East Berlin Borough

ADAMS COUNTY, PA

STORMWATER MANAGEMENT DESIGN ASSISTANCE MANUAL

For Minor Land Development Activities

Simplified Design Approach
(Prepared July, 2012)

Simplified Design Approach adapted from Appendix C of the Adams County Stormwater Management Plan, November, 2011.

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Introduction

This design manual has been created as a tool to help property owners manage stormwater on their property and streamline the process of designing on-site stormwater management facilities for new, relatively minor residential and accessory structure projects. Through the use of this manual, residents have the ability to determine the appropriate facilities for their property, project and budget. This design method is not intended to be used with large-scale subdivision/ land development or activities that include infrastructure such as roadways.

Importance of Stormwater Management

Stormwater is the runoff produced by precipitation, snow melt, or ice melt. When land is developed or changed, the flow patterns of water and quality of water are also changed. Land development activities can affect characteristics of stormwater runoff, including the rate of runoff, volume of runoff, and quality of runoff. When runoff is not managed, the increased volume may aggravate flooding.

The objective of stormwater management is to prevent or mitigate the adverse impacts of the increase in rate and volume of stormwater runoff, while also protecting health, safety, and property. Stormwater Best Management Practices aim to maintain water quality, encourage infiltration in appropriate areas, promote groundwater recharge, maintain the natural drainage characteristics of the site to the maximum extent practicable, and protect stream banks and beds.

Standard Terms Used in the Manual

Best Management Practice (BMP) - Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance.

Disconnected Impervious Area (DIA) - An impervious or impermeable surface that is disconnected from any stormwater drainage or conveyance system and is redirected or directed to a pervious area, which allows for infiltration, filtration, and increased time of concentration.

Disturbed Area - An unstabilized land area where an earth disturbance activity is occurring or has occurred.

Flow Path – The path that stormwater flows from the discharge point to the nearest property line or channelized flow (ie stream, drainage ditch, etc.). The length of the path is measured along the ground slope.

Impervious Surface (Impervious Area) - A surface that prevents the infiltration of water into the ground. Impervious surfaces and areas include but are not limited to roofs, additional indoor living spaces, patios and decks, garages, storage sheds and similar structures, streets, driveways, access drives, parking areas, and sidewalks. Any areas designed to be covered by loose surfacing materials such as gravel, stone and/or crushed stone, and intended for storage of and/or travel by vehicles, or pedestrians shall be considered impervious. Surfaces or areas designed, constructed and maintained to permit infiltration may be considered pervious.

Karst - A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

Minor Stormwater Site Plan – A site plan prepared and submitted to the municipality for proposed projects which may qualify to use the Simplified Approach. The plan depicts existing conditions on the property, proposed impervious areas, and, if required, the location of proposed BMPs.

Regulated Activit(ies)y - Any earth disturbing activity or any activity that involves the alteration or development of land in a manner that may affect stormwater runoff.

Runoff - Any part of precipitation that flows over the land.

Sketch Plan – An informal plan, not necessarily to exact scale, indicating existing features of a tract, its surroundings, and the general layout of a proposed stormwater plan.

Determining What Type of Stormwater Management Plan is Required

The chart on the following page provides a guide to determine what type of stormwater plan is needed. Some projects will be exempt from preparing a stormwater management plan, but documentation of the project must still be filed with the municipality. Completion of the **Municipal Stormwater Management Worksheets** will determine what type of documentation is required for each project.

SMP Plan Requirement	Impervious Area	Disturbed Area	Steps*
Exempt	Up to 1,000 ft² - must be proven to not directly impact neighboring properties	Less than 1 acre	Submit Worksheet A and Sketch Plan.
May be Exempt - Complete a Minor Stormwater Site Plan	1,000 to ≤ 10,000 ft², If shown to be 100% disconnected from impervious areas	Less than 1 acre	Submit Worksheet A & B and Minor Stormwater Site Plan.
Not Exempt - Complete a Minor Stormwater Site Plan with BMP's	1,000 ft² to ≤ 5,000 ft² IF connected to impervious areas	Less than 1 acre	Submit Worksheet A & B, Minor Stormwater Site Plan showing BMP facilities and O& M Agreement.
Formal Stormwater Management Plan	Greater than 5,000 ft² IF connected to impervious areas	Greater than 1 acre	Consult a Qualified Professional

* A General Borough Stormwater Management Application and associated fee is required to be submitted with all applications.

