



New Garden Township
299 Starr Road
Landenberg, Pennsylvania 19350

For Public Review

New Garden Township Christina River Basin Total Maximum Daily Load Strategy

November 2015

Please submit written comments to:

Tony Scheivert – Township Manager
299 Starr Road
Landenberg, PA 19350

Written comments must be received no later than December 14, 2015

Public Hearing is scheduled for November 23, 2015 at 6:30 p.m.

New Garden Township

DRAFT

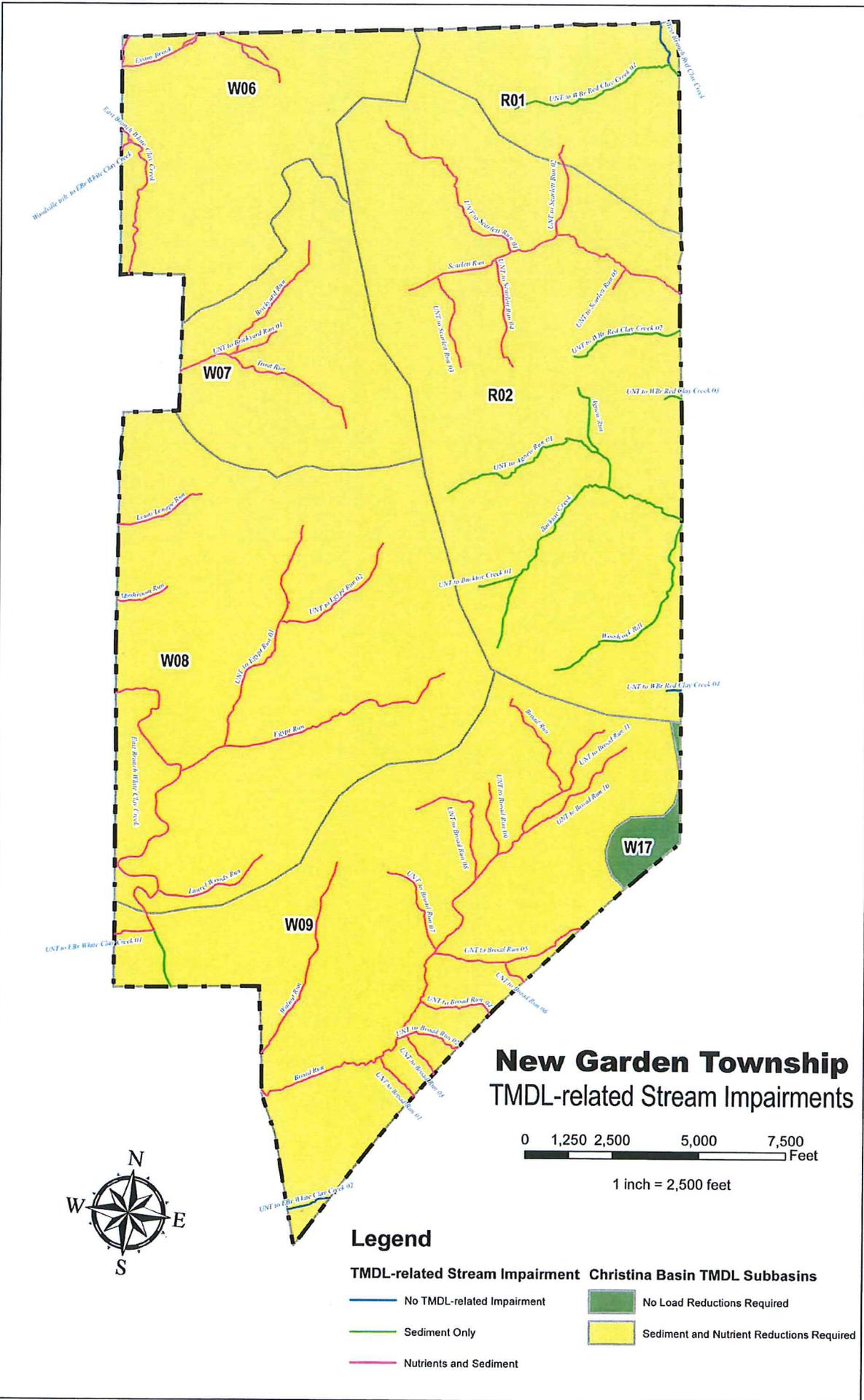
TMDL Program

Implementation Strategy

November 2015



ARRO Consulting, Inc.
108 West Airport Road
Lititz, PA 17543



Draft

New Garden Township Total Maximum Daily Loads Strategy

December 2015

Introduction

Since the initial submission of the New Garden Township Total Maximum Daily Loads (TMDLs) Strategy (Strategy), dated September 14, 2012, the Township has shifted its strategic focus from addressing pollutions suspended in runoff and/or transported and deposited by runoff to preventing those contaminants from coming into contact with runoff in the first place. The initial Strategy relied heavily on street sweeping and inlet cleaning programs to obtain the necessary TMDL-mandated percent reductions. The Township's current Strategy presents a means for developing TMDL priorities, assessing TMDL sources and implementing Best Management Practices (BMPs) to reduce or prevent contaminants from entering Municipal Separate Storm Sewer System (MS4) systems.

New Garden Township has drainage areas in two major watersheds: Red Clay Creek and White Clay Creek. Watershed impairments and load reductions are further divided by subbasin. After re-assessing the intended results of the Strategy in conjunction with the implementation of the Township's aggressive Municipal Separate Storm Sewer System (MS4) Program, it became clear that the key to understanding local watershed impairments involved further sub-classification of the subbasins. This further sub-classification was possible by examination of the impairments that have been determined by PA DEP to be within individual stream segments. Further sub-classification allowed the Township to number the applicable impairments with an MS4 Waste Load Allocation (WLA) and then using total number of impairments, the impairment classes could be ranked; number 1 representing the greatest number of impairments to a stream segment. Based on this ranking system efforts could be focused in the areas of greatest need or in the areas where multiple impairments could be addressed by a minimal number of BMPs. While the Township understands the importance of addressing TMDLs in all areas of the Township, the aforementioned ranking system provides a method for developing priorities.

