

# **Fountain Hill Stormwater Authority**

## **Stormwater Management Program**

### **Credit Policies and Procedures Manual**

#### **Introduction.**

The Fountain Hill Stormwater Authority has enacted Resolution No. 19-2 (the "Resolution") which establishes an annual Stormwater Utility Fee (the "fee") to provide a dedicated funding source to support the Authority's Stormwater Management Program for the operation, maintenance, repair, and replacement of the Authority's Stormwater Management System. The charging of the fee is also necessary to enable the Authority to comply with its regulatory permit requirements, including the activities necessary to carry out the Borough's Municipal Separate Storm Sewer System (MS4) permit and the stormwater-related provisions of the Subdivision and Land Development Ordinance, the Floodplain Ordinance, and the Stormwater Management Ordinance.

Each developed Property within the Borough is subject to the fee requirements, with the total annual fee amount being directly proportional to the total Impervious Area of the Property less approved credit for applicable stormwater Best Management Practices ("BMPs") approved by the Authority in accordance with this manual.

#### **Objective.**

The Authority has developed this manual to provide guidance for Property Owners on how to potentially obtain a reduction ("credit") to their annual Stormwater Utility Fee by installing specific stormwater BMPs on their Property to offset the associated implementation and maintenance costs. The Authority encourages this credit option as a way to incentivize a Property Owner to implement stormwater BMPs on their Property that will mitigate the stormwater runoff volume, peak discharge, or associated pollution leaving their Property. By implementing such BMPs, Property Owners are helping to reduce the demand and associated operational costs on the Authority's existing Stormwater Management System as well as assist the Borough in obtaining and maintaining regulatory permit compliance.

#### **Definitions.**

As used hereinafter, the following words and terms shall have the following meaning:

"Authority" (or "Stormwater Municipal Authority" – Fountain Hill Stormwater Authority, a municipal authority with offices at Borough Hall, 941 Long Street, Fountain Hill, Pennsylvania 18015.

“Best Management Practices” (“BMPs”) – See, definition of Stormwater Best Management Practices.

“Board of Appeals” - The Fountain Hill Stormwater Authority Board of Appeals created and acting in accordance with the terms hereof.

“Borough” – Borough of Fountain Hill, Lehigh County, Pennsylvania.

“Design Manual” - The 2006 Pennsylvania Stormwater Best Management Practices Manual, as revised from time to time, which serves as the official guide for Stormwater Management principles, methods, and practices in Pennsylvania.

“Developed” – Property where man-made changes have been made which add impervious surfaces to the property, changes may include, but are not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or the storage of equipment or materials.

“Development” - A project that consists of subdividing land or adding buildings and other improvements to individual parcels of land.

“Drainage Area” - That land area contributing runoff to a single point, measured in a horizontal plane.

“Green Infrastructure” – Small-scale Stormwater Management Practices, nonstructural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impact of development on water resources. Methods to design Green Infrastructure practices are specified in the 2006 Pennsylvania Stormwater Best Management Practices Manual (See, definition for Design Manual).

“Impervious Area” – Any surface that prevents or limits the Infiltration of water into the ground. Any structure, building, parking area, driveway, road, street, sidewalk, patio, deck, and any area of concrete, asphalt, pavement, compacted gravel, packed stone, stone, brick, tile, swimming pool, or artificial turf, and highly compacted soil shall be considered "Impervious Area," if Infiltration is limited or prevented. "Impervious Area" also includes any area used by or for motor vehicles or heavy commercial equipment, regardless of surface type or material, including any road, road shoulder, driveway, or parking area, if Infiltration is limited or prevented.

“Infiltration” – The passage or movement of water into the soil surface, at a rate sufficient to mitigate the Stormwater Runoff volume produced by up to a one-inch storm event.

“NPDES” – National Pollutant Discharge Elimination System, the Federal government’s system for issuance of permits under the Clean Water Act, which is delegated to PADEP in Pennsylvania.

“PADEP” – Pennsylvania Department of Environmental Protection.

“Property” – Each and every parcel of real estate located within the Borough.

“Property Manager” – A person, company or other entity hired by a Property Owner to manage a Property.

“Property Owner” – The owner of record for a Property within the Borough, as registered in the Borough or County database.

“Stormwater Best Management Practices”– Activities, facilities, designs, measures, or procedures used to manage stormwater quantity and quality impacts. Examples include infiltration devices, filtering devices, stormwater ponds, stormwater constructed wetlands, hydrodynamic structures, or other measures specifically designed and constructed to control Stormwater Runoff, reduce accelerated stream channel erosion, and reduce pollution of surface waters.

“Stormwater” – See, definition of Stormwater Runoff.

“Stormwater Runoff” – Drainage from the surface of land resulting from precipitation or snow/ice melt.

“Stormwater Management Best Management Practice” – See, definition of Stormwater Best Management Practices.