Using Municipal Stormwater Management Worksheets

Determining the impervious area of a proposed project is the first step in using this Manual. Municipal Stormwater Management Worksheets have been included in the Simplified Approach, which will assist the property owner, or applicant, and municipality determine the impervious area of a proposed project and provide guidance through the next steps.

Step 1 - If the proposed new impervious surface area is up to 1,000 square feet, the project may be exempt from the requirements in this guide. The diversion or relocation of piping or of any natural or manmade stream channel is not considered exempt. The applicant must complete and submit Worksheet A and a Sketch Plan and file it with the Borough for review. If the project is considered exempt the application is complete. *If the project is not exempt, go to Step 2.*

Step 2 – If the proposed impervious area is between 1,000 square feet and 10,000 square feet or not deemed exempt in Step 1, the applicant must complete and submit Worksheet A and B and a Minor Stormwater Site Plan to be able to compute items requested in Worksheet B. Worksheets A and B and Minor Stormwater Site Plan shall be filed with the Borough for review. If DIA requirements (100% disconnection) can be met, projects of this size may be exempt from the requirement to install BMP's. *Go to Step 3 if the project is not deemed exempt from providing SWM facilities in this step.*

Step 3- If not deemed to be exempt in Step 2 then preparation and submission of a Minor Stormwater Management (SWM) Site Plan showing the proposed location and size of BMP's on the property is required. These BMP's shall be sized in accordance with the chart in Worksheet B as outlined in Part 2 of the Design Assistance Manual. The Minor Site Plan, Worksheets A and B and an executed and Recorded BMP Facilities Operations and Maintenance Agreement should be filed with the Municipality for review.

All requests for exemptions will be reviewed / determined by Borough Staff. A Stormwater Management/ BMP Facilities & Maintenance Agreement will be required for any project which requires installation of stormwater management facilities (BMP's).

Plan Requirements

Sketch Plan Requirements (to be filed with Worksheet A - < 1000 SF impervious area)

1. Property address and name of applicant
2. Date
3. Property boundary.
4. North Arrow.
5. Location of all existing and proposed structures (house, shed, addition, etc.) and any proposed downspouts with approximate distance to property lines or other permanent fixtures. Include the dimensions of all proposed structures.
6. Site conditions (grassed areas, agricultural fields, direction of slope and stormwater flow on the property).
7. All existing and proposed driveways and impervious areas (stone and gravel driveways are considered impervious).
8. Any other pertinent information that may be significant to the project site (existing drainage ways, steep slopes, etc.).
9. Utility lines, water service, sewer service, wells and on-site septic systems.

Minor Stormwater Site Plan Requirements

A minor stormwater site plan depicts the existing conditions of a property and the location of proposed impervious surfaces. Depicting the relationship between the proposed activities and distances to things like property lines, streams, and vegetated areas will help determine if the stormwater runoff created by the proposed project can be managed naturally within the property or if additional best management practices (BMPs) are needed to accommodate the stormwater runoff.

If a project qualifies for use of a minor stormwater site plan, the applicant must prepare and submit to the Municipality a minor stormwater site plan and the Municipal

Stormwater Management Worksheets. The Adams County GIS Office may also provide assistance to applicants to obtain property maps of existing features. A minor stormwater site plan depicting the key features of the site must be drawn, or depicted, to scale to show the following: (may be submitted in conjunction with site grading plan so as to not duplicate effort)

1. Property address and name of applicant
2. Date
3. Property boundary and building setbacks.
4. North Arrow and plan scale.
5. Aerial map of property.
6. Topography. Contours at 2 foot intervals.
7. Location of all existing and proposed structures (house, shed, addition, etc.) and any proposed downspouts. Include the dimensions of proposed structures.
8. Site conditions (grassed areas, agricultural fields, direction of slope and stormwater flow on the property).
9. Downslope distance from proposed downspouts to property line.
10. All existing and proposed driveways and impervious areas (stone and gravel driveways are considered impervious).
11. Natural features such as streams, wetlands, tree lines and other vegetation on the property and within 50 feet of the property line for lots smaller than 5 acres.
12. Distance from proposed structures or downspouts along the stormwater flow path to any stream or wooded area.
13. Any other pertinent information that may be significant to the project site (existing drainage ways, steep slopes, etc.).
14. Utility lines, water service, sewer service, wells and on-site septic systems.
15. Soil boundaries and types.

