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POLLUTION REDUCTION PLAN FOR MUNICIPAL SEPARATE STORM SEWER SYSTEM

West Chester University of Pennsylvania

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Prepared for:
West Chester University of Pennsylvania

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Acronyms / Abbreviations

WCU	West Chester University
PRP	Pollution Reduction Plan
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
BMP	Best Management Practice
PADEP	Pennsylvania Department of Environmental Protection
O&M	Operation and Maintenance
EHS	West Chester University Environmental Health and Safety Department
TSS	Total Suspended Solids
TN	Total Nitrogen
TP	Total Phosphorus

1 Purpose and Scope

West Chester University (WCU) has developed a revision to its original Pollution Reduction Plan (PRP) for its Municipal Separate Storm Sewer System (MS4). The original PRP was prepared in accordance with the requirements of the ***National Pollutant Discharge Elimination System (NPDES) Stormwater Discharges from Small Municipal Separate Storm Sewer Systems Pollution Reduction Plan Instructions*** as required by the ***PAG-13 Authorization to Discharge Under the NPDES General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4)***. WCU has created a PRP to address discharges from the MS4 affecting the siltation impairments in Plum Run of the Brandywine Creek Watershed and pathogen and siltation impairments in Chester Creek. See the attached ***Requirements (Non-Municipal) Anticipated Obligations for the Subsequent NPDES Permit Term*** table revised 10/2/23 as seen in Appendix A.

The purpose of the PRP is to determine the University's existing pollutant load discharged to Plum Run of the Brandywine Creek Watershed, and to Goose Creek of the Chester Creek Watershed to select and develop stormwater Best Management Practices (BMPs) to be implemented over the next five-year MS4 permit term to reduce waterway pollutants of concern by minimum reduction percentages required by the Pennsylvania Department of Environmental Protection (PADEP). The term began March 16,2018 and concluded on March 15,2023 under the original permit schedule. On September 24, 2022, PADEP extended the permit term for an additional 2 years, expiring on March 15, 2025.

The University's PRP can be evaluated and may be amended over the permit term to meet the goal reductions. The purpose of this revision is to account for several BMPs installed during the permit term in the Brandywine Creek Watershed not included in the original PRP and to add alternative BMPs to meet the remaining siltation reduction requirements.

2 Permit Requirements

As stated in the ***PRP Instructions,*** each PRP is required to include the following elements:

1. Public Participation
2. Map
3. Storm Sewershed Pollutants of Concern
4. Determine Existing loading for Pollutants of Concern
5. Select BMPs to Achieve the Minimum Required Reductions in Pollutant Loading
6. Identify Funding Mechanisms
7. Identify Responsible Parties for Operations and Maintenance of BMPs

West Chester University's PRP addresses the requirements in the order as listed above. Relevant PRP instructions for each element have been included as bulleted items at the beginning of each section.

2.1 Public Participation

The PRP shall address the following elements related to Public Participation:

- The University shall make a complete copy of the PRP available for public review.
- The University shall publish, in a newspaper of general circulation in the area, a public notice containing a statement describing the plan, where it may be reviewed by the public, and the length of time the University will provide for the receipt of comments. The public notice must be published at least 45 days prior to the deadline for submission of the PRP to the DEP. Include a copy of the public notice with the PRP.
- The University shall accept written comments for a minimum of 30 days from the date of public notice. Include a copy of all written comments received from the public with the PRP.
- The University shall accept comments from any interested member of the public at a public meeting or hearing, which may include a regularly scheduled meeting of the governing body of the municipality or municipal authority that is the permittee.
- The University shall consider and make a record of the consideration of each timely comment received from the public during the comment period.
- The University shall consider and make a record of the consideration of each timely comment received form the public during the public comment period concerning the plan, identifying any changes made to the plan in response to the comment. Include a copy of the University's record of consideration of all timely comments received in the public comment period with the PRP.

West Chester University's original PRP public notice was published on August 15th, 2017 in The Daily Local Newspaper and the PRP was made available online for public review and comment on August 17th, 2017 at www.wcupa.edu/facilities and in person at West Chester University's Environmental Health and Safety (EHS) Office. The public was given thirty days to comment on the PRP. A public meeting to address the PRP was held on September 7th, 2017.

For the revision to the PRP in 2024, another public meeting was held to address revisions to the PRP on February 13, 2024.

A copy of the Public Notice, timely comments, and records of consideration are located in Appendix B for the 2017 and 2024 meetings.

2.2 Sewershed Map

The PRP shall address the following elements related to Sewershed Mapping:

- Attach maps that identify land uses and the storm sewershed boundaries associated with the MS4 that discharge to impaired surface waters and calculate the storm sewershed area that is subject to Appendix E of PAG-13. In addition, the proposed location(s) of structural BMP(s) that will be implemented to achieve the required pollutant load reductions must be identified on a map.
- The map may be the same as that used to satisfy MCM #3 of the PAG-13 General or Individual Permit, with the addition of land use, the storm sewershed boundary, and locations of proposed BMPs, or may be a different map. The map must be sufficiently detailed to identify the PRP Planning Area relevant to satisfying the requirements of Appendix E, and to demonstrate that BMPs will be located in appropriate storm sewersheds to meet the requirements.

West Chester University's storm sewershed covers 404.69 Acres located within West Chester Borough, West Goshen Township, East Bradford Township, and the Township of Westtown within Chester County. Within the Brandywine Creek watershed, 316.99 Acres (81.08%) of the campus is pervious and 73.97 Acres (18.92%) are impervious.13.74 Acres of the campus fall within the Chester Creek Watershed, 5.22 acres (38.02%) are pervious, and 8.52 acres (61.98%) are impervious. The University has 18 outfalls total, 5 are located on the University's North Campus and 13 are located on its South Campus.

Table 1 West Chester University Impervious and Pervious Area Totals by Watershed

	Impervious Area (acres)	**Pervious Area (acres)**	**Total (acres)**
Brandywine Creek Watershed	73.97	316.99	390.95
Chester Creek Watershed	8.52	5.22	13.74
West Chester University Total	82.49	322.21	404.69

135 acres within the Brandywine Creek Watershed on WCU's South Campus are protected natural lands called the Gordon Natural Area for Environmental Studies. Plum Run flows through the Gordon Natural Area which is home to trees, plants, and wildlife. The Gordon Natural Area provides many learning and volunteer opportunities to WCU students and the surrounding community.