“Stormwater Management Program” – The activities of the Authority necessary to operate, maintain, enhance, and expand the Stormwater Management System and the activities necessary to carry out the Borough’s Municipal Separate Storm Sewer System (MS4) permit and the stormwater-related provisions of the Subdivision and Land Development Ordinance, the Floodplain Ordinance, and the Stormwater Management Ordinance.

“Stormwater Management System” – The system of stormwater runoff collection, conveyance, and treatment, including storm sewers, pipes, conduits, mains, inlets, culverts, catch basins, gutters, ditches, swales, channels, stormwater ponds (detention, retention, and infiltration), streets, curbs, drains, and all devices, appliances, and stormwater management practices and facilities used for collecting, conducting, pumping, conveying, detaining, retaining, reusing, infiltrating, reducing, managing, and treating stormwater.

“Stormwater Utility Fee” – A fee imposed by the Authority to cover the cost of constructing, operating, and maintaining stormwater management facilities and to fund expenses related to the Borough’s compliance with PADEP NPDES permit requirements under applicable state law based on the impact of stormwater runoff from impervious areas of Developed land in the Borough.

“Undeveloped Land” – Any parcel of land that has not been altered from its natural state and which contains no impervious surfaces, or, if previously Developed, land that has been allowed to return to its natural state with no impervious surfaces or soil compaction which prevents or impedes stormwater infiltration.

### **Credits Available to Property Owners.**

Stormwater Utility Fee credits are available to all properties that implement qualifying BMPs which eliminate Stormwater Runoff from Developed portions of their Property for all storms up to and including a one-inch storm, by providing Infiltration into soils (where soils are appropriate for Infiltration practices) or delayed discharge of clean water to receiving waters after the storm event has ended and receiving waters have returned to baseflow conditions.

Credits will be considered on a case-by-case basis for qualifying BMPs, as listed below in Table 1 and/or as listed in the most current version of the Pennsylvania Stormwater Best Management Practices Manual, subject to review and approval by the Authority.

### **Credit Approval.**

A Stormwater Utility Fee credit to a Property Owner may be issued, as specified in this manual, only if the Property contains a qualifying and approved Stormwater BMP(s) that is properly maintained by the Property Owner in accordance with the requirements established and approved by the Authority, and as agreed upon by the Property Owner.

No Stormwater Utility Fee credit shall be authorized without a written decision of the Authority as to the Stormwater BMP(s) eligibility. If granted, the credit shall be applied to the Property Owner’s Stormwater Utility Fee for the following billing cycle, in accordance with Resolution No. 19-2. Final approval of all Stormwater Utility Fee credits will be at the discretion of the Authority.

### **Eligible Credit Allowance.**

Credit Categories, with associated Maximum Credit percentages, Tier Ratings (level of complexity), and list of qualifying BMPs, are provided below in Table 1 – Stormwater Best Management Practices Information. Credit may be available for all qualifying BMPs which have been implemented, constructed/reconstructed, properly maintained in working condition, and in a manner consistent with the design criteria set forth in the Pennsylvania Stormwater Best Management Practices Manual (PADEP Document No. 363-0300-002, as amended or supplemented), this Resolution, and all applicable Borough Codes and Regulations.

Table 1 – Stormwater Best Management Practices Information

Credit Category	Maximum Credit*	Tier Rating	Stormwater Best Management Practices (BMPs)
Peak Runoff Rate (Flood) Controls	25%	2	Constructed Wetland
		2	Wet Pond / Retention Basin
		2	Dry Extended Detention Basin
		2	Special Detention Areas (parking lots/roof)
Runoff Volume Controls/Green Infrastructure	50%	1	Pervious Pavement with Infiltration Bed
		1	Rain Garden / Bioretention
		1	Runoff Capture & Reuse – Rain Barrel**
		1	Dry Well / Seepage Pit
		2	Green Roof
		2	Infiltration Trench / Tree Infiltration Trench
		2	Infiltration Basin
		2	Subsurface Infiltration Bed
		2	Infiltration Berm & Retentive Grading
		2	Impervious Area Removal with Soil Restoration and Vegetation
		2	Deep Stormwater Injection Well
Water Quality Treatment	25%	2	Constructed Wetland
		2	Constructed Filter
		2	Vegetated Swale
		2	Vegetated Filter Strip
		2	Proprietary Water Quality Filters & Hydrodynamic Devices
		2	Tree Trench with Soil Restoration or Amendment
Non-Structural Controls	15%	1	Tree Canopy Cover
		1	Downspout Disconnection
NPDES Industrial Stormwater Permitted Sites	15%	2	Facilities with an active, fully-compliant NPDES Permit from PADEP
<b>Maximum Credit Applied to Annual Stormwater Utility Fee</b>	<b>50%</b>		

\* Actual credit applied is based on percentage of Impervious Area being treated by each qualifying Best Management Practice (BMP).