If BMPs are required, the following information must also be shown on the plan:

16. Location, size and depth of proposed stormwater BMPs.
17. Proposed materials to be used in construction of the BMP's.

Other Considerations for Minor Plans:

- While soil testing is not mandatory for the simplified approach, soil testing is highly recommended to select and apply the appropriate stormwater BMPs. The use of soil maps, infiltration tests, and/ or perc tests may provide the applicant basic information about soil characteristics.

- Proposed stormwater management facilities must be designed to handle flows from the contributing area.

- The site shall not have any pre-existing stormwater drainage-related problems (as verified by the municipality), at the discretion of the Municipality.

- Water quality shall be protected per Chapter 93 of PA Code.
- The municipality may inspect all BMPs during and after construction/ installation.
- Infiltration BMPs should not be constructed nor receive runoff until the entire contributory drainage area has achieved final stabilization.
- Ensure that infiltration in geologically susceptible areas such as, but not limited to, carbonate geology/ karst topography do not cause adverse effects. The minor stormwater site plan should incorporate steps to ensure that salt or chloride will not contaminate the groundwater.
- Selected BMPs shall be designed, constructed, and maintained in accordance with the manufacturer's recommendation, the BMP Manual, or other written guidance acceptable to the municipality.
- Proposed sump pumps shall discharge to infiltration or vegetative BMPs to the maximum extent practicable.

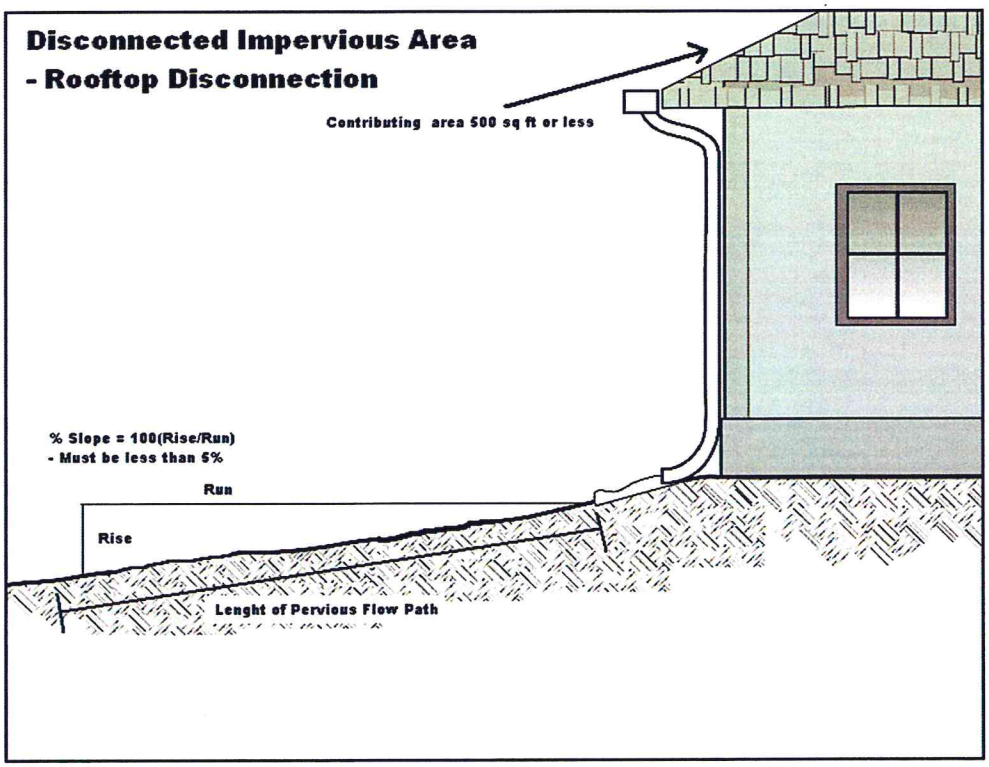
DISCONNECTED IMPERVIOUS AREA (DIA)

When impervious surface areas such as rooftops and paved areas are directed to a pervious area such as lawn or grassed areas that allow for infiltration, filtration, and increased time of concentration, the impervious surface areas may qualify to be treated as Disconnected Impervious Area (DIAs).

