

EAST HANOVER TOWNSHIP

Dauphin County, Pennsylvania

Chesapeake Bay Pollutant Reduction



March 2020

HRG Project No. R000365.0435

HRG

Herbert, Rowland & Grubic, Inc.
Engineering & Related Services

AN EMPLOYEE-OWNED COMPANY



Chesapeake Bay Pollutant Reduction Plan
EAST HANOVER TOWNSHIP
DAUPHIN COUNTY, PENNSYLVANIA

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Introduction

East Hanover Township discharges stormwater to surface waters located within the Chesapeake Bay Watershed, as well as discharges to impaired waterways, and is therefore regulated by a National Pollutant Discharge Elimination System General Permit to Discharge Stormwater From Small Municipal Separate Storm Sewer Systems. The following additional appendices are required due to these impairments: Appendix B (Pollutant Control Measures for Waters Impaired by Pathogens), Appendix C (Pollutant Control Measures for Waters Impaired by Priority Organic Compounds) Appendix D (Pollutant Reduction Plan Requirements for Discharges to the Chesapeake Bay Watershed), and Appendix E (Pollutant Reduction Plan Requirements for Discharges to Waters Impaired for Nutirents and/or Sediment). This Chesapeake Bay Pollutant Reduction Plan (CBPRP) was developed in accordance with both general permit requirements and documents how the Township intends to achieve the pollutant reduction requirements listed in the Pennsylvania Department of Environmental Protection (PADEP) Municipal MS4 Requirements Table¹.

This document was prepared following the guidance provided in the PADEP National Pollutant Discharge Elimination System (NPDES) Stormwater Discharges from Small Municipal Separate Storm Sewer Systems Pollutant Reduction Plan (PRP) Instructions².

General Information	
Permittee Name: East Hanover Township	NPDES Permit No.: PAG133551
Mailing Address: 8848 Jonestown Road	Effective Date: June 15, 2020
City, State, Zip: Grantville, PA 17028	Expiration Date: June 15, 2025
MS4 Contact Person: Jackie Wilbern	Renewal Due Date: June 15, 2025
Title: Assistant Township Manager	Municipality: East Hanover Township
Phone: (717) 469-0833	County: Dauphin
Email: assttwpmgr@ehtdcpa.org	Consultant Name: Herbert, Rowland & Grubic, Inc.
Co-Permittees (if applicable): N/A	Consultant Contact: Michael Hess, P.E 369 East Park Drive Harrisburg, PA 17111 (717) 564-1121 mhess@hrg-inc.com

Located in central Dauphin County, Pennsylvania; East Hanover Township is an MS4 community currently in the process of transferring from an MS4 Permit Waiver to an MS4 General beginning in the year 2020 (PAG 133551). The Township has 3687.1 acres of Urbanized Area (UA) according to the United States Census Bureaus' 2010 census.

East Hanover Township is in the Bow Creek-Swatara Creek and Manada Creek HUC-12 watersheds. The Bow Creek (Siltation Impairment), Manada Creek (Pathogen Impairment), Raccoon Creek (DO/BOD Impairment), Unnamed Tributaries to Bow Creek (Siltation Impairment) and Unnamed Tributaries to Raccoon Creed (Pathogen Impairment) watersheds have been classified as impaired by PADEP. The PRP requirements for these impaired watersehds are included within this Chesapeake Bay PRP (CBPRP).

¹ PADEP, MS4 Requirements Table (Municipal) (rev. 11/18/2019)
² PADEP PRP Instructions; Document #3800-PM-BCW0100k (rev. 3/2017)

SECTION A: PUBLIC PARTICIPATION

A complete copy of this CBPRP was made available for the public to review at the East Hanover Township Municipal Office from August 7, 2020 to September 8, 2020. The availability of the document was publicized on the Township website for 30 days and published in *The Hummelstown Sun* on August 6, 2020. The published public notice contained a brief description of the plan, the dates and locations at which the plan was available for review by the public, and the length of time provided for the receipt of comments. Copies of the public notice as posted on the Township website and published in *The Hummelstown Sun* are included in Appendix A.

The information contained in this report was presented to the public during the regularly scheduled Township Board of Supervisor's meeting held on September 15, 2020. Comments and questions regarding the CBPRP were received during the public presentation. A copy of CBPRP presentation and the meeting minutes are included in Appendix A.

Written comments were accepted for 30 days following the publication date of the public notice, no additional public comment outside of the comments and questions received during the September 15, 2020 meeting was received.

SECTION B: MAPPING

The East Hanover Township CBPRP Planning Area Map depicts the Township's current regulated outfalls and its contributing Municipal Separate Storm Sewer System (MS4) as required under MCM #3, BMPs 2 and 3 of the general permit. In addition to the MS4 infrastructure (inlets, swales and outfalls), the MS4 Map also shows the CBPRP planning areas, UA boundary, impaired streams watersheds boundaries, and proposed BMP locations.