The next step in the Township's strategic focus was to assess sources of impairment and how those sources impact the MS4 system. The Township is still in the process of developing this portion the Strategy. The goal of this assessment will be achieved by adding multiple map layers to the sub-classification of the subbasins and defining areas most likely to contribute to impairment.

The final step in the Township's strategic focus is to select the BMPs with the intent of controlling areas most likely to contribute to impairment. First and foremost the Township intends to control an impairment source where it originates. The Township is actively exploring options to achieve the

aforementioned while recognizing impairment sources from private properties play a major role in meeting the TMDL objectives. If source control is not possible, BMPs will be selected with the intent of maximizing impairment reductions using a holistic approach and/or retro-fitting of existing stormwater management facilities.

Background Information

Total Maximum Daily Loads

The Clean Water Act (33 U.S.C. §1251 et seq.) requires that TMDLs must be developed for waterbodies that have an identified impairment. A TMDL is the sum of all contributions of a particular type of pollution by unit mass that can be contributed to a waterbody in one day without causing that waterbody to exceed established water quality standards. TMDL Documents are plans that are written to ensure compliance with water quality standards in accordance with the Clean Water Act.

Within TMDL Documents, known point sources contributing pollution for which there is a TMDL are assigned a WLA in unit mass per day of pollutant contribution. Non-point sources are assigned a similar parameter, known as a load allocation (LA). The TMDL for an assessed body of water is the sum of all WLAs and LAs plus a margin of safety, meaning if every known source of a particular pollutant, point and non-point, discharges a daily load of that pollutant equal to their allocation, then the body of water will meet its water quality standard for that pollutant by the established margin of safety. Many known sources with pollutant allocations are estimated to discharge loads in excess of their allocation and therefore must make reductions in order to demonstrate compliance with the Clean Water Act and to assist in the effort to mitigate water quality impairments and ultimately return the assessed body of water to a level of contamination that is within the established water quality standards.