As per PA DEP PRP requirements, maps identifying land use, storm sewershed boundaries, and proposed locations of structural BMPs required to achieve the required pollutant load reductions are attached in Appendix C.

2.3 Pollutants of Concern

The PRP shall address the following elements related to Pollutants of Concern:

- Identify the pollutants of concern for each storm sewershed or the overall PRP Planning Area.
- The term "nutrients" refers to "Total Nitrogen" (TN) and "Total Phosphorus" (TP) unless specifically stated otherwise in DEP's latest Integrated Report. The terms "sediment," "siltation," and "suspended solids" all refer to inorganic solids and are hereinafter referred to as "sediment."
- The term, “storm sewer shed" is defined in the PAG·13 General Permit as the land area that drains to the municipal separate storm sewer from within the jurisdiction of the MS4 permittee. This term is used in these instructions as well as the term "PRP Planning Area" (or "Planning Area"), which refers to all of the storm sewersheds that an MS4 must calculate existing loads and plan load reductions for.
- For all PRPs, MS4s shall calculate existing loading of the pollutant(s) of concern in lb./year; calculate the minimum reduction in loading in lb./year select Best Management Practice(s) to reduce loading; and demonstrate that the selected BMPs will achieve the minimum reductions.
- For PRPs developed for Appendix E, impaired waters, the pollutant(s) are based on the impairment listing, as provided in the MS4 Requirements Table. If the impairment is based on siltation only, a minimum 10% sediment reduction is required. If the impairment is based on nutrients only or other surrogates for nutrients (e.g., “Excessive Algal Growth" and "Organic Enrichment/low D.O."), a minimum 5% TP reduction is required. If the impairment is due to both siltation and nutrients, both sediment (10% reduction) and TP (5% reduction) must be addressed. PRPs may use a presumptive approach in which it is assumed that a 10% sediment reduction will also accomplish a 5% TP reduction. However, MS4s may not presume that a reduction in nutrients will accomplish a commensurate reduction in sediment.

As identified in Appendix A, ***MS4 Requirements (Non-Municipal) Anticipated Obligations for the Subsequent NPDES Permit Term*** table, West Chester University is required to implement BMPs to improve the siltation impairment of Plum Run within the Brandywine Creek Watershed and the siltation and pathogen impairment of Chester Creek. The University is not required to reduce Total Nitrogen or Total Phosphorus loads however the BMPs implemented for the siltation impairments may reduce the loading.

2.4 Determine Existing Loading for Pollutants of Concern

The PRP shall address the following elements related to determining the existing load for Pollutants of Concern:

- Identify the date associated with the existing loading estimate. Calculate the existing loading, in lbs. per year, for the pollutant(s) of concern in the PRP Planning Area.
- There are several possible methods to estimate existing loading, ranging from simplistic to complex. One method to estimate existing loading that is acceptable to DEP is to determine the percent impervious and pervious surface within the urbanized area of the storm sewershed and calculate existing loading by multiplying the developed impervious and developed pervious land areas (acres) by pollutant loading rates (lb./acre/year) ("simplified method").The MS4 may use loading rates for undeveloped land for areas outside of the urbanized area which flows into the urbanized area. Where structural BMPs are currently in place and are functioning, the existing loading estimate may be reduced to account for pollutant reductions from those BMPs.
- Use of DEP's simplified method is not required. Any methodology that calculates existing pollutant loading in terms of pounds per year, evaluates BMP-based pollutant reductions utilizing the BMP effectiveness values contained in 3800-PM-BCW0100m or Chesapeake Bay Program expert panel reports, uses average annual precipitation conditions, considers both overland flow and stream erosion, and is based on sound science may be considered acceptable.
- Whatever tool or approach that is used to estimate existing loading from the PRP Planning Area must also be used to estimate existing loading to planned BMPs. This avoids errors in percent pollutant removal calculations that would result if different methods were used. Later BMP design efforts will usually apply a more sophisticated method than used in planning to calculate load to a BMP. The design loading may not however be used to alter the assumed pollutant reduction by the BMP unless the PRP is revised to apply the more sophisticated method to the load from the storm sewershed as a whole.
- MS4s may claim "credit" for structural BMPs implemented prior to development of the PRP to reduce existing loading estimates. In order to claim credit, identify all such structural BMPs in Section D of the PRP along with the following information:
    - A detailed description of the BMP.
    - Latitude and longitude coordinates for the BMP.
    - Location of the BMP on the storm sewershed map.
    - The permit number, if any, that authorized installation of the BMP.
    - Calculations demonstrating the pollutant reductions achieved by the BMP.

  - The date the BMP was installed and a statement that the BMP continues to serve the function(s) it was designed for; and
  - The operation and maintenance (O&M) activities and O&M frequencies associated with the BMP.

- The MS4 permittee may optionally submit design drawings of the BMP for previously installed or future BMPs with the PRP.
- Existing loading must be calculated and reported for the portion of the Planning Area which drains to impaired waters as of the date of the development of the PRP. MS4s may not claim credit for street sweeping and other non-structural BMPs implemented in the past, and an MS4 may not reduce its obligations for achieving permit term pollutant load reductions through previously installed BMPs. If structural BMPs were implemented prior to development of the PRP and continue to be operated and maintained, the MS4 may claim pollutant reduction credit in the form of reduced existing loading.
- An MS4 may use all BMPs installed prior to the date of the load calculation to reduce its estimate of existing pollutant loading. For example, if a rain garden was installed ten years ago and is expected to remove 100 lbs. of sediment annually, and the overall annual loading of sediment in the storm sewershed is estimated to be 1,000 lbs.without specifically addressing the rain garden, an MS4 may not claim that the rain garden satisfies its obligations to reduce sediment loading by 10%.The MS4 may however use the rain garden to demonstrate that the existing load is 900 lbs. instead of 1,000 lbs., and that 90 lbs. rather than 100 lbs. needs to be reduced during the term of permit coverage.
- Each impairment identified on the MS4 Requirements Table ("Table") must be addressed in a PRP document. The Table listings for each MS4 are different because they reflect local conditions, which is why an MS4 must carefully interpret the information on the Table.
- For PRPs developed for impaired waters (Appendix E), the pollutant(s) are based on the impairment listing, as provided in the MS4 Requirements Table. If the impairment is based on siltation only, a minimum 10% sediment reduction is required. If the impairment is based on nutrients only or other surrogates for nutrients (e.g., "Excessive Algal Growth" and "Organic Enrichment/low D.O."), a minimum 5% TP reduction is required. If the impairment is due to both siltation and nutrients, both sediment (10% reduction) and TP (5% reduction) must be addressed. PRPs may use a presumptive approach in which it is assumed that a 10% sediment reduction will also accomplish a 5% TP reduction. However, MS4s may not presume that a reduction in nutrients will accomplish a commensurate reduction in sediment.
- All MS4s must use the BMP effectiveness values contained within DEP's BMP Effectiveness Values document (3800-PM-BCW0100m) or Chesapeake Bay Program expert panel reports for BMPs listed in those resources when determining pollutant load reductions in PRPs, except as otherwise approved by DEP. An example of other approaches that may be approved by DEP include the use of thoroughly vetted mechanistic models with self-contained BMP modules (e.g.,

