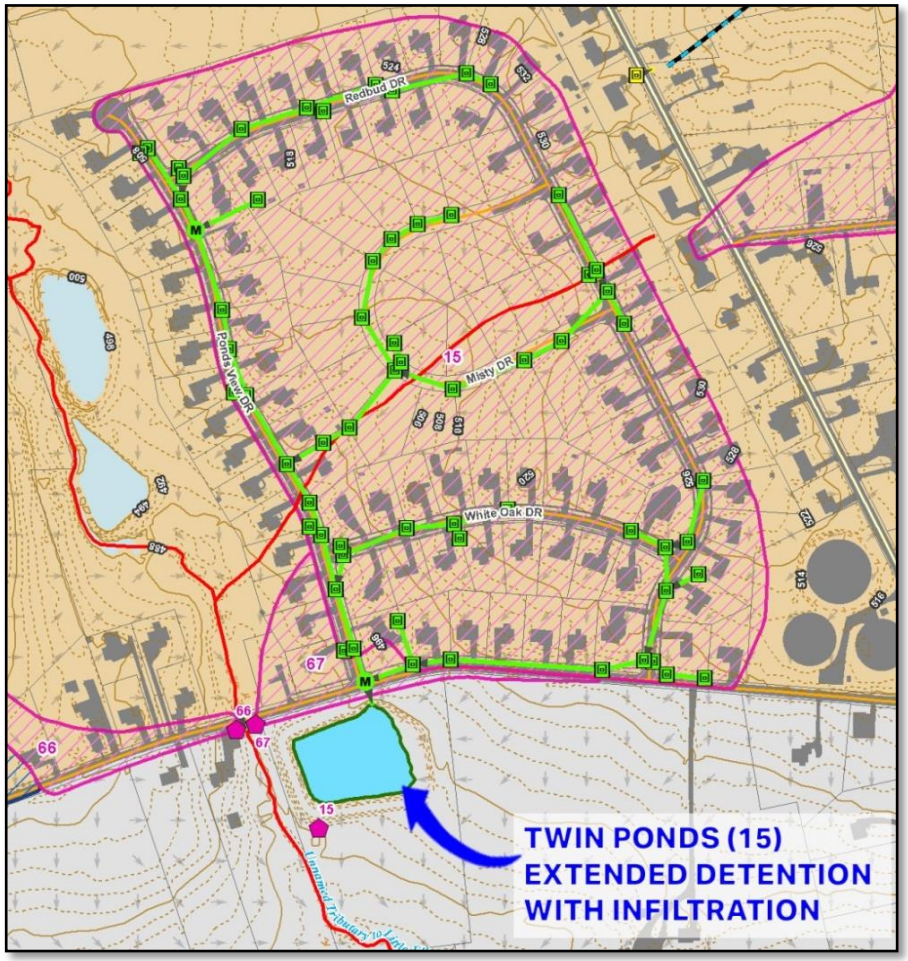
25I Looking South on Crowl Toot Rd

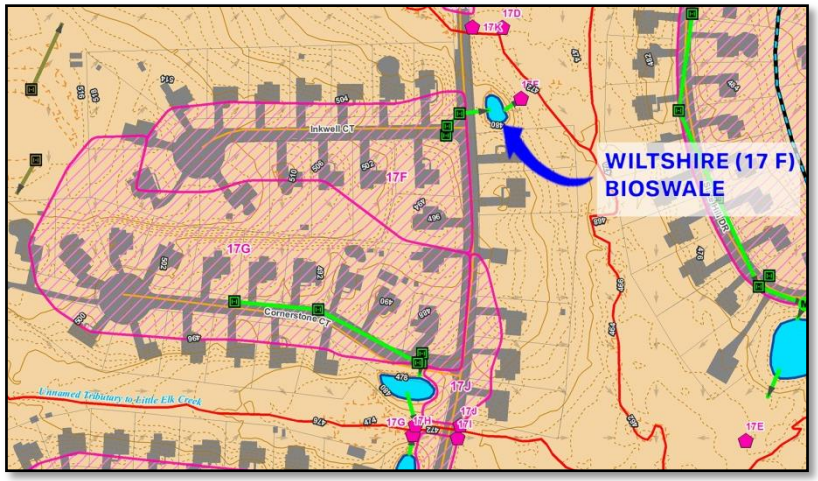
25I Looking North on Crowl Toot Rd

25I

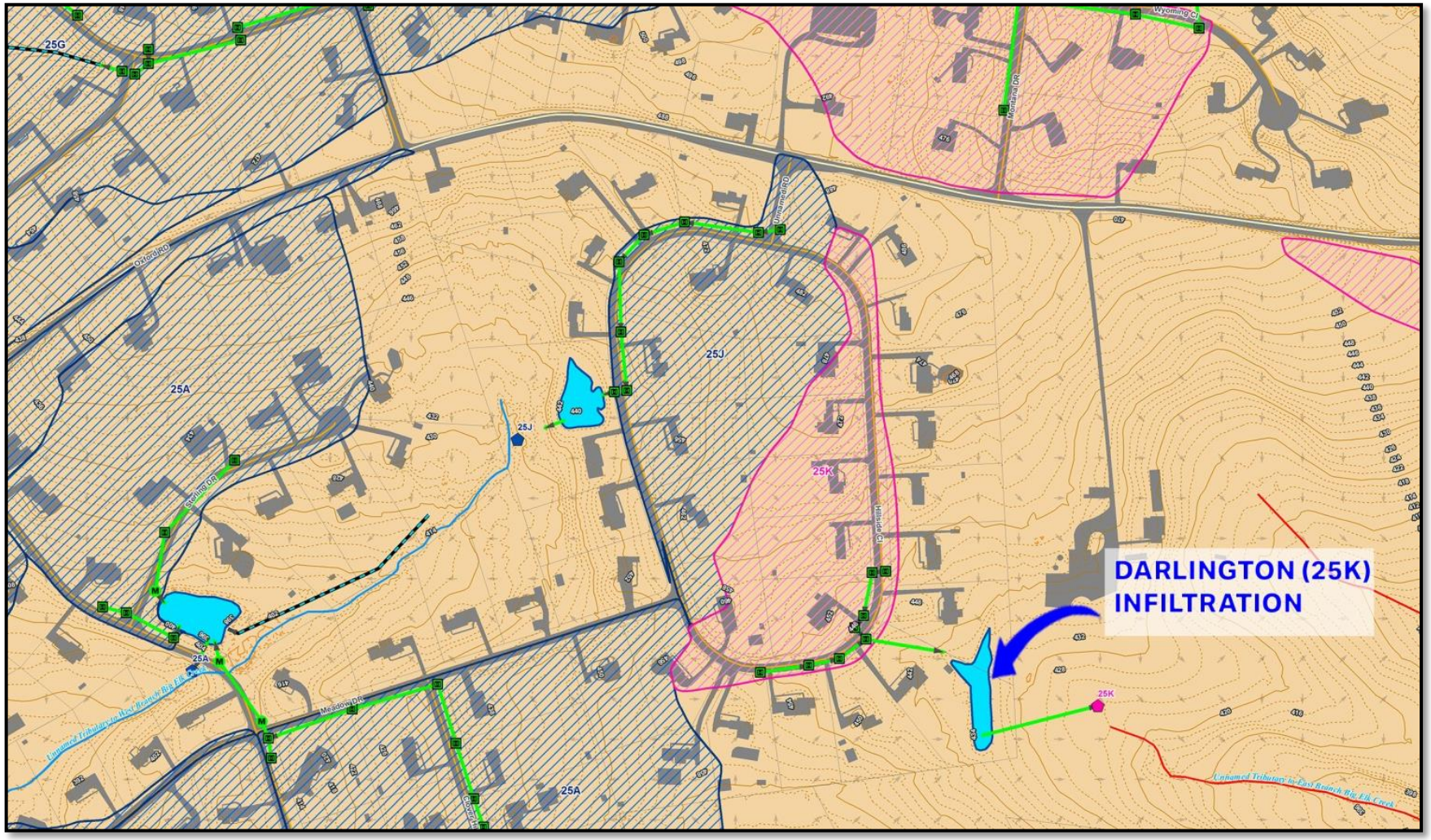
25G Looking South