Municipal Separate Storm Sewers as Point Sources and Percent Reductions

MS4s are point sources of pollution that are permitted by the National Pollutant Discharge Elimination System (NPDES) and therefore may be assigned a WLA in a TMDL Document. The pollution load contributed by a particular MS4 is known as an MS4 Baseline¹ and the percent difference between an MS4 Baseline and the WLA established for the MS4 within the TMDL Document is the percent reduction that the MS4 must achieve in order to demonstrate that it is meeting its Clean Water Act compliance obligation. The Municipality must elicit this reduction through the implementation of best management practices (BMPs) that will either intercept pollution before it is discharged or mitigate pollution within the stream.

¹ In the case of the WLAs applicable to New Garden Township, the MS4 Baseline was calculated using the entire Township area. This is an overestimate that may be corrected by delineating the drainage area for every regulated outfall and recalculating a baseline based on the land use within the delineated MS4 drainage area.

MS4 TMDL WLAs applicable to New Garden Township

The following TMDL Documents contain WLAs that are applicable to New Garden Township's MS4 Program:

- *Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin, Pennsylvania, Delaware, and Maryland*
- *Revisions to Total Maximum Daily Loads for Nutrient and Low Dissolved Oxygen Under High-Flow Conditions, Christina River Basin, Pennsylvania, Delaware, and Maryland*

The Pennsylvania Department of Environmental Protection (PA DEP) has identified various surface waters within New Garden Township in the Christina River Basin as being impaired and the United States Environmental Protection Agency (EPA) developed TMDLs with WLAs that are applicable to the Township's MS4 program for sediment (siltation) and nutrients (total nitrogen and total phosphorus). New Garden Township has drainage areas in two major watersheds: Red Clay Creek and White Clay Creek. Distinct MS4 WLAs are expressed specific to both pollutant and major watershed. Major watershed, calculated baseline, MS4 WLA and percent reduction are reproduced from the TMDL Document in Tables 1 and 2.

Table 1. Sediment baseline, MS4 WLA and percent reduction by New Garden Township watershed.

Watershed	Baseline (tons/yr)	MS4 WLA (tons/yr)	Percent Reduction
Red Clay Creek	4709.65	2118.72	55.01%
White Clay Creek	6746.50	2986.66	55.73%

Table 2. Nutrient baseline, MS4 WLA and percent reduction by New Garden Township watershed and pollutant type.

Watershed	Pollutant	Baseline (kg/day)	MS4 WLA (kg/day)	Percent Reduction
White Clay Creek	TN	167.06	83.83	49.82%
White Clay Creek	TP	41.916	13.374	68.09%
Red Clay Creek	TN	77.03	38.52	49.99%
Red Clay Creek	TP	27.708	2.87	89.64%

Impairments and load reductions are further divided in the TMDL Document by subbasin. The Christina River Basin is divided into multiple subbasins, seven of which overlap with New Garden Township. The subbasins and the associated load reductions are reproduced in Table 3, below. *See the TMDL-related Stream Impairments Map.* With the exception of subbasin W17, every subbasin occurring within New Garden Township requires a reduction of both sediment and nutrient loading.

Table 3. Load Reductions Required by TMDL Subbasin.

TMDL Subbasin	TMDL Load Reductions Required
R01	Sediment and Nutrient Reductions Required
R02	Sediment and Nutrient Reductions Required
W06	Sediment and Nutrient Reductions Required
W07	Sediment and Nutrient Reductions Required
W08	Sediment and Nutrient Reductions Required
W09	Sediment and Nutrient Reductions Required
W17	No Load Reductions Required

Table 4. TMDL-related Stream Impairments.