The Township's Land Use Map was originally developed using the most recent National Land Cover Database³. Much of the Township is agricultural or residential. Land cover throughout East Hanover Township includes a mixture of commercial, residential, industrial, mixed-use, and agricultural. The commercial development is concentrated north of Interstate 81. Residential development is spread throughout the township. Industrial land is found most adjacent to Allentown Boulevard (SR 22). Agricultural land is vastly spread across the central and southern regions of the Township.

Impervious cover was further refined by importing geospatial data from the County and delineating aerial imagery for driveways in AutoCAD Civil 3D. This impervious cover data collection method, which more closely reflects actual conditions on the ground than the PADEP – Statewide MS4 Land Cover Estimates, has been utilized to update the pollutant loading calculations.

³ Multi-Resolution Land Characteristics (MRLC) Consortium, *National Land Cover Database 2011* (NLCD 2011)

SECTION C: POLLUTANTS OF CONCERN

The pollutants of concern for East Hanover Township were determined by referencing the PADEP MS4 Municipal Requirements Table⁴ (Table 1). The applicable section of this table is included for reference in Appendix C.

Table 1. Pollutants of Concern

Planning Area (Watershed)	Impaired Downstream Water	Pollutants of Concern
Chesapeake Bay PRP	Chesapeake Bay	Appendix D - Sediment (TSS), Nutrients (TN, TP)
Bow Creek	Bow Creek	Appendix E – Siltation (5)
Manada Creek	Manada Creek	Appendix B – Pathogens (5)
Raccoon Creek	Raccoon Creek	Appendix E – DO/BOD (4a)
UNT to Bow Creek	UNT to Bow Creek	Appendix E – Nutrients (4a) Appendix C – Priority Organics (5)
UNT to Raccoon Creek	UNT to Raccoon Creek	Appendix B – Pathogens (5)

Likely sources of these pollutants in the Township are identified below.

- Siltation – Sediment (Total Suspended Solids)
 - Streambank erosion
 - Construction/earth moving activities
 - Agricultural activities
 - Urban runoff
- Nutrients – (Total Nitrogen, Total Phosphorus)
 - Lack of adequate stream buffer
 - Heavy use of lawn fertilizers
 - Agricultural activities
 - Urban runoff / discharges from septic tanks
- Organic Enrichment / Low Dissolved Oxygen
 - Eutrophication from high nutrients (see nutrients above)
- Pathogens (select bacterial and protozoan pathogens)
 - Agricultural activities
 - Urban runoff / discharges from failing septic tanks or failing wastewater treatment plants
- PCB / Priority Organics
 - Sources where PCB's were used prior to the 1979 ban (manufacturing, electrical transformers, capacitors, etc.)
 - Priority Organics (Pesticides, Volatile Organic Compounds, Synthetic Organic Compounds, etc.)

⁴ PADEP, MS4 Requirements Table (Municipal) (rev. 11/18/2018)

SECTION D: DETERMINE EXISTING LOADING FOR POLLUTANTS OF CONCERN

D.1 Sewershed Planning Areas

Mapping was completed using AutoCAD Civil 3D. The sewershed planning areas were delineated manually using Lidar generated contours, aerial mapping, located outfalls and inlets. Each sewershed was delineated to best incorporate drainage to each outfall or a group of adjacent outfalls.

Consideration was given to areas outside of the UA when delineating the sewershed planning areas in addition to non-UA areas that drain to and from the UA were included in the sewershed planning areas.

D.2 Parsed Area Calculation

In order to calculate the actual pollutant loads applicable to the East Hanover Township MS4, the PRP instructions allow areas that do not drain to the MS4 and areas that are already covered by their own MS4 or other NPDES permit to be removed from the planning area through the parsing process⁵.

Therefore, the following areas were removed from the CBPRP and PRP planning areas:

- Interstate-81 Corridor & PennDOT Roadways**– The estimated pollutant load from stormwater runoff generated by PennDOT roadways located within the Township was parsed from the existing pollutant base load, as PennDOT maintains their own MS4 permits to account for stormwater runoff generated from their facilities.

A summary of parsed area removed from the Township planning areas is shown in Table 2. Parsed areas are shown on the CBPRP Planning Area Map (Appendix B) and supporting calculations for the pollutant loads associated with each parsed area are included in Appendix D.

Table 2. Parsed Area Summary – Overall Planning Area

Planning Area	Planning Area (acres)
Overall Planning Area	3,997.4
Parsed Areas (I-81 and PennDOT Roadways)	-171.6
Adjusted Planning Area	3,825.8

D.3 Existing Pollutant Load Calculation

The existing pollutant loadings were calculated using the Simplified Method⁶. In accordance with this method, land use coverage was determined using calculated impervious surface data from aerial imagery. The impervious and pervious acreages were then multiplied by the Developed Land Loading Rates for Cumberland County⁷ to determine the total existing pollutant load attributed to the Township. The existing pollutant loading was determined for the overall CBPRP planning area.