\*\* Rain Barrels – Standard size rain barrels range from 45 to 55 gallons. A maximum of four (4) 55-gallon barrels per acre are allowable, with maximum treatment area of 100 square feet per rain barrel, and must fully and automatically drain within five (5) days and have a minimum discharge infiltration area of 20 square feet, or 5:1 minimum loading ratio, on the Property, per rain barrel. A credit of \$2 per standard size rain barrel shall be applied to the total annual Stormwater Utility Fee. Alternative size rain barrels must meet the same standards, with credit adjusted for actual treatment volume, based on a rate of \$2 for treatment of 45 gallons of stormwater runoff.

## **Common Stormwater BMPs and Eligible Stormwater Utility Fee Credit.**

To be eligible for a fee credit, a Property Owner must treat Impervious Area with qualifying BMPs, as listed above in Table 1. The Tier Ratings indicate general complexity and type of information needed by the Authority to review and approve any fee credit. Tier 1 Stormwater BMPs are relatively simple to design, install, and maintain and are commonly used to treat smaller drainage areas (rooftops, driveways, etc.) on smaller properties. Tier 1 Stormwater BMPs may be approved for use by the Authority without detailed formal engineering review. Tier 2 Stormwater BMPs are more complicated and are generally used to treat larger drainage areas and as such require formal engineering review to ensure adequacy.

*Note: All Stormwater BMPs used for Stormwater Utility Fee credit must be properly maintained and be fully functional at all times to maintain eligibility.*

Tier 1 Stormwater BMPs include:

1. Pervious Pavement with Infiltration Bed
2. Rain Garden / Bioretention
3. Runoff Capture & Reuse – Rain Barrel
4. Dry Well / Seepage Pit
5. Tree Canopy Cover
6. Downspout Disconnection

*See Appendix A for additional design information for the Tier 1 Stormwater BMPs listed above and Appendix B for examples of Stormwater Utility Fee credit calculations.*

Tier 2 Stormwater BMPs listed in Table 1 are the most commonly used BMPs for treatment of larger drainage areas and are consistent with those included in the Pennsylvania Stormwater Best Management Practices Manual (PADEP Document No. 363-0300-002, as amended or supplemented). Property Owners who have installed or plan to install Tier 2 Stormwater BMPs will need to provide the Authority with a detailed site analysis and engineering design with their Stormwater Utility Fee Credit Application Form to allow for proper review and approval by the Authority.

*See Credit Applications section, below, for additional information about the required supplemental information for use of Tier 1 and 2 Stormwater BMPs.*

## **Maximum Credit.**

The maximum Stormwater Utility Fee credit for any individual Property is fifty percent (50%) of the calculated Stormwater Utility Fee determined for the entire Property, in accordance with Section 303 of the Resolution regardless of additional credit that may be calculated for additional BMPs on the same Property. The total credit approved shall be rounded to the nearest whole percent.

The credit must be limited due to the need of the Borough to fund the overall Stormwater Management Program, construct public facilities, as well as maintain, repair and/or rehabilitate publicly owned Stormwater BMPs. Even if a Property Owner manages the entirety of his/her/its Stormwater Runoff on their Property, the Borough still has obligations under the MS4 permit to maintain its entire Stormwater Management System to protect the health and safety of the public.

### **Credit Applications.**

For approval (includes new, renewal, and/or change of ownership) of a Stormwater Utility Fee credit by the Authority, the Property Owner must submit a completed Stormwater Utility Fee Credit Application Form (see Appendix C) including any required supplemental materials based on Tier Ratings for Stormwater BMPs.

New credit applications may be submitted to the Authority at any time via the Stormwater Utility Fee Credit Application. Upon receipt of a Stormwater Utility Fee Credit Application, an initial determination of the application's completeness will be made within fifteen (15) days of receipt by a representative of the Authority and/or the Borough Engineer. If the application is deemed incomplete, the application will be returned to the applicant who will be given up to thirty (30) days from the date of written notice to provide missing information necessary to complete the application. Once an application is deemed complete, the Authority will have thirty (30) days to approve or deny the application. However, if, within such thirty (30) day period, the application or documentation is found to be technically deficient by the Authority's engineer, the applicant will be notified in writing and given sixty (60) days to correct such deficiency. Should the deficiency not be corrected within the sixty (60) day period, the application will be deemed abandoned, and the applicant will be required to file a new application and shall be responsible for any applicable fees with such new applications, including applicable review fees. If the applicant corrects such deficiencies within the sixty (60) day period, the Authority shall have thirty (30) days from the date the Authority deems such deficiencies corrected in writing to approve or deny such credit application. Any credit application approved by the Authority will take effect the following billing cycle. Applications approved prior to December 31 will have credit applied during the subsequent year's billing cycle.

The application process does not relieve the Property Owner of payment of any applicable Stormwater Utility Fees during the review process. The written approval of the credit by the Authority shall state the conditions of the issuance of the Stormwater Utility Fee credit and effective date of the credit.

### **Credit Expiration and Renewals.**

Stormwater Utility Fee credits expire annually but may be automatically renewed upon a timely submission of the completed Annual Self-Inspection Report Form (see Appendix E) by the Property Owner, indicating that the Stormwater BMP(s) has/have been properly maintained and

is/are fully functional. All Stormwater BMPs are subject to random inspections by the Authority after prior notification to the Property Owners. To renew the credit, the Property Owner must satisfy the requirements of the section having to do with Inspections more fully explained below. All renewed credits shall become effective January 1 of the year following the date of the renewal application.