Stream	Impairment Class	Chapter 93 Designation	Major Watershed	TMDL Impairment
Agnew Run	E	TSF	Red Clay Creek	Sediment
Brickyard Run	C	CWF	White Clay Creek	Sediment and Nutrients
Broad Run	I	CWF	White Clay Creek	Sediment and Nutrients
Bucktoe Creek	E	TSF	Red Clay Creek	Sediment
East Branch White Clay Creek (W06)	A	CWF	White Clay Creek	Sediment and Nutrients
East Branch White Clay Creek (W08)	G	CWF	White Clay Creek	Sediment and Nutrients
East Branch White Clay Creek (W09)	J	CWF	White Clay Creek	Sediment
Egypt Run	H	CWF	White Clay Creek	Sediment and Nutrients
Evans Brook	B	EV	White Clay Creek	Sediment and Nutrients
Laurel Woods Run	G	CWF	White Clay Creek	Sediment and Nutrients
Lenni Lenape Run	G	CWF	White Clay Creek	Sediment and Nutrients
Mushroom Run	G	CWF	White Clay Creek	Sediment and Nutrients
Scarlett Run	D	TSF	Red Clay Creek	Sediment and Nutrients
Trout Run	C	CWF	White Clay Creek	Sediment and Nutrients
UNT to Agnew Run 01	E	TSF	Red Clay Creek	Sediment
UNT to Brickyard Run 01	C	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 01	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 02	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 03	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 04	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 05	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 06	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 07	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 08	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 09	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 10	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Broad Run 11	I	CWF	White Clay Creek	Sediment and Nutrients
UNT to Bucktoe Creek 01	E	TSF	Red Clay Creek	Sediment
UNT to EBr White Clay Creek 01	G	CWF	White Clay Creek	Sediment and Nutrients
UNT to EBr White Clay Creek 02	K	CWF	White Clay Creek	No TMDL-related Impairment
UNT to Egypt Run 01	H	CWF	White Clay Creek	Sediment and Nutrients
UNT to Egypt Run 02	H	CWF	White Clay Creek	Sediment and Nutrients

Stream	Impairment Class	Chapter 93 Designation	Major Watershed	TMDL Impairment
UNT to Scarlett Run 01	D	TSF	Red Clay Creek	Sediment and Nutrients
UNT to Scarlett Run 02	D	TSF	Red Clay Creek	Sediment and Nutrients
UNT to Scarlett Run 03	D	TSF	Red Clay Creek	Sediment and Nutrients
UNT to Scarlett Run 04	D	TSF	Red Clay Creek	Sediment and Nutrients
UNT to Scarlett Run 05	D	TSF	Red Clay Creek	Sediment and Nutrients
UNT to WBr Red Clay Creek 01	E	TSF	Red Clay Creek	Sediment
UNT to WBr Red Clay Creek 02	E	TSF	Red Clay Creek	Sediment
UNT to WBr Red Clay Creek 03	E	TSF	Red Clay Creek	Sediment
UNT to WBr Red Clay Creek 04	F	TSF	Red Clay Creek	No TMDL-related Impairment
Walnut Run	I	CWF	White Clay Creek	Sediment and Nutrients
West Branch Red Clay Creek (Upstream of confluence with UNT 01)	F	TSF	Red Clay Creek	No TMDL-related Impairment
West Branch Red Clay Creek (Downstream of confluence with UNT 01)	E	TSF	Red Clay Creek	Sediment
Woodcock Rill	E	TSF	Red Clay Creek	Sediment
Woodville trib. to EBr White Clay Creek	A	EV	White Clay Creek	Sediment and Nutrients

Further sub-classification of the drainage areas is possible by examination of the impairments that have been determined by PA DEP within individual stream segments. According to the spatial data provided from the 2014 Pennsylvania Integrated Water Quality Monitoring and Assessment Report available from the Pennsylvania Spatial Data Clearinghouse (PASDA), the following sources and causes of impairment are applicable to surface waters within New Garden Township:

- Agriculture
 - Nutrients
 - Siltation (Sediment)
 - Organic Enrichment / Low DO
- Unknown Source
 - Pathogens
 - Pesticides
 - PCB
- Construction
 - Siltation (Sediment)
- Urban Runoff/Storm Sewers
 - Water/Flow Variability
- Hydromodification
 - Organic Enrichment/Low DO
- Golf Courses
 - Other Habitat Alterations

When classified by unique combinations of impairments, the stream segments within New Garden Township fall into eleven (11) spatially related categories, which have been labeled A through K and will be referred to as impairment classes. The majority of stream segments within New Garden Township are impaired for sediment and/or nutrients, with the only excepted impairment classes being F and K, which are both located along the periphery of the Township and both have small drainage areas in comparison with the drainage areas of the other impairment classes. The remainder of the impairment classes are impaired by pollutants for which there are MS4 WLAs, although impairment classes E and J are also an unusual subset in that among the TMDL-related impairments, they are only impaired by sediment – and not nutrients – while the remainder of the impairment classes are impaired by both sediment *and* nutrients. The stream name, impairment class, Chapter 93 designation, major watershed and TMDL-related impairment are summarized in Table 4. *See the TMDL Stream Impairment Classification Map.*

Table 5 lists the sources and causes of impairment as identified by PA DEP and provides the defining combination of impairments for each impairment class, where an X denotes that the class has been determined to be impaired by the source and cause.