Storm Water Management Model (SWMM), WinSLAMM) to demonstrate achievement of reduction targets. Application of these data intensive models could allow for a streamlining of the planning and design phases of BMPs that may provide future cost savings as municipalities move toward implementation of the plan. Such resources must be documented in the PRP and must reflect both overland flow and in-stream erosion components.

The University's existing sediment load and required ten percent reduction was calculated using ***Attachment B: Developed Land Loading Rates For PA Counties*** and ***Attachment C: The Chesapeake Boy PRP Example Using DEP Simplified Method of the National Pollutant Discharge Elimination System (NPDES) Stormwater Discharges From Small Municipal Separate Storm Sewer Systems Pollution Reduction Plan Instructions***. The Chester County loading rates and watershed calculations may be found in Appendix D.

Brandywine Creek Watershed

West Chester University is required by the PADEP to reduce sediment impairment from stormwater discharges to the waters of Plum Run in the Brandywine Creek Watershed by ten percent during the current permit term. The tables below summarize the existing sediment load and required reduction for each watershed.

Table 2 Brandywine Creek Watershed Existing Sediment Load Calculation

	Percentage	Acres	Loading Rate	Total
Impervious	18.92%	73.97 Acres	1504.78 lbs./acre/year	111,304.06 lbs./yr
Pervious	81.08%	316.99 Acres	185.12 lbs./acre/year	58,680.26 lbs./yr
Total Existing Sediment Load				169,984.33 lbs./yr

Table 3 Brandywine Creek Watershed Required Sediment Reduction Calculation

Total Sediment Load Total	Reduction Multiplier	Reduction Total
169,984.33 lbs./yr	0.10	16,998.43 lbs./yr

Chester Creek Watershed

West Chester University is required to reduce sediment impairments from stormwater discharges to Chester Creek by ten percent and implement PADEP required controls for Pathogen impairments during the current permit term.

Table 4 Chester Creek Watershed Existing Sediment Load Calculation

	Percentage	Acres	Loading Rate	Total
Impervious	21.15%	8.52 Acres	1504.78 lbs./acre/year	12,816.64 lbs/yr
Pervious	14.09%	5.22 Acres	185.12 lbs./acre/year	967.04 lbs./yr
Existing Sediment Load				13,783.68 lbs/yr

Table 5 Chester Creek Watershed Required Sediment Reduction Calculation

Total Sediment Load Total	Reduction Multiplier	Reduction Total
13,783.68 lbs./yr	0.10	1,378.37 lbs./yr

The University stated in the original PRP report it would implement the PADEP required pollution control measures due to pathogen impairment of Chester Creek over the permit term as follows:

1. Map- WCU must develop a map of the storm sewershed associated with all outfalls that flow to Chester Creek by September 30th, 2019.
2. Inventory- Develop an inventory of all suspected and known sources of bacteria in stormwater within the storm sewershed by September 30th, 2020.
3. Investigate- Complete an investigation of each suspected bacteria source and include stormwater sampling if required under Illicit Discharge Detection & Elimination Program by September 2022.
4. Ordinance- Enforce ordinances that prohibit illicit and illegal connections and discharges of sewage into the MS4. All illicit and illegal connections and discharges of sewage must be reported in Annual MS4 Status Report along with corrective actions.
5. Standard Operating Procedure- WCU must enact a standard operating procedure that requires proper management of animal wastes on property owned by the University.
6. Documentation- The progress of investigations and source control efforts of pathogens must be documented in the Annual MS4 Status Reports.

The are no known or suspected sources of bacteria or pathogens from the WCU MS4 area within the Chester Creek Watershed. The WCU portion of the watershed consists of office buildings, parking lots and above ground detention basins. The buildings connect to public sewers owned and operated by West Chester Borough Public Works. West Chester Borough would be responsible for enforcing ordinances related to illicit and illegal connections and the University is not aware of any of their buildings violating this. The University has a Pet Waste Management Policy requiring all staff, students, on-campus business and visitors to picking up their animal's waste and disposing of it properly. There are minimal

animal wastes associated with the office buildings in the Chester Creek Watershed. Animal wastes would be limited to visitor or service animals.

2.5 Select BMPs to Achieve the Minimum Required Reductions in Pollutant Loading

The PRP shall address the following elements related to selecting BMPs to achieve the Minimum Required Reductions in Pollutant Loading:

- Identify the minimum required reductions in pollutant loading. Applicants must propose the implementation of BMP(s) or land use changes within the PRP Planning Area that will result in meeting the minimum required reductions in pollutant loading within the Planning Area. These BMP(s) must be implemented within 5 years of DEP's approval of coverage under the PAG-13 General Permit or an individual permit and may be located on either public or private property.

- If the applicant is aware of BMPs that will be implemented by others (either in cooperation with the applicant or otherwise) within the Planning Area that will result in net pollutant loading reductions, the applicant may include those BMPs within its PRP.

- Historic street sweeping practices should not be considered in calculating credit for future practices. All proposed street sweeping practices may be used for credit if the minimum standard is met for credit (see 3800-PM-BCW0100m).In other words, if sweeping was conducted 1/month and will be increased to 25/year in the future, the MS4 does not need to use the "net reduction" resulting from the increased sweeping; it may take credit for the full amount of reductions from 25/year sweeping.