The pollutants of concern are TSS, TN, and TP; however, the plan has been prepared in accordance with assumption outlined in the simplified method that within the overall Bay watershed, the TP and TN goals will be achieved when the permit-required sediment reduction is achieved. Therefore, only the TSS pollutant loading was calculated (Table 3). Detailed pollutant load calculations are provided in Appendix D.

⁵ PADEP - PRP Instructions, Attachment A: Parsing Guidelines for MS4s in Pollutant Reduction Plans (rev. 3/2017)

⁶ PADEP PRP Instructions - Attachment C "Chesapeake Bay PRP Example Using DEP Simplified Method"

Table 3. Pollutant Loading for East Hanover Township Planning Areas

Planning Area	Planning Area (acres)	Regulated Pollutant Load TSS (lbs/yr)
Impervious Developed Planning Area	362	724,288.42
Pervious Developed Planning Area	3,451	1,034,078.51
CBPRP Total	3,799	1,758,366.93

D.4 Existing Pollutant Loading Adjustment for Previously Implemented BMPs

East Hanover Township does not currently contain any existing BMPs that have been identified, installed previously and inventoried to continue to function as designed.

As part of East Hanover's first general permit term, any NPDES Permits, land development plans and stormwater management reports will be used to determine the pollutant load reduction associated with any existing BMP not previously identified. In the case of any older BMPs where land development plans were unavailable, land use data from aerial flight data and PADEP's standard BMP Effectiveness Values⁸ will be used to estimate the pollutant load reduction associated with the BMP.

⁸ PADEP Document 3899-PM-BCW0100M, NPDES Stormwater Discharges from Small MS4s, BMP Effectiveness Values (6/2018)

SECTION E: BMPS TO ACHIEVE THE REQUIRED POLLUTANT LOADING REDUCTIONS

E.1 Required Pollutant Reduction Calculation

East Hanover Township discharges stormwater to surface waters located within the Chesapeake Bay Watershed and must complete Appendix D (nutrients and sediment in stormwater discharges to waters in the Chesapeake Bay watershed). The pollutants of concern for Appendix D are TSS, TP, and total nitrogen (TN), with required loading reductions of 10-percent, 5-percent, and 3-percent, respectively. However, as stated previously, it is presumed that within the overall Bay watershed, the TP and TN goals will be achieved when a 10-percent reduction in sediment is achieved⁷. Therefore, only the required 10-percent TSS reduction is calculated herein as a requirement for planning area load reductions (Table 4). Additionally, the two HUC-12 watersheds within East Hanover Township, Manada Creek and Bow Creek-Swatara Creek, have impairments requiring additional requirements: Appendix B (Pathogens), Appendix C (Pollutant Control Measures for Waters Impaired by Priority Organic Compounds) for Bow Creek-Swatara Creek only, and Appendix E (nutrients and/or sediment in stormwater discharges to impaired waterways). Appendix E siltation impairments require a minimum 10-percent reduction in sediment load. The pollutant load reduction requirements listed below consider adjustments to baseline loading from the parsed areas discussed in Section D.

Table 4: Required Pollutant Load Reduction Goals – Non-Impaired Planning Area

Planning Area	Planning Area (acres)	Regulated Pollutant Load TSS (lbs/yr)
Impervious Developed Planning Area	362	72,428.84
Pervious Developed Planning Area	3,451	103,407.85
CBPRP Total	3,799	175,836.69

The planning areas associated with each of these impaired waters are shown on the CBPRP Planning Area Map (Appendix B).

As stated previously, the load reduction requirements for each impaired watershed planning areas are included as a portion of the total CBPRP pollutant load reduction. Of the total CBPRP Planning area required sediment load reduction **175,836.69 lbs/yr.**, the required pollutant reduction will be targeted throughout the Manada Creek watershed. This was decided due to the Manada Creek Watershed being the vast majority of impaired waters within the East Hanover Township planning area.

E.2 Proposed BMPs

The following section outlines the BMP implementation strategy developed to achieve the required pollutant load reduction goals stated in Section E.1. The proposed BMPs were determined through discussions with municipal staff, in-field site assessments, and public outreach meetings.

A summary of the type and scale of BMP projects included in the pollutant reduction strategy is listed in Table 5. The pollutant loading reductions for each proposed BMP were calculated in terms of pounds per

⁷ PADEP – PRP Instruction, Document #3800-PM-BCW0100k (rev. 3/2017)

year using PADEP’s standard BMP Effectiveness Values⁸. Complete calculations for the anticipated pollutant load reductions for each BMPs listed below is provided in Appendix E.