Table 5. Stream Impairment Class.

Source	Cause	Impairment Class										
		A	B	C	D	E	F	G	H	I	J	K
Agriculture	Nutrients	X	X	X	X			X	X	X		
	Siltation	X	X	X	X	X		X	X		X	
	Organic Enrichment/Low DO					X			X		X	
Unknown	Pathogens							X	X	X	X	X
	Pesticides			X								
	PCB				X	X	X					
Construction	Siltation									X		
Urban Runoff/Storm Sewers	Water/Flow Variability									X		
Hydromodification	Organic Enrichment/Low DO									X		
Golf Courses	Other Habitat Alterations		X									

Developing Priorities

Implementation of BMPs to ameliorate stream impairments should be done in a way that maximizes treated stormwater volume, pollutants treated, and implementability. In order to maximize treated stormwater volume, priority should be given to locating BMPs in areas that are downstream within an MS4/stream segment and that have a large tributary MS4 drainage area. In order to maximize pollutants treated, treatment BMPs should be prioritized within MS4s discharging to stream segments with the largest number of impairments. Greater priority should be given to impairments which have an MS4 WLA; however, other impairments should be given secondary consideration. When ordered by number of applicable impairments with an MS4 WLA and then by total number of impairments, the impairment classes may be ranked. Table 6 ranks impairment classes by the number of impairment.

Table 6. Ranking of impairment classes by number of impairments.

Class	TMDL Impairments	Total Impairments	Rank
I	2	5	1
H	2	4	2
B	2	3	3
C	2	3	3
D	2	3	3
G	2	3	3
A	2	2	4
E	1	3	5
J	1	3	5
F	0	1	6
K	0	1	6

In order to maximize implementability, BMP locations should be chosen where existing BMPs may be retrofitted and where the municipality already owns land that may be utilized for BMP installation. Synthesizing these three considerations yields high priority areas as being downstream locations within drainage areas associated with Impairment Class I that are owned by the municipality and that have a relatively large MS4 drainage area and low priority areas would be upstream locations within drainage areas associated with Impairment Class F/K with small drainage areas.

Assessing Sources

According to PA DEP, nutrient pollution (TN and TP) is sourced from agricultural activities within the Township and siltation is sourced from agriculture and construction. Although there is no TMDL for water/flow variability, instream erosion will be addressed through resolving this cause of impairment. It is notable that water/flow variability is the only pollutant to which PA DEP has attributed the source of urban runoff/storm sewers. As agriculture is cited as a source in both of the pollutants for which the Township's streams have been issued TMDLs (siltation and nutrients) the influence of agricultural runoff on municipally-owned storm sewer discharge is a high priority. According to the United States Agricultural National Agricultural Statistics Service (USDA NASS) Cropland Data Layer, approximately 31% of New Garden Township by land area is occupied by agricultural land.

Agriculture

Table 7 shows the total land area occupied by agricultural and non-agricultural uses as both an acreage and percent of the total land area within the Township. See the attached map, showing both agricultural and non-agricultural land uses in New Garden Township.

Table 7. New Garden Township Land Area Categories

Category	Arcreage	Percent of Total
Agricultural	3219.20	31%
Non-Agricultural	7202.60	69%
Total	10421.80	100%

Considering that nearly a third of the Township's land area is in agricultural use and that agriculture is identified by PA DEP as a source of both nutrient and sediment pollution, for which the Township's streams are issued TMDLs, it is imperative to determine the extent to which agricultural runoff contributes to the Township's storm sewer system. Agricultural runoff, if tributary to municipally-owned storm sewersheds, is expected to contribute heavily to nutrient and sediment loading and, if not tributary to municipally-owned storm sewersheds, should be excluded from the Township's waste load allocation (WLA). Agricultural land within the Township must be delineated and intersected with the municipally-owned storm sewersheds in order to determine the total impact of agriculture on the Township's municipal storm sewer system (MS4) as well as to identify specific locations of the sources of agricultural pollution so that appropriate BMPs may be selected and proposed in locations that will effectively ameliorate both the sediment and nutrient loading expected from these sources.