To renew the credit, renewal credit applications and change in ownership credit applications need only include supplemental documentation if there have been any changes to the Stormwater BMP(s) on the Property. If previously approved Stormwater BMPs have not been altered, any complete Renewal and Change in Ownership credit applications shall be processed by the Authority within fifteen (15) days of receipt. If previously approved Stormwater BMPs are altered in the previous calendar year, such applications will be processed by the Authority in accordance with the process and timeframes specified for new credit applications as more fully explained in the previous paragraph.

Supplemental information to be provided for new or changed Tier 1 and 2 Stormwater BMPs, include:

1. Tier 1 Stormwater BMPs – Requires submission of a completed Stormwater Utility Fee Credit Application Form and a legible sketch plan on 8 ½” x 11” paper which includes, at a minimum, the following information:
  - Total lot area in square feet;
  - Location and area of all existing Impervious Areas (e.g., surface areas of buildings, patios, paved driveways, etc. where stormwater cannot normally infiltrate into the soil);
  - Location and description of the existing, qualifying and functioning Tier 1 Stormwater BMP(s);
  - Impervious Area in square feet being treated by each Tier 1 Stormwater BMP (see Appendix A for additional information on how treatment areas are determined and calculated for each respective BMP and how credit is applied for each);
  - Calculation to verify the Stormwater BMP(s) has capacity to meet the design criteria, if applicable;
  - Time-stamped photograph(s) of existing, qualifying and functioning Tier 1 Stormwater BMP(s), if applicable;
  - Proposed Operation and Maintenance (“O&M”) Schedule detailing the Property Owner's proposed maintenance activities for the Tier 1 Stormwater BMP(s); and
  - Executed Right-of-Entry and Indemnification Agreements (see Appendix D)
2. Tier 2 Stormwater BMPs – Requires submission of a Stormwater Utility Fee Credit Application Form, application review fee, and the following minimum information:
  - Construction or As-Built Plans, at an appropriate scale, showing the site, overland flow paths, drainage flow arrows, stormwater facilities, and the surrounding area;

- Maps delineating drainage areas and/or watersheds, indicating which Impervious Areas flow to the Tier 2 Stormwater BMP(s);
- Time-stamped photograph(s) of existing Tier 2 Stormwater BMP(s);
- Calculations to verify that the Stormwater BMP(s) has capacity to meet the design criteria for the requested credit;
- Proposed Operation and Maintenance (“O&M”) Schedule detailing Property Owner's proposed maintenance activities for the Tier 2 Stormwater BMP(s).
- Executed Right-of-Entry and Indemnification Agreements (see Appendix D)
- A copy of the NPDES Permit(s) for Industrial Stormwater from the PADEP, if applicable. The applicant must be able to demonstrate full compliance with the NPDES Permit(s).

### **Credit Denial and Appeals.**

The Authority and/or Borough Engineer may deny a credit for good reason (a “Denial”), including:

1. For a new Stormwater Utility Fee credit application – Failure to submit a complete application with sufficient documentation of the qualifying Stormwater BMP(s) design and proof of construction to demonstrate that the facility meets credit eligibility criteria by the stated application deadline.
2. For an existing stormwater BMP(s) – Failure to meet minimum maintenance requirements and/or maintain full functionality. Failure to submit complete supporting Annual Self-Inspection Reports by the stated deadline.

The Property Owner may appeal the Authority’s Denial to the Board of Appeals within thirty (30) days after the date of the Authority’s Denial. All such appeals shall be in accordance with Section 306 of the Resolution.

### **Credit Termination.**

Upon written notice, the Authority through its Code Enforcement Officer and/or Zoning Officer may terminate a Stormwater Utility Fee credit for good reason, including failure to meet credit conditions or failure to meet minimum maintenance requirements (a “Credit Termination Notice”). In the event a credit is terminated by the Authority, the credit currently applied to the property will be terminated effective the next billing following the date of termination notice, unless an appeal is filed in accordance with the following section.

### **Appeal of Credit Termination.**

A Property Owner aggrieved by a Credit Termination Notice may appeal the same to the Board of Appeals within thirty (30) days of the date of such notice, provided that the appeal is accompanied by documentation supporting the Property Owner’s appeal (e.g., plans, materials, etc.) and any applicable fees.

Upon receipt of the Property Owner's appeal, a hearing shall be scheduled within ninety (90) days before the Board of Appeals. The hearing shall be attended by the Authority's representative who issued the Credit Termination Notice and the Property Owner. After such a hearing, a decision will be made by the Board of Appeals within forty-five (45) days.

## **Inspections.**

Two (2) types of inspections are included as part of this manual: (1) Annual Self-Inspections and (2) Inspections by the Authority, as described below in greater detail.