- The names and descriptions of BMPs and land uses reported in the PRP should be in accordance with the Chesapeake Bay Program Model. The names and descriptions are available through CAST (log into www.casttool.org,select "Documentation," select "Source Data" and see worksheets named "Land Use Definitions" and "BMP Definitions").

- Opportunities for BMP installation vary across a municipality, and for that reason MS4s with multiple PRP obligations need not propose BMPs to address each impairment listed in the Table during the permit term. The existing loading must be calculated for the entire PRP Planning Area which drains to impaired waters but pollutant controls to be installed during the subsequent permit term may be located such that they reduce the load In one sub-watershed by less than 10% and by more than 10% in another (as long as the overall amount of lbs. reduced constitutes 10% of the existing loading for the entire PRP Planning Area)

- MS4s may propose and take credit for only those BMPs that are not required to meet regulatory requirements or otherwise go above and beyond regulatory requirements. For example, a BMP that was installed to meet Chapter 102 NPDES permit requirements for stormwater associated with construction activities may not be used to meet permit term minimum pollutant reductions unless the MS4 can demonstrate that the BMP exceeded regulatory requirements if this is done,

the MS4 may take credit for only those reductions that will occur as a result of exceeding regulatory requirements.

Brandywine Creek Watershed

Since the original PRP was prepared, multiple BMPs have been constructed and installed reducing the sediment load to the Brandywine Creek. This includes BMPs which were not accounted for in the original report. As part of the WCU Commons Building and Parking Facility, 4 BMPs were designed and constructed. The BMPs were designed to PADEP's latest Stormwater BMP Design Manual and were reviewed and approved by the Chester County Conservation District as part of the project's Construction and Erosion Control NPDES permit. The BMPs combined to provide a reduction of 2,842.33 pounds per year of TSS.

WCU's primary BMP to address the remaining minimum reduction requirements will be to implement Stream Restoration along Plum Run in the Gordon Natural Area to address the siltation impairment in the Brandywine Creek Watershed. Per the ***NPDES Stormwater Discharges from Small Municipal Separate Storm Sewer Systems BMP Effectiveness Values***, as seen in Appendix E, Stream Restoration removes 44.88 lbs./ft/yr. The stream restoration will nearly meet the required 10 percent reduction of 16,711.20lbs/yr. The University will implement additional BMPs by planting over 250 trees throughout the North Campus.

Table 6 Brandywine Creek Watershed BMPs Sediment Removal Calculations

BMP #	BMP Type	BMP Name / Description	Impervious Area Controlled	BMP Effectiveness Value	Quantity of BMP	Sediment Removed (#/Yr)
1	Infiltration Bed	University and Allegheny Halls	39,057 sf	95%		1,281.76
2	Infiltration Bed	Commons Building	26,850 sf	95%		933.04
3	Rain Garden	University Ave	17,774 sf	90%		552.60
4	Detention Vault	Commons Building Parking Facility	30,375 sf	10%		104.93
5	Stream Restoration		N/A	44.88 lbs./ft/yr	300 LF	13,464
6	Tree Planting	North Campus	435 sf / tree	20% of lbs./ac/yr, 100 trees/ac	256 trees	770
					Total	**17,106.33 lbs./yr**

Table 7 Brandywine Creek Watershed Sediment Reductions

Existing Load	169,984.33 lbs/year
Percent Reduction	10%
Required Reduction	16,998.43 lbs/year
Total Proposed Reduction	17,106.33 lbs/year

A possible location of the stream restoration along Plum Run was identified in coordination with the Brandywine Red Clay Alliance and the Brandywine Conservancy. The Brandywine Red Clay Alliance has performed separate analysis of Plum Run and successfully implemented stream restoration directly downstream of the WCU selected location. Continuing the restoration through portions in the WCU MS4 area will help to provide a cohesive restored stream and help prevent erosion in downstream areas.

Additional BMPs have been identified as alternate measures to reduce the total sediment reduction. In the event funding or the design and permitting process of the stream restoration determines it is not feasible, these alternatives may be selected from. A total of 12 projects involving the installation of new BMPs or retrofitting of existing BMPs to improve their function have been identified across the portion of the campus in the Brandywine Creek watershed. The proposed BMPs include new bioswales, detention basins, the retrofitting of existing detention basins, and the retrofitting of existing infiltration basins. Sediment removal efficiencies for each BMP are in accordance with the NPDES BMP Effectiveness Values table. Per the Appendix E table, a bioswale has a sediment removal efficiency of 90%, each infiltration basin has a sediment removal efficiency of 95%, and each detention basin has a sediment removal efficiency of either 60% or 70%, depending on if the basin includes an underdrain system. Below is a list of these projects:

Table 8 Proposed Alternative BMPs Removal Calculations

BMP #	BMP (New or Retrofit)	BMP Name / Description	Drainage Area	Impervious Area Controlled	TSS Removal Efficiency (%)	Sediment Removed (#/Yr)
A1	Bioswale (New)	WCU Parking Lot S	<1 acre	32,000 sf	90%	2,076.18
A2	Detention Basin (Retrofit)	WCU Parking Lot Q	10 acres	291,790 sf	95%	10,717.25
A3	Bioretention (New)	South Parking Lot	7 acres	61,420 sf	95%	3,157.01
A4	Basin (Retrofit)	North side of WCU South Campus Apartments	11 acres	219,670 sf	60%	5,273.96
A5	Basin w/ Underdrain (Retrofit)	WCU South Campus Apartments Basketball Court	1 acre	38,025 sf	70%	1,760.50
A6	Basin w/ Underdrain (Retrofit)	South side of WCU South Campus Apartments	10 acres	192,340 sf	70%	5,492.07

A7	Basin w/ Underdrain (Retrofit)	WCU South Campus Apartments Buildings 181-182	5 acres	41,900 sf	70%	1,854.20
A8	Basin (Retrofit)	Swope Detention Basin Conversion	9 acres	210,410 sf	60%	5,082.02
A9	Basin (Retrofit)	WCU Student Union Parking Basin	7 acres	171,680 sf	60%	4,279.27
A10	Bioswale (Retrofit)	WCU Parking Lot L	< 1 acre	28,500 sf	90%	1,967.37
A11	Bioswale (New)	Tigue Road / Plum Run Trail	1 acre	29,380 sf	90%	1,994.72
A12	Bioswale (New)	New Street Parking Garage	1 acre	38,170 sf	90%	2,268.01
					Total	**45,922.56 lbs/yr**

Chester Creek Watershed

WCU proposes to alter the existing retention basin at 887 Matlack Street within its property within the Chester Creek Watershed. The retention basin will be converted to an infiltration basin with sand/vegetation. Infiltration facilities with sand, vegetation effectiveness value may be found in NPDES BMP Effectiveness Values Appendix E. The converted basin will exceed the required 10 percent reduction of 1,378.37 lbs./yr. Due to the limited size of the WCU MS4 area in the Chester Creek Watershed, no alternative BMPs are proposed.