Table 5: East Hanover Township Proposed BMP Summary

Project Site	BMP ID	BMP Type	Planning Area	Length (feet)	BMP Effectiveness Value (lbs/ft/yr)	Load Reduction TSS (lbs/yr)
East Hanover Community Park	BMP-1	Stream Restoration	Manada Creek	1350	44.88	60,480
Manada Gap Road	BMP-2	Stream Restoration	Manada Creek	1700	44.88	76,160
Douglas Road	BMP-3	Stream Restoration	Manada Creek	380	44.88	17,024
South Crawford Road	BMP-4	Stream Restoration	Manada Creek	500	44.88	22,400
Total						176,064

E.3 BMP Project Descriptions

Four existing receiving waters were identified within East Hanover Township and are all located within the Manada Creek Planning Area. The stream lengths range from approximately 380 feet to 1700 feet. Douglas Road and South Crawford Road were identified as severely eroding streambanks and are in need of restoration. Descriptions of each stream restoration are as follows:

BMP-1– East Hanover Community Park Stream Restoration - A stream restoration project was identified along an Unnamed Tributary to Manada Creek. Approximately 1350 feet of stream spanning from upstream at the Community Park's property frontage (Manada Gap Road) to the downstream confluence of approximated wetland areas. This section exhibits streambank erosion, unnatural debris in the channel, lack of riparian buffer and excessive algae growth. It was determined that the reach would benefit from the entire 1350 feet of restoration consisting of construction of cross vanes, J-hook vanes and willow plantings to aid in stabilizing the stream bed and banks and reintroducing a more natural, meandering flow path. Constructed features will aid in slowing stream velocity and sediment transport while incorporation of native vegetation will act to filter out sediment through runoff entering the stream.

BMP-2– Manada Gap Road Stream Restoration - A stream restoration project was identified along an Unnamed Tributary to Manada Creek. Approximately 1700 feet of stream spanning from upstream at Manada Gap Road to the downstream confluence of the Manada Creek. This section exhibits a straightened channel, streambank erosion and unnatural debris in the channel. It was determined that the reach would benefit from the entirety of the restoration consisting of construction of cross vanes, J-hook vanes and tree plantings to aid in stabilizing the stream bed and banks and reintroducing a more natural, meandering flow path. Constructed features will aid in slowing stream velocity and sediment transport while incorporation of native vegetation will act to filter out sediment through runoff entering the stream.

BMP-3– Douglas Road Stream Restoration - A stream restoration project was identified along Manada Creek. Approximately 880 feet of stream spanning from upstream at Carlson Road to the downstream confluence of UNT 09576 to Manada Creek. This section exhibits a straightened channel, severe streambank erosion along Douglas Road, and lack of riparian buffer. It was determined that

⁸ Chesapeake Stormwater Network Recommendations of the Exert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects (10/9/2012) and PADEP Document 38-99-PM-BCW0100M, NPDES Stormwater Discharges from Small MS4s, BMP Effectiveness Values (6/2018)

approximately 500 feet of the streambank is in need of immediate repair to prevent further scour to Douglas Road, so the reach would benefit from the approximately 380 feet of restoration consisting of construction of cross vanes, J-hook vanes and tree plantings to aid in stabilizing the stream bed and banks and reintroducing a more natural, meandering flow path. Constructed features will aid in slowing stream velocity and sediment transport while incorporation of native vegetation will act to filter out sediment through runoff entering the stream.

BMP-4– South Crawford Road Stream Restoration - A stream restoration project was identified along an impaired Unnamed Tributary Manada Creek. Approximately 500 feet of stream spanning from upstream at Carlson Road to the downstream confluence of UNT 09576 to Manada Creek. This section exhibits severe streambank erosion along South Crawford Road and lack of riparian buffer. It was determined that approximately 500 feet of the streambank is in need of immediate repair to prevent further scour to Douglas Road, so the reach would benefit from the approximately 500 feet of restoration consisting of construction of cross vanes, J-hook vanes and tree plantings to aid in stabilizing the stream bed and banks and reintroducing a more natural, meandering flow path. Constructed features will aid in slowing stream velocity and sediment transport while incorporation of native vegetation will act to filter out sediment through runoff entering the stream.

Table 8: BMP Implementation Schedule

Project Site	BMP ID	BMP Type	Permitting & Engineering Design	Construction/Reporting
East Hanover Community Park	BMP-1	Stream Restoration	2021	June 2023 - December 2023
Manada Gap Road	BMP-2	Stream Restoration	2021	January 2024 -June 2024
Douglas Road	BMP-3	Stream Restoration	2020	January 2023 -June 2023
South Crawford Road	BMP-4	Stream Restoration	2020	January 2023 -June 2023

SECTION F: FUNDING MECHANISMS

The design and construction of the BMPs proposed herein will be funded through a variety of sources including the Township's General Fund, available grants, and public donation of materials and manpower. The proposed stream restoration projects within and along the East Hanover Community Park will likely be constructed, at least in part, by Township staff in order to lessen the overall cost of implementing the CBPRP.