### **1. Annual Self-Inspections.**

If a property has been given a Stormwater Utility Fee credit pursuant to this manual, the Property Owner must submit to the Authority an Annual Self-Inspection Report for the Property and all applicable Stormwater BMPs for which credit has been granted. The Annual Self-Inspection Report must provide all required information about the Property and Stormwater BMPs, as listed on the Annual Self-Inspection Report Form (see Appendix E). The intent of this Annual Self-Inspection Report is to show that the Property and Stormwater BMPs were properly maintained and fully functional during the preceding calendar year, sufficient for the Authority to approve renewal of the credit during the subsequent year.

A timely Annual Self-Inspection Report must be submitted and date-stamped received by the Authority between September 1 and October 31 of each year. Any Annual Self-Inspection Report submitted outside of such timeframe will be rejected as untimely. Any completed, timely and compliant Annual Self-Inspection Report shall be approved by the Authority and the credit shall continue to the applicant's next billing cycle.

If after receipt of the report, it is deemed non-compliant or submitted untimely, the Property shall be considered non-compliant and a credit will not be applied to the applicant's next billing cycle. If, after initial review by an Authority representative of a timely filed Annual Self-Inspection Report, it is deemed incomplete, the applicant will be notified in writing and given thirty (30) days from the date of such notice to submit a complete reporting indicating full compliance. If a complete report indicating full compliance is received within such thirty (30) day period, the credit will be renewed for the subsequent calendar year. The burden of proof for full compliance is entirely on the Property Owner/applicant.

### **2. Inspection by the Authority.**

Upon application for a Stormwater Utility Fee credit or in connection with an Annual Self-Inspection Report, as more fully explained above, the applicant shall grant the Authority a Right-of-Entry and Indemnification to inspect the Property and Stormwater BMP(s) that are the subject of the application in order to verify the information submitted and to confirm compliance with applicable requirements set forth in this manual. The Right-of-Entry and Indemnification Agreements are provided in Appendix D.

If, after its review or inspection, the Authority finds the application or Annual Self-Inspection Report to be inaccurate or the Stormwater BMP(s) to be non-compliant, the applicant will be notified in writing (the "Non-Compliance Notice") and be given sixty (60) days to correct such inaccuracy or non-compliance listed in the Non-Compliance Notice (the "Non-Compliance Correction Period"). Within the Non-Compliance Correction Period, the applicant must provide to the Authority written documentation and evidence satisfactory to the Authority that the issue(s) listed in the Non-Compliance Notice has/have been corrected and/or that the Stormwater BMP(s) is/are in compliance with all applicable requirements (the "Non-Compliance Response"). If the issue(s) in the Non-Compliance Notice has/have not been corrected or the Stormwater BMP(s) is/are not in compliance, or if the Property Owner fails to provide a Non-Compliance Response to the Authority within the sixty (60) day period, the Stormwater Utility Fee credit will be terminated effective the date of the next billing cycle.

# APPENDIX A

## Commonly Used Tier 1 Stormwater Best Management Practices (BMPs) Eligible for Stormwater Utility Fee Credit

*(See Pennsylvania Stormwater Best Management Practices Manual or consult a design professional for detailed information regarding the design and construction of stormwater BMPs, as well as all Tier 2 Stormwater BMPs)*

### **Pervious Pavement with Infiltration Bed**

Pervious pavement consists of a permeable surface course underlain by a uniformly-graded stone bed which provides temporary storage for peak rate control and promotes infiltration. A pervious pavement bed consists of a pervious surface course underlain by a stone bed of uniformly graded and clean-washed coarse aggregate, 1-1/2 to 2-1/2 inches in size, with a void space of at least 40%. The pervious pavement may consist of pervious asphalt, pervious concrete, or pervious pavement units. Stormwater drains through the surface, is temporarily held in the voids of the stone bed, and then slowly drains into the underlying, uncompacted soil mantle.

The stone bed can be designed with an overflow control structure so that during large storm events peak rates are controlled, and at no time does the water level rise to the pavement level. A layer of geotextile filter fabric separates the aggregate from the underlying soil, preventing the migration of fines into the bed. The bed bottoms should be level and uncompacted. If new fill is required, it should consist of additional stone and not compacted soil.

Pervious pavement is well suited for parking lots, walking paths, sidewalks, playgrounds, plazas, tennis courts, and other similar uses. Pervious pavement can be used in driveways if the homeowner is aware of the stormwater functions of the pavement.

Design Requirements - General Criteria Only *(See Pennsylvania Stormwater Best Management Practices Manual for detailed information regarding the design and construction of Pervious Pavement Systems):*

- Site evaluation shall be completed to determine suitability for the use of pervious pavement
- Areas should be oriented along existing contours to reduce the need for extensive grading.
- Pervious pavement and infiltration beds should not be placed in areas of recent fill or compacted fill.
- The bed bottom should be level or nearly level and should not be compacted.
- Underlying infiltration bed is typically 12 to 36 inches deep and comprised of clean, uniformly graded aggregate with approximately 40% void space.
- Stone subbase should be placed in lifts and lightly rolled.
- All systems should be sized appropriately for the contributing impervious area. Systems should be designed to capture 1-inch of runoff from the impervious area.
- All systems should be designed with an overflow system, with a stable discharge (from the point of discharge to the receiving water or wetland).
- After completion, full permeability of the pavement surface should be tested by application of clean water at the rate of 5 gallons per minute (minimum) over the surface using a hose or other distribution device. All applied water should infiltrate directly without puddling or surface runoff.
- Sediment shall be controlled and measures provided to prevent sediment from being deposited on the pavement surface or within the stone bed.