Table 9 Chester Creek Watershed BMPs Sediment Removal Calculations

BMP #	BMP (New or Retrofit)	BMP Name / Description	Impervious Area Controlled	TSS Removal Efficiency (%)	Sediment Removed (#/Yr)
7	Infiltration Basin (Retrofit)	887 Matlack Street	61,288 sf	95%	2,011

Table 10 Chester Creek Watershed Sediment Reductions

Existing Load	13,783.68 lbs/year
Percent Reduction	10%
Required Reduction	1,378.37 lbs/year
Proposed Reduction	2,011 lbs/year

2.6 Funding Mechanisms

- Prior to approving coverage DEP will evaluate the feasibility of implementation of an applicant's PRP. Part of this analysis includes a review of the applicant's proposed method(s) by which BMPs will be funded. Applicants must identify all project sponsors and partners and probable funding sources for each BMP.

West Chester University initially intended to allocate $50,000 for the stream restoration in Brandywine Creek Watershed and $25,000 for the infiltration basin in the Chester Creek Watershed from West Chester University's Facilities Operations budget in the previous version of this report. Based on the Brandywine Red Clay Alliance’s recent experience in design, permitting, and construction costs for stream restoration along Plum Run, this funding would be insufficient. Design and permitting of the stream restoration project is now estimated to cost between $50,000 and $75,000 and construction costs are estimated at $100,000. WCU commits to funding the cost of implementing the plan without any monetary restrictions. If the project exceeds the allocated costs, WCU will either seek to allocate additional money or select an Alternative BMPs identified in the PRP.

2.7 Responsible Parties for Operation and Maintenance of BMPs

The PRP shall address the following elements related to establishing the Operation and Maintenance of BMPs and the responsible parties:

- Once implemented, the BMPs must be maintained in order to continue producing the expected pollutant reductions. Applicants must identify the following for each selected BMP:
    - The party(ies) responsible for ongoing O&M.
    - The activities involved with O&M for each BMP; and
    - The frequency at which O&M activities will occur.
- MS4 permittees will need to identify actual O&M activities in AnnualMS4 Status Reports submitted under the General Permit.

West Chester University will operate maintain and inspect the implemented BMPs in accordance with the latest Pennsylvania Stormwater BMP Manual in order to achieve the anticipated reductions.

West Chester University's Environmental Health and Safety Department (EHS) will be responsible for creating and following an Inspections Checklist and Maintenance Guidance for each BMP. The inspections will take place annually prior to the Annual MS4 reporting period. Any O&M activities will be identified in the Annual MS4 Report. Facilities will be responsible for upkeep, maintenance, and any corrective actions that will need to be implemented upon a BMPs failure to produce the expected pollutant reductions.

Stream Restoration Operation and Maintenance

Routine maintenance of the vegetation surrounding the stream banks with the riparian forest buffer will include maintaining the grass cover until area is fully stabilized on a monthly basis. On a semi-annual basis, maintenance will include mowing the grass and meadow areas not under established tree canopies, removal of invasive plant species, replacement of lost or damaged trees, and removal of accumulated debris within the watercourse. For years 2 through 5, planned inspections of the stream can reduced to an annual basis while continuing the semi-annual vegetation maintenance. Additional inspections will be conducted following a major flooding event, i.e., greater than a 1-year storm event or after a bankfull event to check for erosion, bank stability, and sediment/debris accumulation in the stream and stream banks.

Tree Planting Operation and Maintenance

The areas directly around the trees shall be planted with a grass cover and will be regularly mowed. Application of a carefully selected herbicide around the protective tree shelters/tubes may be necessary. Once the tree canopy has expanded and shading is adequate, between 2 and 5 years from planting, growth of invasive species and other weeds will be naturally prevented, and the ground cover becomes

self-maintaining. Review of the new tree plantings would be undertaken annually to determine if replacement trees should be provided.

Bioretention/Bioswales/Aboveground Basins

The areas would be inspected at least twice a year (once in the spring and fall). Routine maintenance of the bioretention areas includes weeding and removal of invasive species, placement of mulch in the spring, inspection of the plantings including replacement of damaged plantings, removal of any debris, and cutting of perennial plantings in the fall. If inspections find erosion, additional mulching, extensive replacement of the mulch, or stabilization may be need. Additional inspections shall be conducted following a greater than 1-year storm event to check for erosion or damaged areas.

Appendix A MS4 Requirement Table (Non-Municipal) Anticipated Obligations for Subsequent NPDES Permit Term

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
Chester County						
West Chester University	PAG130169	No		Brandywine Creek	Appendix E-Siltation (4a)	
				Chester Creek	Appendix B-Pathogens (5), Appendix E-Siltation (5)	Cause Unknown (4a), Cause Unknown (5), Flow Alterations, Water/Flow Variability (4c)
				Plum Run	Appendix E-Siltation (4a)	Water/Flow Variability (4c)
Cumberland County						
Camp Hill State Correctional Institution	PAG133717	No		Cedar Run	Appendix B-Pathogens (5), Appendix E-Nutrients, Siltation (5)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
				Susquehanna River	Appendix C-PCB (5)	
				Yellow Breeches Creek	Appendix B-Pathogens (5)	
Naval Ships Parts Control Center	PAI133516	Yes	SP, IP	Unnamed Tributaries to Trindle Spring Run	Appendix E-Siltation (4a)	Cause Unknown (5)
				Trindle Spring Run	Appendix C-PCB, Priority Organics (5)	
				Susquehanna River	Appendix C-PCB (5)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
Dauphin County						
Dixon University Center	PAG133642	No			No known water quality impairments at this time. Must comply with all other permit requirements.	
PSU Harrisburg	PAG133607	No		Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
				Unnamed Tributaries to Susquehanna River	Appendix E-Siltation (5)	Other Habitat Alterations (4c)
				Susquehanna River	Appendix C-PCB (5)	
PSU Hershey Medical Center (HMC)	PAG133606	No		Unnamed Tributaries to Swatara Creek	Appendix E-Siltation (5)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	