Impervious Area is defined as: A surface that prevents the infiltration of water into the ground. Impervious surfaces and areas shall include roofs, home additions, patios and decks, garages, storage sheds and similar structures, driveways, access drives, parking areas, walkways and sidewalks. Any areas designed to be covered by loose surfacing materials such as gravel, stone and/or crushed stone, and intended for storage of and/or travel by vehicles, or pedestrians shall be considered impervious. Surfaces or areas designed, constructed and maintained to permit infiltration may be considered pervious.

Rooftop Disconnection A rooftop is considered to be completely disconnected if it meets the requirements listed below:

- The contributing area of rooftop to each disconnected discharge (downspout) is 500 square feet or less.
- The overland flow path from roof runoff discharge point has a positive slope of five percent (5%) or less.
- The length of the overland flow path is greater than 75 feet.
- Soils along the overland flow path are not classified as hydrologic group "D" i.e. infiltration is at least 1 inch per 24-hour day.
- The minimum required receiving pervious area shall not include another person's property unless written permission has been obtained from the affected property owner.



Note: Downspout not required.

Determining Status of DIA

Step 1: Determine contributing area of the roof to each disconnected discharge (downspout). If it's 500 ft^2 or less, continue to step 2. If it's greater than 500 ft^2, the area does not qualify as DIA.

Step 2: Determine the length of down slope pervious flow path available for each disconnected discharge.

Step 3: Determine the % slope of the pervious flow path, % slope = (rise/ run) x 100. Must be 5% or less.

Step 4: See the table on the next page to determine the percentage of the area that can be treated as disconnected. If the available length of the flow path is equal to or greater than 75 ft, the discharge qualifies as entirely disconnected.

Partial Rooftop Disconnection		
Length of Pervious Flow Path* (ft) Lots 10,000 ft² and Under	Length of Pervious Flow Path* (ft)	Roof Area Treated as Disconnected
0 – 7.9	0 – 14	0%
8 – 15.9	15 – 29	20%
16 – 22.9	30 – 44	40%
23 – 29.9	45 – 59	60%
30 – 34.9	60 – 74	80%
35 or more	75 or more	100%
*Pervious flow path must be at least 15 feet from any impervious surface and cannot include impervious surfaces.		

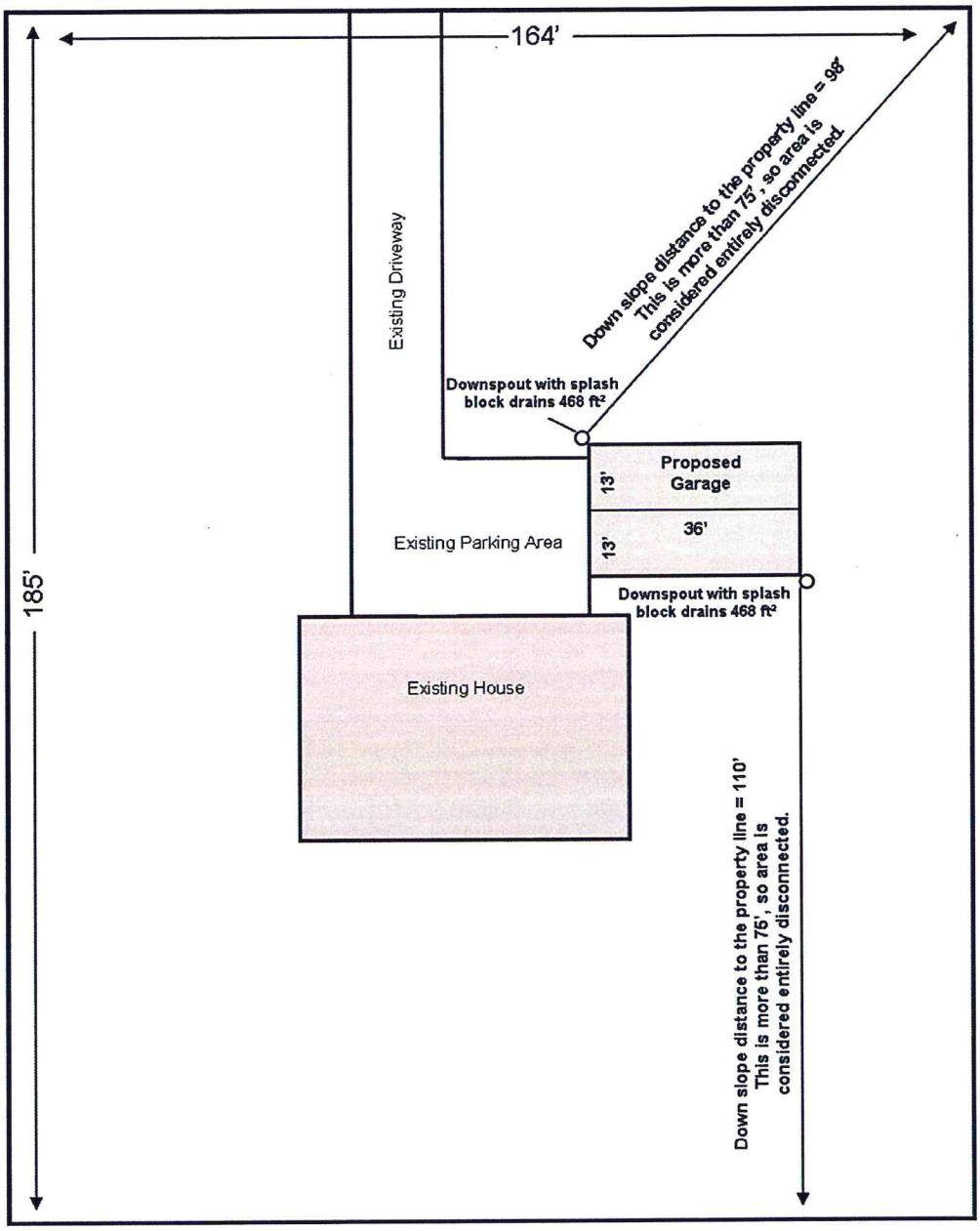
Paved Disconnection - When runoff from paved surfaces is directed to a pervious area that allows for infiltration, filtration, and increased time of concentration, the contributing pavement area may qualify as disconnected. This applies generally to only small or narrow pavement structures such as driveways and walkways. Paved surfaces can be considered disconnected if they, or the adjacent areas, meet the following requirements:

- The contributing flow path over the impervious area is not more than 75 feet
- The length of overland flow is greater than or equal to the maximum length of flow over the impervious area
- The slope of the contributing impervious area is five percent (5%) or less
- The slope of the overland flow path is five percent (5%) or less
- If discharge is concentrated at one or more discrete points, no more than 500 ft² may discharge to any one point. In addition, a gravel strip or other spreading device is required for concentrated discharges. For non-concentrated discharges along the entire edge of paved surface, a level spreader is not required; however, there must be provisions for the establishment of vegetation along the paved edge and temporary stabilization of the area until the vegetation is established.

REFERENCE: Philadelphia Water Department. 2006 & 2011. Stormwater Management Guidance Manual. Section 4: Integrated Site Design. Philadelphia, PA.

The following example determines the status of DIA for a proposed 936 ft² garage.

This example meets the criteria to use the Simplified Approach.



Step 1: Determine the area to each disconnected discharge. The area draining to each downspout is 468 ft^2. This is less than 500 ft^2, proceed to step 2.

Step 2: The discharge on the north side of the garage has a 98 ft pervious flow path available. The south discharge has 110 ft pervious flow path available.

Step 3: The rise of the north discharge is 2 ft and the run is 75 ft for a slope of 2.6%. This is 5% or less so it qualifies. For the south discharge the rise is 4 ft and the run is 100 ft equaling a slope of 4%. This is 5% or less, so it qualifies.

Step 4: Both of these discharges have pervious flow paths greater than 75 ft, so they qualify as entirely disconnected.

Selecting BMPs

If BMPs are required, the Owner/ Designer should review the compiled information in the enclosed "Guide to Choosing Stormwater BMPs", as taken from the *PA Handbook of Best Management Practices for Developing Areas* and the *PA Stormwater Management BMP Manual*. These documents identify stormwater BMPs that have been deemed to be of a nature and cost that will accomplish the goals of the Adams County Stormwater Management Plan, while not unduly burdening the residents. It will then be the Owner's responsibility to select a facility, determine the appropriate size and agree to construct and maintain that facility or facilities. The property owner is encouraged to utilize both multiple and hybrid versions of the facilities, as outlined in the documents mentioned above.