- Surface sediment should be removed by a vacuum sweeper and should not be power-washed into the bed.
- The treatment area for this BMP is the area of Impervious Area replaced by the BMP (e.g., impervious surface that is replaced by the pervious pavement surface), as well as the area of any other on-site Impervious Area draining to and treated by this BMP (e.g., impervious asphalt that drains to the pervious pavement, with the pervious pavement infiltration potential sufficient to treat the runoff from the impervious asphalt (for the one (1) year storm event volume)).

### **Rain Garden / Bioretention**

A rain garden (also called bioretention) is an excavated shallow surface depression planted with specially selected native vegetation to treat and capture runoff. Rain gardens treat stormwater by pooling water on the surface and allowing filtering and settling of suspended soils and sediment at the mulch layer, prior to entering the plant/soil/microbe complex media for infiltration and pollutant removal. Rain gardens can be designed and placed to collect and absorb runoff from rooftops, sidewalks, and paved areas providing water quality improvement and water quantity reduction.

Rain gardens can be used in a variety of applications, from small areas in residential lawns to extensive systems in large parking lots. They are flexible in design and can vary in complexity.

Design Requirements - General Criteria Only (*See Pennsylvania Stormwater Best Management Practices Manual for detailed information regarding the design and construction of Rain Gardens/Bioretention Systems*):

- Soil drainage tests must be completed prior to constructing the rain garden to confirm the facility will be able to handle the water getting to it and empty within the required time. Surface Ponding depth should not exceed 6 inches in most cases and the facility should empty within 72 hours.
- Rain garden must be sized appropriately relative to the contributing impervious area and be able to capture the 1-inch of runoff from the impervious area.
- Surface area is dependent upon storage volume requirements but should generally not exceed a maximum loading ratio of 5:1 (impervious drainage area to infiltration area).
- The rain garden should be designed to be able to release water in a controlled manner and direction during excess stormwater events.
- Surface side slopes should be gradual. For most areas, maximum 3:1 side slope is recommended, however where space is limited, a 2:1 side slope may be acceptable.
- Planting soil depth should generally be at least 18 inches where only herbaceous plant species will be utilized. If trees and woody shrubs will be used, soil media depth may be increased, depending on plant species.
- Planting soil should be a loam soil capable of supporting a healthy vegetative cover. Soils should be amended with a composted organic material. A typical organic amended soil is with 20-30% organic material (compost), and 70-80% soil base (preferably topsoil). Planting soil should be approximately 4 inches deeper than the bottom of the largest root ball.
- Volume storage soils should also have a pH of between 5.5 and 6.5 (better pollutant adsorption and microbial activity), a clay content less than 10% (a small amount of clay is beneficial to adsorb pollutants and retain water), be free of toxic substances and unwanted plant material and have a 5 –10% organic matter content.
- Proper plant selection is essential for bioretention areas to be effective. Typically, native floodplain plant species are best suited to the variable environmental conditions encountered. Planting of shrubs and trees is also recommended.

- Planting periods will vary, but in general trees and shrubs should be planted from mid-March through the end of June, or mid-September through mid-November.
- A maximum of 2 to 3 inches of shredded mulch or leaf compost (or other comparable product) should be uniformly applied immediately after shrubs and trees are planted to prevent erosion, enhance metal removals, and stimulate leaf litter in a natural forest system.
- The treatment area for this BMP is the area of Impervious Area that drains directly into and is treated by this BMP.

### **Runoff Capture & Reuse – Rain Barrel**

Rainwater harvesting systems collect and store rainfall temporarily for later use, delayed discharge, and/or infiltration. When designed appropriately, they prevent, slow, and/or reduce runoff and provide a valuable source of water for watering lawns, flower gardens, and house plants.

A rain barrel is any type of container used to catch water flowing from a downspout or rooftop. The rain barrel is placed underneath a shortened downspout and roof runoff is diverted into it. For every 1 inch of rain that falls on 1 square foot of rooftop, 0.6 gallons of runoff is produced and can be “collected.” Therefore, 100 square feet of roof area will produce about 60 gallons of rainwater runoff during a 1-inch rain event. Typical rain barrels are 55-gallon, more or less depending on model. A maximum of four (4) rain barrels may be used per acre of property.