Appendix B Public Participation

West Chester University Public Notice

In accordance with the National Pollutant Discharge Elimination System (NPDES) Municipal Storm Sewer System (MS4) permit requirements, West Chester University (WCU) prepared a MS4 Report and Pollutant Reduction Plan (PRP). The PRP was originally adopted in 2018 and is proposed to be revised. The revisions include Best Management Practices (BMPs) constructed and installed by WCU since 2018 and changes to the locations and types of BMPs proposed to be installed to meet the remaining permit requirements.

Notice is hereby given that beginning February 1, 2024, the plan will be available on WCU's website (https://www.wcupa.edu/_information/AFA/Facilities/environmental-health-safety) and a hardcopy may be reviewed in person at the Environmental Health & Safety Office, 201 Carter Drive, Suite 100, West Chester, PA during business hours. The community is also invited to a public meeting on Wednesday February 13th, 2024, 1:30PM at West Chester University's **Sykes Student Union, 110 W Rosedale Ave.**

This Public Comment Period is an opportunity for members of the public to read and comment on the draft revised MS4 Report and PRP. Written comments may be submitted to Gary Ludwig, Director of Environmental Health and Safety, 201 Carter Drive, West Chester, PA, 19383 or EHS@wcupa.edu through March 4, 2024.

WEST CHESTER UNIVERSITY PUBLIC PARTICPATION 2024 COMMENTS

RECORD OF CONSIDERATION

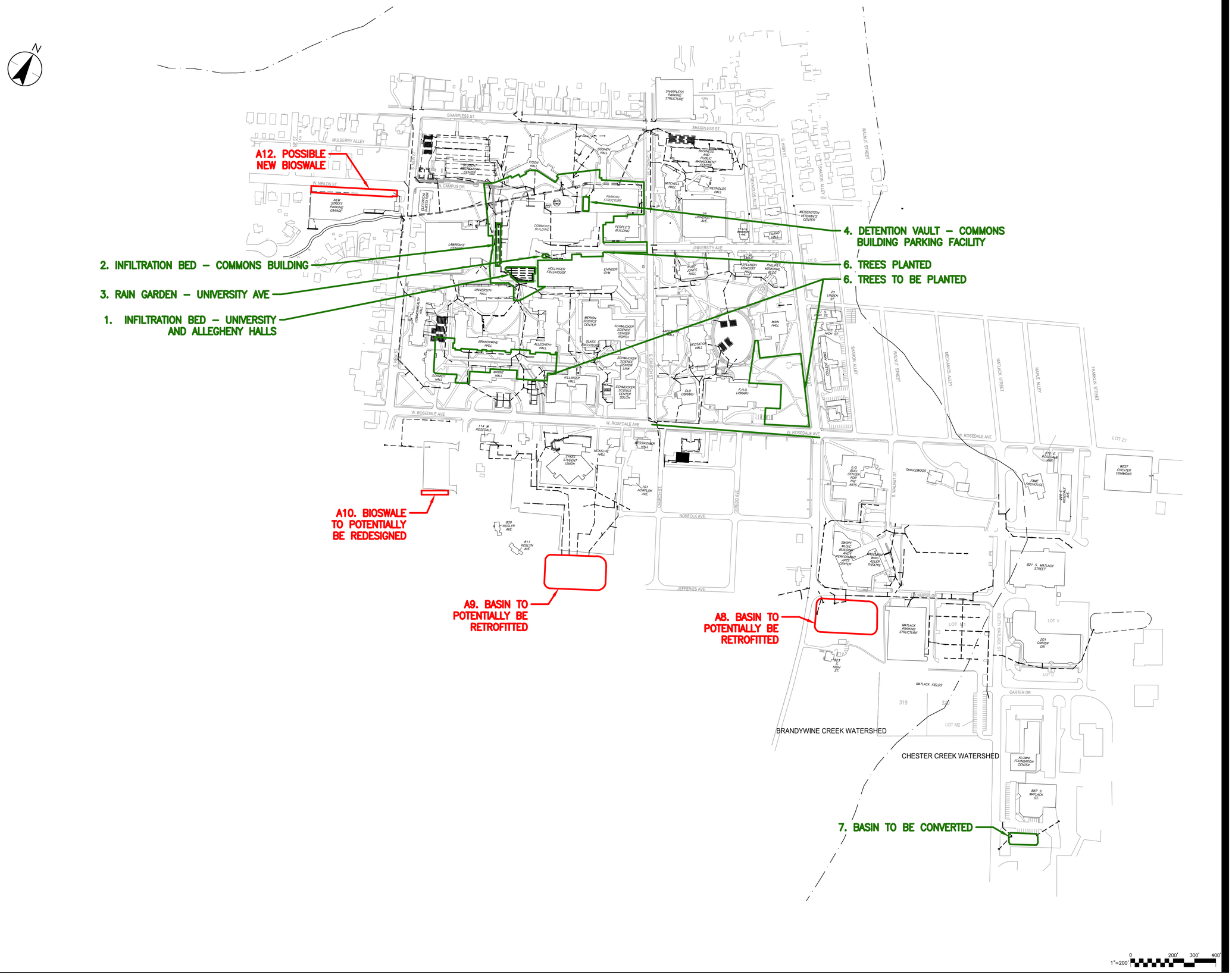
PRP Public Notice was published in: The Daily Local Newspaper

Date PRP public notice was published in newspaper: X/X/24

Date PRP was made available for public review/comment: 2/1/24

End date for written receipt of public comments (30 days from the date of public notice): 3/4/24

Appendix C Sewershed Map



Stantec

Stantec Consulting Services Inc.
1060 Andrew Drive Suite 140
West Chester PA 19380-5602
Tel: (610) 840-2500
www.stantec.com

LEGEND

- STORM INLET
- STORM MANHOLE
- STORM PIPE
- CLEANOUT
- ENDWALL
- STORMWATER BASIN BOUNDARY
- WATERSHED BOUNDARY
- PRP BMP PROJECT BOUNDARY
- PRP ALTERNATE BMP PROJECT BOUNDARY

Revision	By	Appd	YYYY.MM.DD
File Name: 218011974 - NORTH CAMPUS	RB	RB	GI	2023.08.11
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

PRELIMINARY NOT FOR CONSTRUCTION

Not for permits, pricing or other official purposes. This document has not been completed or checked and is for general information or comment only.