SECTION G: OPERATION & MAINTENANCE

Once implemented, the BMPs outlined in this plan will be operated and maintained by East Hanover Township Staff and inspected regularly by the Township’s MS4 Program Coordinator to ensure that they continue to produce the expected pollutant reductions. The Operation and Maintenance activities will be reported in the Annual MS4 Status Reports submitted in accordance with the General Permit. In areas in which a project is located within private property, an easement will be obtained if not already existing.

The Operation and Maintenance activities and schedule for each BMP will be developed during the design phase. A general summary of the O&M activities involved with each BMP type and the frequency at which O&M activities will occur are as follows:

Stream Restoration BMP

- Operation and maintenance requirements for the stream restoration project includes:
- Ensure disturbed areas are kept free of foot and/or vehicular traffic until full stabilization has occurred. Properly designed and installed stream features require some monitoring and regular maintenance.
 - Stream Restoration areas should be inspected at least four times per year for sediment buildup, erosion, vegetative conditions, etc.
 - Trees and shrubs should be inspected twice per year to evaluate health.

The contractor shall be responsible for the operation and maintenance of the stream restoration area until all features of the project have been successfully constructed to the specifications and design standards set forth by the Township Engineer. The Contractor should provide a one-year 80% care and replacement warranty for all planting beginning after installation and inspection of all plants.

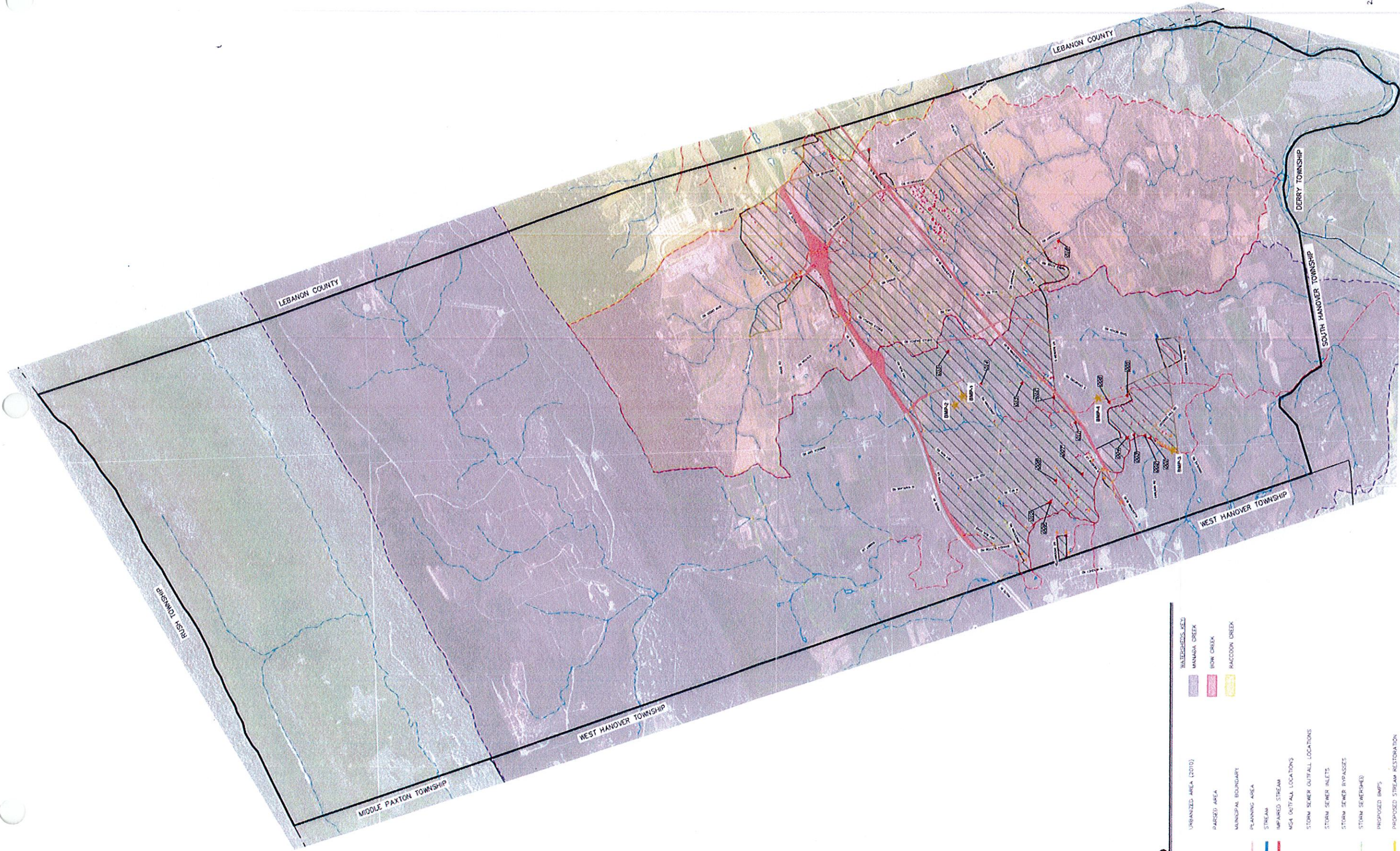
Once construction of the project(s) is complete, the Township shall be responsible for long term implementation of all Operation and Maintenance procedures to ensure the stream channel remains operationally functional and physically consistent with the original design.