To serve the function of stormwater management, it is necessary for rain barrels to empty via a slow release within five (5) days immediately following the end of a rain event, so that they are able to accept rainfall for the next rain event. To accomplish this, the outlet port on the bottom of a rain barrel must be partially opened and adjusted to prolong the release over a 3- to 5-day period. The discharge must be onto a permeable surface (e.g., lawn, garden, etc.) or infiltration facility on the owner’s property. Therefore, the discharge for each rain barrel should have a minimum 5:1 loading rate for area to help avoid overloading issues and potential sinkhole development, which means that at least 20 square feet of pervious surface must be available at the point of discharge from the rain barrel to infiltrate runoff collected and treated by the rain barrel from a 100-square foot roof area (maximum allowable per rain barrel). Engineered stormwater infiltration systems may have lower ratios for loading rates, as determined by a qualified Professional Engineer.

***Note, water collected in rain barrels is not suitable for human consumption and due to lack of research data, and water collected in a rain barrel is not recommended for watering vegetable gardens.***

Design Requirements – General Criteria Only:

- The rain barrel must have a minimum storage/release capacity of 45 gallons.
- The rain barrel must capture runoff from an adjacent rooftop of at least 100 square feet for credit, in order to maximize capture of the 1-inch rain event. Rooftop area in excess of 100 square feet will overflow the barrel for the 1-inch rain event, and therefore is not treated and does not count toward credit.
- The rain barrel must empty within 3 to 5 days immediately following each rain event in order to maintain adequate available capacity in the rain barrel. Collected water shall not to be used for consumption and is not recommended for watering vegetable gardens as noted above.
- Discharges from rain barrels must be to pervious surfaces on the owner’s property and of sufficient size to prevent runoff to off-site properties. A 5:1 loading rate (impervious drainage area to infiltration area) would mean that each rain barrel must have at least 20 square feet of pervious surface on the owner’s property at the controlled discharge point.

- The rain barrel shall have a spigot at the bottom to discharge water.
- The rain barrel shall be placed on a sturdy, raised platform to allow for adequate clearance under the spigot and to increase the rate of flow when attaching a hose to the spigot.
- The rain barrel must have an overflow near the top of the barrel to discharge overflow during large storm events.
- All rain barrel openings, other than the spigot, must have screens for mosquito control.
- Routinely inspect and remove any accumulated debris on the lid that may block the screen mesh.
- Routinely clean the inside of the rain barrel to reduce algae growth. Barrel should be located/protected from direct sunlight to minimize algae growth.
- The treatment area for this BMP is the area of Impervious Area that drains directly into this BMP, for a maximum treatment area of 100 square feet per rain barrel, with a maximum of four (4) rain barrels per acre of property.

### **Dry Well / Seepage Pit**

A Dry Well, sometimes called a Seepage Pit, is a subsurface storage facility that temporarily stores and infiltrates stormwater runoff from the roofs of structures. Roof leaders connect directly into the dry well, which may be either an excavated pit filled with uniformly graded aggregate wrapped in geotextile or a prefabricated storage chamber or pipe segment. Dry wells discharge the stored runoff via infiltration into the surrounding soils. An overflow mechanism (surcharge pipe, connection to a larger infiltration area, etc.) is provided to safely convey stormwater runoff in the event that the dry well is overwhelmed in an intense storm event.

By capturing runoff at the source, dry wells can reduce the increased volume of stormwater generated by the roofs of structures. By decreasing the volume of stormwater runoff, dry wells can also reduce runoff rate and improve water quality. As with other infiltration practices, dry wells may not be appropriate for “hot spots” or other areas where high pollutant or sediment loading is expected without additional design considerations. Dry Wells are not recommended within a specified distance to structures or subsurface sewage disposal systems.

Design Requirements - General Criteria Only (*See Pennsylvania Stormwater Best Management Practices Manual for detailed information regarding the design and construction of Dry Wells/Seepage Pits*):

- Dry wells are sized to temporarily retain and infiltrate stormwater runoff from roofs of structures. A dry well typically provides stormwater management for a limited roof area. Care should be taken not to hydraulically overload a dry well based on bottom area and drainage area. Testing shall be completed as required to ensure proper infiltration at proposed site location.
- Dry wells are not recommended when their installation would create a significant risk for basement seepage or flooding. In general, infiltration BMPs should be sited so that they present no threat to sub-surface structures, at least 10 feet down gradient or 100 feet up gradient from building basement foundations, and 50 feet from septic system drain fields, unless specific circumstances allow for reduced separation distances
- Dry wells should drain-down within 72 hours. Longer drain-down times reduce dry well efficiency and can lead to anaerobic conditions, odor and other problems.
- Dry wells typically consist of 18 to 48 inches of clean washed, uniformly graded aggregate with 40% void capacity (AASHTO NO. 3, or similar). Dry well aggregate is wrapped in a nonwoven geotextile, which provides separation between the aggregate and the surrounding soil. At least 12 inches of soil is then placed over the dry well. A prefabricated dry well can also be used.
- Dry wells should be able to convey system overflows to downstream drainage systems. System overflows can be incorporated either as surcharge (or overflow) pipes extending from roof leaders or via connections to more substantial infiltration areas.