Client/Project
WEST CHESTER UNIVERSITY

INLET MAP

WEST CHESTER, PA

Title
NORTH CAMPUS

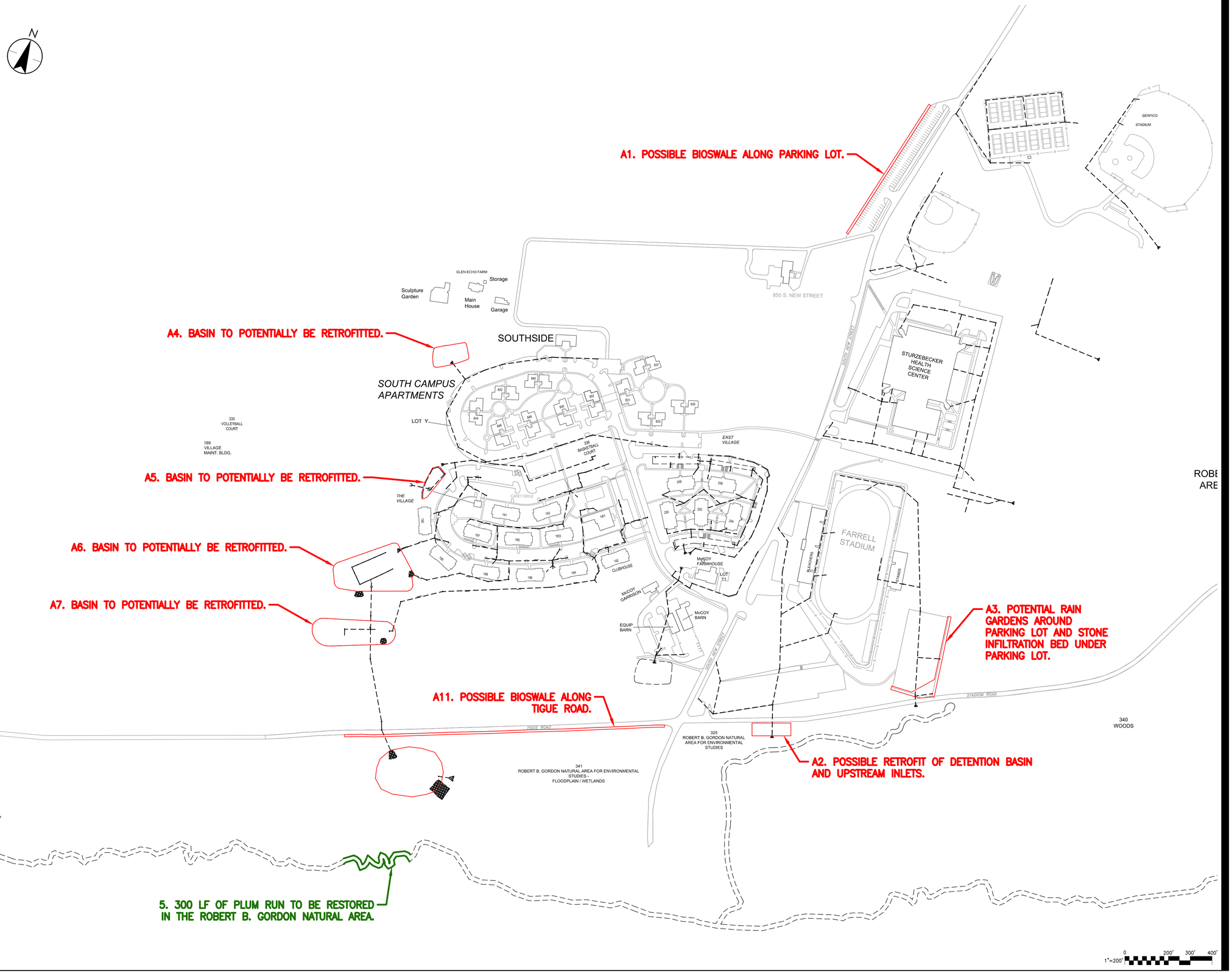
Project No.
218011974

Scale
1" = 200'

Revision
0

Sheet
1 of 1

Drawing No.
NC



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LEGEND

STORM INLET	
STORM MANHOLE	
STORM PIPE	
CLEANOUT	
ENDWALL	
STREAM	
STORMWATER BASIN BOUNDARY	
PRP BMP PROJECT BOUNDARY	
PRP ALTERNATE BMP PROJECT BOUNDARY	

Revision	By	Appd	YYYY.MM.DD
File Name: 218011974 - SOUTH CAMPUS	RB	RB	GI	2023.08.11
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit/Seal

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Client/Project
WEST CHESTER UNIVERSITY

INLET MAP

WEST CHESTER, PA

Title
SOUTH CAMPUS

Project No.
218011974

Scale
1" = 200'

Revision
0

Sheet
1 of 1

Drawing No.
SC

ORIGINAL SHEET - ARCH D

Appendix D Existing Loading

Title:	Loading Calculations	Revised By:	
Project #:	218011974	Date:	
Prepared By:	TJN	Checked By:	GKK
Date:	10/17/2023	Date:	10/20/2023

BRANDYWINE CREEK WATERSHED AREA

Campus area within Brandywine Creek Watershed	17,029,782	sq. ft
Impervious Developed, Area	3,222,003	sq. ft
Pervious Developed, Area	13,807,867	sq. ft
Non Developed Area	-	sq. ft

Brandywine Creek PRP Sediment Loading Calculations

Land Cover	Area		TN		TP		TSS	
	(sf)	(ac)	#/ac/yr	lb/yr	#/ac/yr	lb/yr	#/ac/yr	lb/yr
Undeveloped Area	-	-		-		-		-
Impervious Developed	3,222,003	73.97	21.15	1,564.40	1.46	107.99	1504.78	111,304.06
Pervious Developed	13,807,867	316.99	14.09	4,466.32	0.36	114.11	185.12	58,680.26
Total	**17,029,869**	**390.95**		**6,030.72**		**222.11**		**169,984.33**