Exhibit 5. Proposed BMP Location Maps

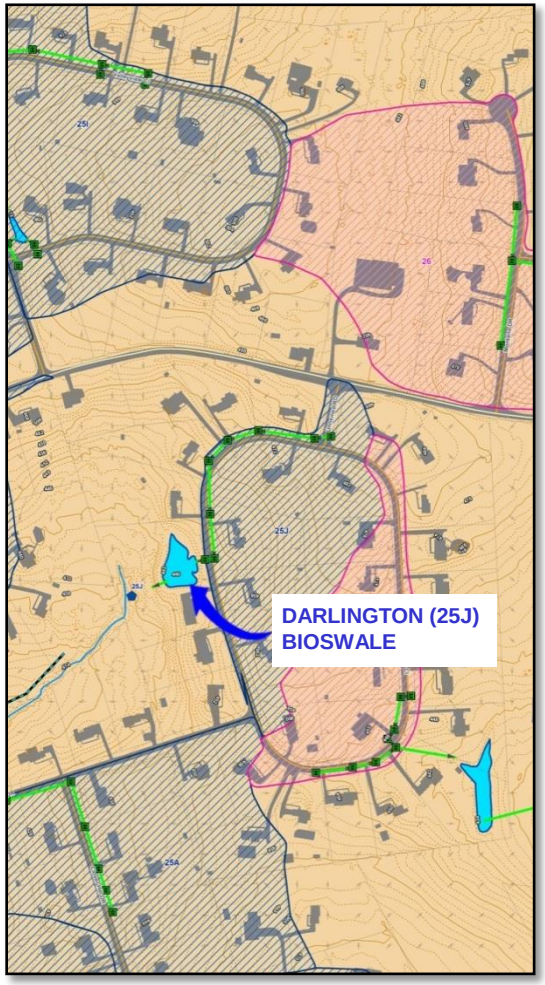


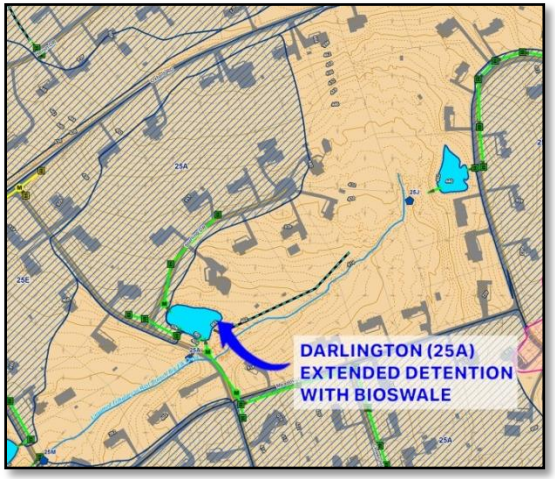


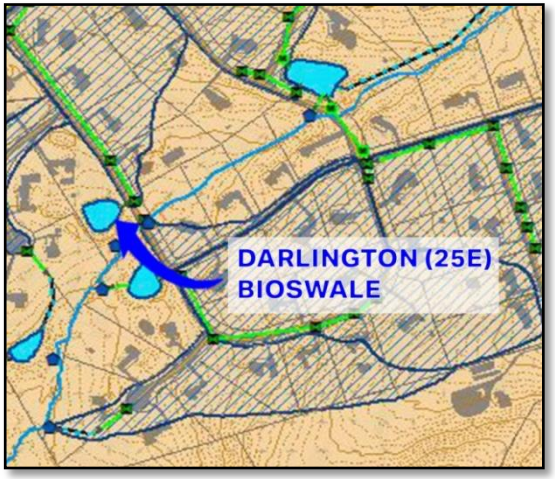
Outfalls to Little Elk Creek (Impaired)