APPENDIX A

Public Participation Documentation

APPENDIX B

Mapping



LEGEND

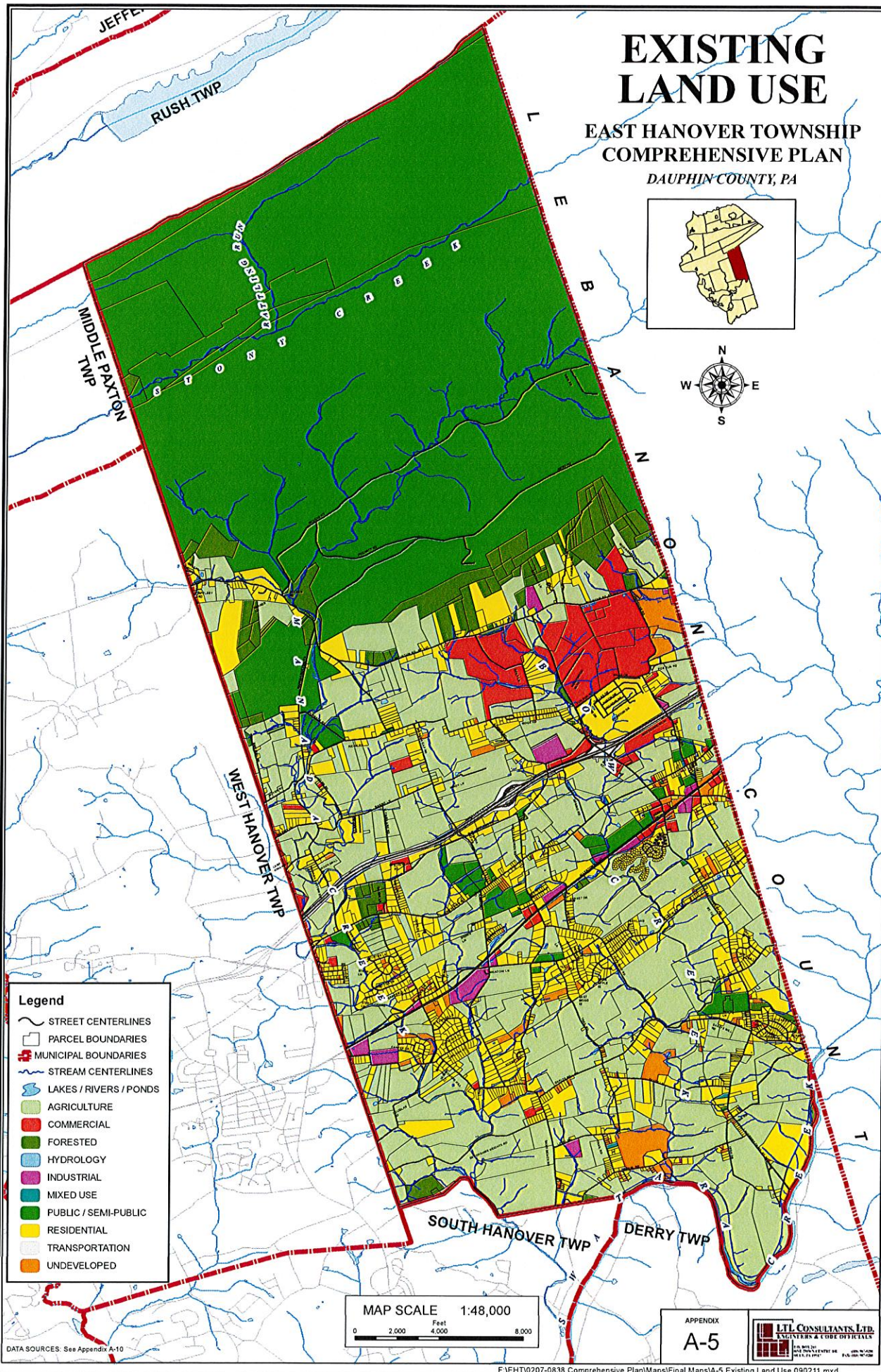
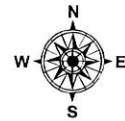
- URBANIZED AREA (2010)
- PARKED AREA
- MUNICIPAL BOUNDARY
- PLANNING AREA
- STREAM
- IMPAIRED STREAM
- MSA OUTFALL LOCATIONS
- STORM SEWER OUTFALL LOCATIONS
- STORM SEWER INLETS
- STORM SEWER BYPASSES
- STORM SEWER(SHED)
- PROPOSED BMP'S
- PROPOSED STREAM RESTORATION