Stormwater

Management Worksheets

East Berlin Borough
Simplified Design Approach
Worksheet A

Property Owner's Name _____
Applicant Name _____

Applicant /Owner Address _____
and phone number _____
_____

Address of Property _____

Tax Map Parcel ID # _____
Parcel Size (approx) _____

A Sketch Plan must be included and the proposed new impervious area stated below:

New impervious area proposed _____

Are there any known existing drainage problems or the potential for the proposed project to create drainage problems? (if yes, please explain)

Acknowledgement - "I verify that the statements made in this application/work sheet for storm water management are true and correct. I understand that false statements herein are made subject to the penalties of 18 Pa. C.S. Section 4904 relating to unsworn falsification to authorities."

Applicant Signature _____ Date _____

To be completed by authorized municipal official

Type of Stormwater Management Required:

- Exempt from stormwater management plan preparation _____
  (Worksheet A and Sketch Plan)
- Minor stormwater management site plan preparation _____
  (Complete Worksheet B to determine necessary BMP's)
- Formal stormwater management plan preparation _____
  (Consult a professional)

Determined by: _____ Date: _____

East Berlin Borough
Simplified Design Approach
Worksheet B

Step 1: Determine the amount of impervious area created by the proposed projects. This includes any new surface area that inhibits the infiltration of stormwater into the ground. New stone and gravel areas area considered impervious. Existing impervious areas are not included in this calculation.

Table # 1

Surface	**Length**	**x**	**Width =**	**Total Impervious Area (SF)**
Buildings				
Buildings				
Driveways				
Parking Areas				
Patios/Walkways				
Decks				
Other				
			Total Proposed Impervious Area =	

Step 2: Determine the Disconnect Impervious Area (DIA). All or parts of proposed impervious surfaces may qualify as Disconnected Impervious Area if runoff is directed to a pervious area that allows for infiltration, filtration and increased time of concentration. The volume of stormwater that needs to be managed could be reduced through DIA. Prepare a Minor Stormwater Management Site Plan to determine DIA.

Determining Status of DIA

a) Determine contributing area of the roof/driveway to each disconnected discharge. If it's 500 ft^2 or less (for a roof) or 1,000 ft^2 or less (for a driveway), continue to "b". If it's greater than these amounts, the area does not qualify as a DIA.

b) Determine the length of down slope pervious flow path available for each disconnected discharge.

c) Determine the % slope of the pervious flow path, % slope = (rise/ run) x 100. Must be 5% or less.

d) See the table on the next page to determine the percentage of the area that can be treated as disconnected. If the available length of the flow path is equal to or greater than 75 ft, the discharge qualifies as entirely disconnected.

Partial Disconnections		
Length of Pervious Flow Path* (ft) Lots 10,000 ft² and Under	Length of Pervious Flow Path* (ft) Lots >10,000 ft²	DIA Credit Factor
0 – 7.9	0 – 14	1.0
8 – 15.9	15 – 29	0.8
16 – 22.9	30 – 44	0.6
23 – 29.9	45 – 59	0.4
30 – 34.9	60 – 74	0.2
35 or more	75 or more	0
*Pervious flow path must be at least 15 feet from any impervious surface and cannot include impervious surfaces.		

Using step 2 calculations calculated from the minor stormwater site plan, complete the table below. This will determine the impervious area that may be excluded from the area that needs to be managed through stormwater management BMP's. If total impervious area to be managed is zero, the area can be considered entirely disconnected and further calculations are not needed.

Table # 2

Surface	Area (SF)	x	DIA Credit =	Impervious Area to be Managed (SF)
Buildings				
Buildings				
Buildings				
Buildings				
Buildings				
Driveways				
Driveways				
Parking Areas				

***If total impervious surface area to be managed is greater than zero, continue to Step 3.**

Step 3: Calculate the volume of stormwater runoff created by proposed impervious surfaces.

Impervious Area (SF) to be Managed (Sum from Table 2)	x	2.8in/12in = 0.233 (from 24hr rainfall)	=	Volume of Stormwater to be Managed (CF)
	x	0.233	=	

Step 4: Select BMP's and size according to the volume of stormwater that needs to be managed in Step 3.

Table # 3 - BMP Sizing Table*

BMP Type	Necessary Volume** (from Step 3 above)	Length	Width	Depth	Void Ratio	Volume ***
Infiltration Bed or Trench					0.4	
Infiltration Berm					1	
Rain Garden					0.4 in stone 1.0 above ground	
Rain Barrel or other usable storage		Use known volume of rain barrel, etc. 1 cubic foot is equal to 7.48 gallons.			1	
Other						

* Chart should only be used when a formal SWM Site Plan is not required.
** Should not include areas that were proven to be 100% disconnected

Sample Sketch Plan