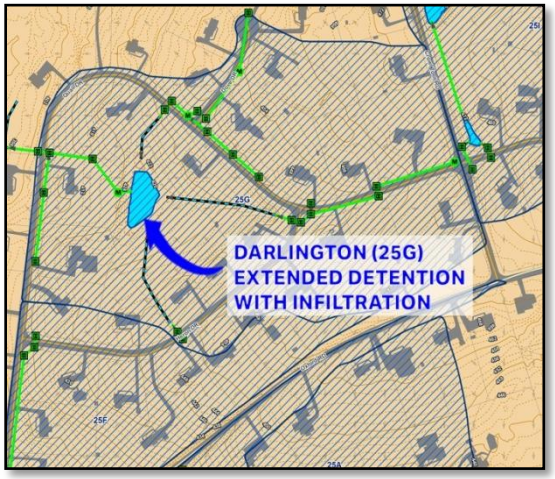


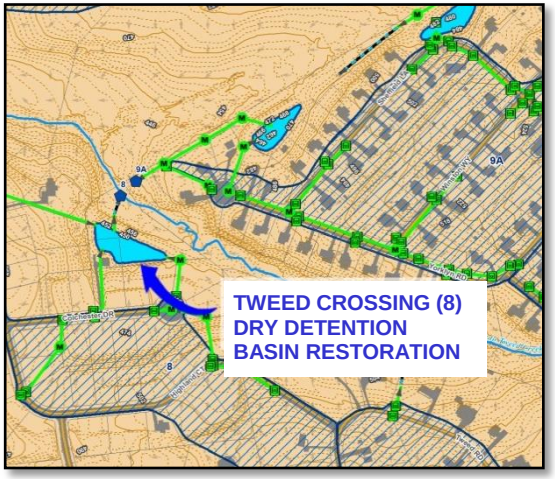
Outfall to East Branch Big Elk Creek (Impaired)











Outfalls to Unimpaired Waterways

Appendices

Appendix A

MS4 Map