- WATERSHEDS KEY
- MANADIA CREEK
- IRON CREEK
- RACCOON CREEK

EXISTING LAND USE

EAST HANOVER TOWNSHIP COMPREHENSIVE PLAN

DAUPHIN COUNTY, PA



Legend

- STREET CENTERLINES
- PARCEL BOUNDARIES
- MUNICIPAL BOUNDARIES
- STREAM CENTERLINES
- LAKES / RIVERS / PONDS
- AGRICULTURE
- COMMERCIAL
- FORESTED
- HYDROLOGY
- INDUSTRIAL
- MIXED USE
- PUBLIC / SEMI-PUBLIC
- RESIDENTIAL
- TRANSPORTATION
- UNDEVELOPED

MAP SCALE 1:48,000

0 2,000 4,000 8,000 Feet

APPENDIX

A-5



DATA SOURCES: See Appendix A-10

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APPENDIX C

PADEP Municipal MS4 Requirements Table

MS4 e	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
Dauphin County	CONEWAGO TWP	No		Conewago Creek	Appendix E-Nutrients, Siltation, Suspended Solids (4a), Appendix B-Pathogens (5)	
				Unnamed Tributaries to Susquehanna River	Appendix E-Nutrients, Suspended Solids (4a)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
				Spring Creek	Appendix E-Siltation (5)	Flow Alterations, Other Habitat Alterations (4c)
DAUPHIN BORO	PAG133550*	No		Iron Run	Appendix E-Siltation (5)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
DERRY TWP	PAG133637	No		Susquehanna River	Appendix C-PCB (5)	
				Unnamed Tributaries to Swatara Creek	Appendix E-Siltation (5)	
				Susquehanna River	Appendix C-PCB (5)	
				Spring Creek	Appendix E-Siltation (5)	Flow Alterations, Other Habitat Alterations (4c)
EAST HANOVER TWP				Unnamed Tributaries to Spring Creek		Water/Flow Variability (4c)
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
				Iron Run	Appendix E-Siltation (5)	
				Unnamed Tributaries to Raccoon Creek	Appendix B-Pathogens (5)	
HARRISBURG CITY	PAG133551*	No		Raccoon Creek	Appendix E-DO/BOD (4a)	Flow Alterations (4c)
				Manada Creek	Appendix B-Pathogens (5)	
				Unnamed Tributaries to Bow Creek	Appendix E-Nutrients (4a), Appendix C-Priority Organics (5)	
				Bow Creek	Appendix E-Siltation (5)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
				Susquehanna River	Appendix C-PCB (5)	
				Spring Creek		Cause Unknown (5)
				Paxton Creek TMDL	TMDL Plan-Siltation, Suspended Solids (4a)	
				Wildwood Lake	Appendix E-Nutrients, Suspended Solids (4a)	
				Asylum Run	Appendix B-Pathogens (5)	Water/Flow Variability (4c)
				Unnamed Tributaries to Spring Creek	Appendix E-Siltation (5)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
HIGHSPIRE BORO	PAG133544	No		Paxton Creek	Appendix B-Pathogens (5)	Other Habitat Alterations, Water/Flow Variability (4c)
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
				Susquehanna River	Appendix C-PCB (5)	
				Burd Run		Cause Unknown (5)
HUMMELSTOWN BORO	PAG133556	No		Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	

APPENDIX D

Pollutant Load Calculations

Developed Loading Rates for PA	Acres	TN(lb/acre/yr)	TP(lb/acre/yr)	TSS(lb/acre/yr)
Impervious Developed	3482.4	28.59	1.07	1999.14
Pervious Developed	9405.8	21.24	0.34	299.62
EHT	UA % Impervious	UA% Pervious	Outside UA % Impervious	Outside UA % Pervious
	9.5%	90.5%	5%	95%
EHT	UA Imperv (Acre)	UA Perv (Acre)	Planning Area	
	380	3618		3997.4
EHT (parsed)	UA Imperv (Acre)	UA Perv (Acre)	Planning Area	
	362	3451		3826

Urban Area	TN	TP	TSS (lb/ft/yr)
Impervious Developed	10014	375	700,248
Pervious Developed	70874	1135	999,780
Undeveloped	n/a	n/a	n/a
Total Loadings	80889	1509	1,700,027
Loading Reductions	8089	151	170,003
Loading Goals	72800	1358	1,530,025

Parsed Planning Area			
Planning Area	TN	TP	TSS (lb/ft/yr)
Impervious Developed	10,358.16	387.66	724,288.42
Pervious Developed	73,305.61	1,173.44	1,034,078.51
Undeveloped	n/a	n/a	n/a
Existing BMP Reductions	-	-	-
Total Loadings	83664	1561	1,758,366.93
Req'd Loading Reductions	8366	156	175,836.69
Loading Goals	75297	1405	1,582,530.24