Construction

Deficient or improperly functioning erosion and sedimentation (E&S) control BMPs on construction sites may contribute to sediment load to streams within the Township. The Township relies on Pennsylvania's statewide program for stormwater associated with construction activities, but will consider taking a more proactive role in the role of managing stormwater discharges associated with construction activities as it pertains to achieving the sediment reductions mandated by the TMDL.

Urban Runoff/Storm Sewers

Although urban runoff/storm sewers are only identified as contributing flow variability, periods of elevated peak runoff rates combined with large total volumes will invariably contribute to instream erosion and subsequent downstream sedimentation pollution. For this reason, it is important to address both rate and volume issues within the Township. The Township's stormwater ordinance requires the implementation of BMPs to control the rate and volume of stormwater runoff for new development and redevelopment. Although more likely to occur in redevelopment than in new development, any net reductions in sediment and nutrient loading between the pre-development and post-development condition will contribute to achieving the required reductions to meet TMDL obligations.

In addition to the net change in nutrient and sediment loading from new and redevelopment, the existing MS4 should be reviewed for opportunities to retrofit existing BMPs to achieve

greater loading reductions and for opportunities to construct additional BMPs on municipally-owned properties. Considerations should include not only BMPs that intercept stormwater runoff before it reaches the stream, but also those which help to reduce instream erosion, such as a stream restoration plan.

Other Sources

It is certain that sources of pollution exist within the Township's regulated area in addition to those that have been identified by PA DEP in its stream assessments or by the TMDL Reports conducted by the EPA. The stream impairment listing itself evidences the fact that not all sources are detected at this time: PA DEP lists pathogens, PCBs, and pesticides as stream impairments with unknown sources. It is important to conduct ongoing inquiries as to the sources of pollution within the Township so that all applicable sources of pollution can be addressed with BMPs appropriate to the identified source.

It should be noted here that, although there are no applicable MS4 WLAs for many of the above identified pollutants and that they are therefore technically beyond the scope of this Strategy, the source of these pollutants should be investigated as a component of the Township's MS4 program as a whole and may be addressed in conjunction with BMPs designed to achieve TMDL-mandated loading reductions. BMPs that may address other identified causes of impairment in addition to nutrients and/or sediment should be prioritized wherever practicable.

Determination of currently unknown sources of impairment may involve comparison of the known stream impairments with the land uses derived from county land use data, municipal zoning data, government databases (industrial facilities with stormwater NPDES permits, hazardous waste accumulators/generators, agricultural land) and/or knowledge derived from in-depth investigations.

The previously referenced source data represents the starting point for assessing sources of impairment and how those sources impact the MS4 system. Additional work needs to be completed before a thorough assessment can be completed. A TMDL map including the following is in the process of being developed:

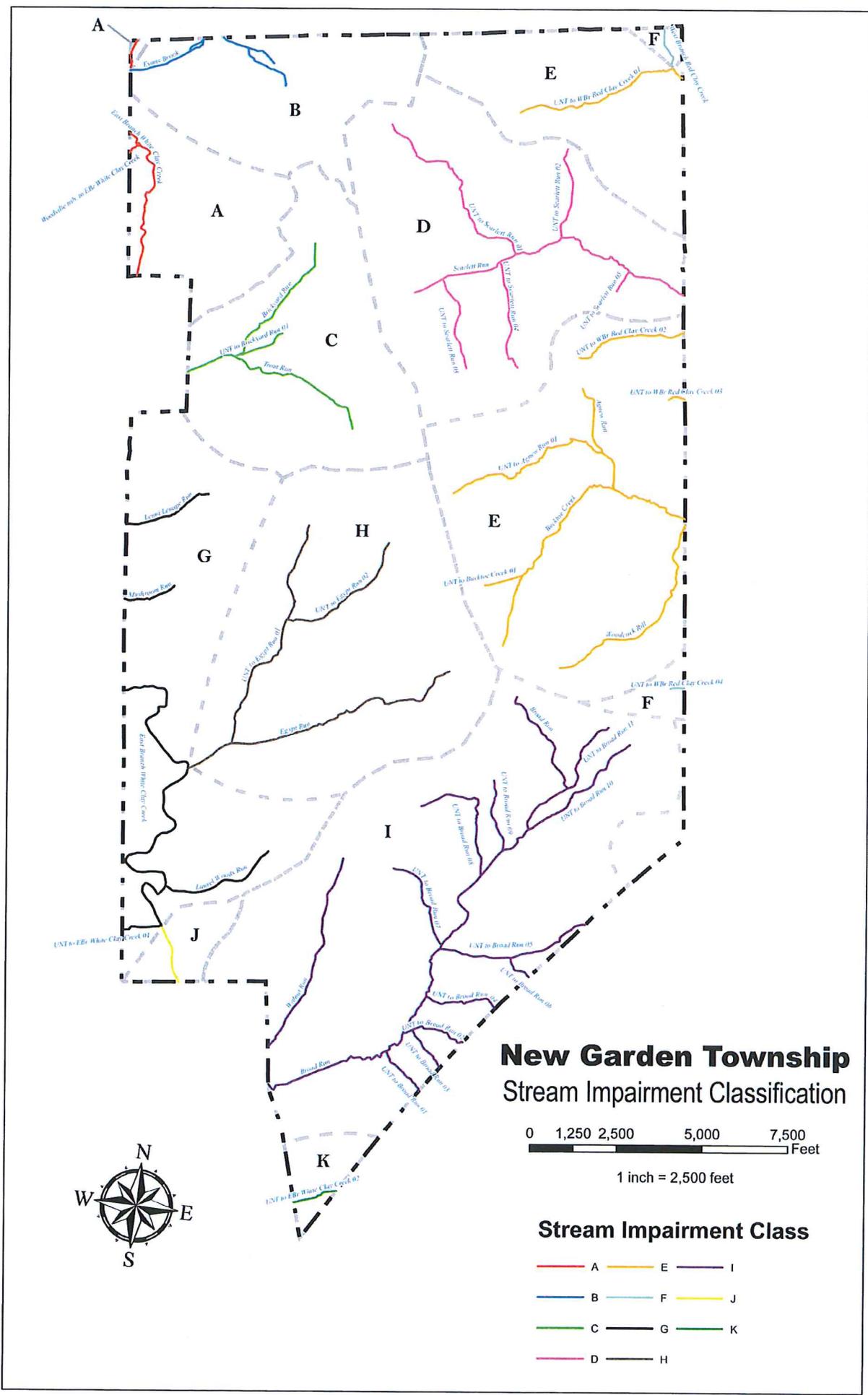
- Land Uses
- Topography
- Individual MS4s (rated by ranking of impairment classes of streams that they discharge to)
- MS4 Drainage Areas
- Sub-classifications of the Subbasins
- Municipally-owned properties
- Existing BMPs

Once completed, the map will illustrate the intersection of a number of priority locations and serve as an integral part of the successful implementation of the TMDL Strategy.

Selecting BMPs

All of the considerations outlined so far will enter into the determination of where BMPs should be located and which BMPs should be employed within the Township in order to treat stormwater runoff and achieve the TMDL-mandated percent reductions.

First and foremost the Township intends to control an impairment source where it originates. The Township is actively exploring options to achieve the aforementioned while recognizing impairment sources from private properties play a major role in meeting the TMDL Strategy objectives. If source control is not possible, BMPs will be selected with the intent of maximizing impairment reductions using a holistic approach and/or retro-fitting of existing stormwater management facilities.



New Garden Township Stream Impairment Classification

0 1,250 2,500 5,000 7,500 Feet

1 inch = 2,500 feet

Stream Impairment Class

- | | | |
|--|--|--|
| — A | — E | — I |
| — B | — F | — J |
| — C | — G | — K |
| — D | — H | |