Required 10% Reduction due to Siltation: 16,998.4 lb/year TSS

BMP to Reduce Siltation

BMP Name	BMP Effectiveness			BMP Area	Pollutant Removal
	TN	TP	Sediment		
(1) Infiltration Bed - University and Allegheny Halls	85%	85%	95%		1281.76 lb/yr
(2) Infiltration Bed - Commons Building	85%	85%	95%		933.04 lb/yr
(3) Rain Garden - University Ave	80%	85%	90%		552.60 lb/yr
(4) Detention Vault - Commons Building Parking Facility	5%	10%	10%		104.93 lb/yr
(5) Stream Restoration	0.075 lb/ft/yr	0.068 lb/ft/yr	44.88 lb/ft/yr	300 lf	13,464.00 lb/yr
(6) Tree Planting	10%	15%	20%	256 Trees	770.45 lb/yr
Total TSS Reduction					**17,107**

Title:	Loading Calculations	Revised By:	
Project #:	218011974	Date:	
Prepared By:	TJN	Checked By:	GKK
Date:	10/17/2023	Date:	10/20/2023

CHESTER CREEK WATERSHED AREA

Campus area within Chester Creek Watershed	598,514	sq. ft
Impervious Developed, Area	371,131	sq. ft
Pervious Developed, Area	227,383	sq. ft
Non Developed Area	-	sq. ft

Chester Creek PRP Sediment Loading Calculations

Land Cover	Area		TN		TP		TSS	
	(sf)	(ac)	#/ac/yr	lb/yr	#/ac/yr	lb/yr	#/ac/yr	lb/yr
Undeveloped Area	-	-		-		-		-
Impervious Developed	371,131	8.52	21.15	180.20	1.46	12.44	1504.78	12,820.73
Pervious Developed	227,383	5.22	14.09	73.55	0.36	1.88	185.12	966.33
Total	**598,514**	**13.74**		**253.75**		**14.32**		**13,787.05**

Required 10% Reduction due to Siltation: 1,378.71 lb/year TSS

BMP to Reduce Siltation

BMP Name	BMP Effectiveness			BMP Area	Pollutant Removal
	TN	TP	Sediment		
(7) Rain Gardens / Bioretention	85%	85%	95%	1.407 imp. ac.	2,011 lb/yr
Total TSS Reduction					**2,011**

Installed PRP BMP Removal Calculations

BMP #	BMP	BMP Name / Description	DA (sf)	Latitude	Longitude	Receiving Waters	Date Installed or Implemented	Within MS4 Drainage Area	Zoning District	Impervious Area Controlled (SF)	TSS Removal Efficiency (%)	Sediment Removed (#/Yr)
	Green Roof	Commons Building Green Roof	< 1 acre	39° 57' 08.8"	-75° 36' 05.2"	Brandywine Creek	2019	Yes	N/A			
1	Infiltration Bed	University and Allegheny Halls	< 1 acre	39° 57' 05.5"	-75° 36' 06.4"	Brandywine Creek	2019	Yes	N/A	39,057	95%	1,281.76
2	Infiltration Bed	Commons Building	< 1 acre	39° 57' 09.9"	-75° 36' 05.4"	Brandywine Creek	2019	Yes	N/A	26,850	95%	933.04
3	Rain Garden	University Ave	< 1 acre	39° 57' 06.9"	-75° 36' 05.5"	Brandywine Creek	2019	Yes	N/A	17,774	90%	552.60
4	Detention Vault	Commons Building Parking Facility	< 1 acre	39° 57' 05.9"	-75° 36' 08.2"	Brandywine Creek	2019	Yes	N/A	30,375	10%	104.93
	Permeable Pavers		< 1 acre	39° 57' 07.0"	-75° 36' 06.0"	Brandywine Creek	2019	Yes	N/A			
										Total		**2,872.33**

Proposed Alternative BMP Removal Calculations

BMP #	BMP	BMP Name / Description	DA (sf)	Latitude	Longitude	Receiving Waters	Date Installed or Implemented	Within MS4 Drainage Area	Zoning District	Impervious Area Controlled (SF)	TSS Removal Efficiency (%)	Sediment Removed (#/Yr)
A1	Bioswale	WCU Parking Lot S	<1 acre			Brandywine Creek		Yes	N/A	32,000	90%	2,076.18
A2	Detention Basin	WCU Parking Lot Q	10 acres			Brandywine Creek		Yes	N/A	291,790	95%	10,717.25
A3	Bioretention	South Parking Lot	7 acres			Brandywine Creek		Yes	N/A	61,420	95%	3,157.01
A4	Basin	North side of WCU South Campus Apartments	11 acres			Brandywine Creek		Yes	N/A	219,670	60%	5,273.96
A5	Basin w/ Underdrain	WCU South Campus Apartments Basketball Court	1 acre			Brandywine Creek		Yes	N/A	38,025	70%	1,760.50
A6	Basin w/ Underdrain	South side of WCU South Campus Apartments	10 acres			Brandywine Creek		Yes	N/A	192,340	70%	5,492.07
A7	Basin w/ Underdrain	WCU South Campus Apartments Buildings 181-182	5 acres			Brandywine Creek		Yes	N/A	41,900	70%	1,854.20
A8	Basin	Swope Detention Basin Conversion	9 acres			Brandywine Creek		Yes	N/A	210,410	60%	5,082.02
A9	Basin	WCU Student Union Parking Basin	7 acres			Brandywine Creek		Yes	N/A	171,680	60%	4,279.27
A10	Bioswale	WCU Parking Lot L	< 1 acre			Brandywine Creek		Yes	N/A	28,500	90%	1,967.37
A11	Bioswale	Tigue Road / Plum Run Trail	1 acre			Brandywine Creek		Yes	N/A	29,380	90%	1,994.72
A12	Bioswale	New Street Parking Garage	1 acre			Brandywine Creek		Yes	N/A	38,170	90%	2,268.01
Total												**45,922.56**

Appendix E BMP Effectiveness Value

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%.