Proposed BMPs Load Reduction			
	TN	TP	TSS (lb/ft/yr)
Stream Restoration (Needed)	0.075	0.068	44.88
Length (ft)	3920	3920	3920
Reduction	294	266.56	175,929.60

Proposed BMPs			
SR 01 Municipal Bldg Park	0.075	0.068	44.88
Length (ft)	1350	1350	1350
Reduction	101.25	91.8	60588
SR 02 UNT North of Muni. Park	0.075	0.068	44.88
Length (ft)	1700	1700	1700
Reduction	127.5	115.6	76296
SR 03 Douglas Road	0.075	0.068	44.88
Length (ft)	380	380	380
Reduction	28.5	25.84	17054.4
SR 04 S. Crawford Road	0.075	0.068	44.88
Length (ft)	500	500	500
Reduction	37.5	34	22440
		TOTAL	176378.4

APPENDIX E

Proposed BMP Pollutant Load Reduction Calculations

BMP-1– East Hanover Community Park Stream Restoration - A stream restoration project was identified along an Unnamed Tributary to Manada Creek. Approximately 1350 feet of stream spanning from upstream at the Community Park's property frontage (Manada Gap Road) to the downstream confluence of approximated wetland areas. This section exhibits streambank erosion, unnatural debris in the channel, lack of riparian buffer and excessive algae growth. It was determined that the reach would benefit from the entire 1350 feet of restoration consisting of construction of cross vanes, J-hook vanes and tree plantings to aid in stabilizing the stream bed and banks and reintroducing a more natural, meandering flow path. Constructed features will aid in slowing stream velocity and sediment transport while incorporation of native vegetation will act to filter out sediment through runoff entering the stream. The BMP efficiency was obtained by the PADEP BMP Effectiveness Values at 44.88 lbs/ft/yr.

Load Reduction (lbs) = Length of Project x 44.88

60,480 lbs = 1,350 x 44.88

BMP-2– Manada Gap Road Stream Restoration - A stream restoration project was identified along an Unnamed Tributary to Manada Creek. Approximately 1700 feet of stream spanning from upstream at Manada Gap Road to the downstream confluence of the Manada Creek. This section exhibits a straightened channel, streambank erosion and unnatural debris in the channel. It was determined that the reach would benefit from the entirety of the restoration consisting of construction of cross vanes, J-hook vanes and tree plantings to aid in stabilizing the stream bed and banks and reintroducing a more natural, meandering flow path. Constructed features will aid in slowing stream velocity and sediment transport while incorporation of native vegetation will act to filter out sediment through runoff entering the stream. The BMP efficiency was obtained by the PADEP BMP Effectiveness Values at 44.88 lbs/ft/yr.

Load Reduction (lbs) = Length of Project x 44.88

76,160 lbs = 1,700 x 44.88

BMP-3– Douglas Road Stream Restoration - A stream restoration project was identified along Manada Creek. Approximately 880 feet of stream spanning from upstream at Carlson Road to the downstream confluence of UNT 09576 to Manada Creek. This section exhibits a straightened channel, severe streambank erosion along Douglas Road, and lack of riparian buffer. It was determined that approximately 500 feet of the streambank is in need of immediate repair to prevent further scour to Douglas Road, so the reach would benefit from the approximately 380 feet of restoration consisting of construction of cross vanes, J-hook vanes and tree plantings to aid in stabilizing the stream bed and banks and reintroducing a more natural, meandering flow path. Constructed features will aid in slowing stream velocity and sediment transport while incorporation of native vegetation will act to filter out sediment through runoff entering the stream. The BMP efficiency was obtained by the PADEP BMP Effectiveness Values at 44.88 lbs/ft/yr.

Load Reduction (lbs) = Length of Project x 44.88

17,024 lbs = 380 x 44.88

BMP-4– South Crawford Road Stream Restoration - A stream restoration project was identified along an impaired Unnamed Tributary Manada Creek. Approximately 500 feet of stream spanning from upstream at Carlson Road to the downstream confluence of UNT 09576 to Manada Creek. This section exhibits severe streambank erosion along South Crawford Road and lack of riparian buffer. It was determined that

approximately 500 feet of the streambank is in need of immediate repair to prevent further scour to Douglas Road, so the reach would benefit from the approximately 500 feet of restoration consisting of construction of cross vanes, J-hook vanes and tree plantings to aid in stabilizing the stream bed and banks and reintroducing a more natural, meandering flow path. Constructed features will aid in slowing stream velocity and sediment transport while incorporation of native vegetation will act to filter out sediment through runoff entering the stream. The BMP efficiency was obtained by the PADEP BMP Effectiveness Values at 44.88 lbs/ft/yr.

Load Reduction (lbs) = Length of Project x 44.88

22,400 lbs = 500 x 44.88