- The design depth of a dry well should take into account frost depth to prevent frost heave.
- A removable filter with a screened bottom should be installed in the roof leader below the surcharge pipe in order to screen out leaves and other debris.
- Adequate inspection and maintenance access to the dry well should be provided. Observation wells not only provide the necessary access to the dry well, but they also provide a conduit through which pumping of stored runoff can be accomplished in case of slowed infiltration.
- Measures such as roof gutter guards, roof leader clean-out with sump, or an intermediate sump box can provide pretreatment for dry wells by minimizing the amount of sediment and other particulates that may enter it.
- Dry Well Volume = Dry Well Area (square feet) x Dry Well Water Depth (feet) x 40% (if stone filled)
- Dry well may consider both bottom and side (Lateral) infiltration according to design standards.
- The treatment area for this BMP is the area of Impervious Area that drains directly into this BMP, as designed and specified for treatment by this BMP.

### **Tree Canopy Cover**

Trees can provide a reduction in stormwater quantity and provide water quality benefits by reducing impervious area, promoting infiltration, and filtering pollutants. They also can reduce urban heat and improve air quality. For these reasons, tree planting is eligible for a credit, but only when all design requirements are met.

#### Design Requirements:

- Trees must be planted where they are likely to thrive and create a full tree canopy that intercepts rainfall and reduces stormwater runoff from developed areas of the property. Trees planted in areas where less than 25% of their Mature Average Canopy Spread (see Appendix F for Canopy Spread Information) overlaps the limits of existing impervious area on the property will not be eligible for credit.
- Only native or naturalized tree species may be planted (see Appendix F), with a species selected that best fits the specific site conditions and environment. All tree species shall be approved by the Authority and Zoning Officer prior to planting.
- Trees shall be planted in a location that will allow them to grow naturally (without pruning) and cover an impervious area on the Property, such as driveway, sidewalk or roof. All planting locations shall be approved by the Authority and Zoning Officer prior to planting.
- Trees must have a minimum 2-inch caliper at the time of planting.
- Trees must have a sufficient tree opening space (typically 25 square feet minimum) to allow for trunk and root growth, as well as runoff infiltration between areas such as curbs and sidewalks, or driveways and sidewalks, etc. A good rule of thumb is to allow a minimum distance of three (3) feet between the center of the tree and nearby structures/impervious surfaces.
- Overhead and underground utilities must be taken into consideration for the long-term growth of planted trees and the potential future conflicts. Pruning that diminishes the trees' ability to adequately mitigate stormwater runoff, as determined by the Authority or Zoning Officer, will disqualify the trees as stormwater BMPs used for Stormwater Utility Fee credit.
- Planted trees must be in good health with full canopies, normal for the particular species and age, without pruning or other loss that compromises their ability to adequately mitigate stormwater runoff.
- The treatment area for each planted tree is the area of Impervious Area on the property that the Mature Average Canopy Spread will cover for the tree species, as provided in Appendix F – Tree List, Mature Average Canopy Spread. The canopy spread (assumed to be round) is measured from the center of the tree using the listed species-specific Mature Average Canopy Spread radius in Appendix F, and is calculated as the percentage of Impervious Area that will be covered by the mature canopy

size, rounded to the nearest 25% (*i.e. ¼ circle, ½ circle, ¾ circle or full circle*), as provided in Appendix F – Tree List, Area for Estimated Percentage Canopy Coverage of Impervious Area.

Property Owners assume full responsibility for any and all damages and liabilities that may result from the planting, growth, and maintenance of trees.

### **Downspout Disconnection**

Downspout Disconnection is the process of physically separating roof downspouts from discharge into the Authority's storm sewer collection system and redirecting runoff from roofs onto pervious, landscaped surfaces where it can infiltrate into the ground. This practice reduces the amount of Impervious Area directly connected to the Authority's system.

Design Requirements:

- Downspouts must be disconnected from roof drains discharging directly into a storm inlet, catch basin or other structure of the Authority's storm sewer collection system or discharging directly to a street, alley or other public right-of-way.
- Downspouts must discharge into a suitable pervious area, such as a garden, landscaped area, or planter that will infiltrate the volume produced by a one-inch storm. Areas or soils must be determined to be appropriate for infiltration practices. The pervious area shall have maximum loading ratio of 5:1 (impervious area surface (drainage area) to infiltration area surface), or in other words the size of the infiltration area surface must be a minimum of 20% of the size of the roof area surface that drains to the disconnected downspout discharge.
- Downspouts must discharge a minimum of 3 feet away from structures, including basements, garages, sheds, and porch steps.
- A splash block or similar structure must be used to spread water out and prevent erosion.
- Runoff must not flow toward building foundations or adversely impact adjacent or downstream properties.
- The treatment area for this BMP is the area of Impervious Area that drains directly into the downspout that is disconnected and treated by this BMP.

## APPENDIX B

### Examples of Stormwater Utility Fee Credit Calculation

**EXAMPLE 1:** The owner of a Property with 10,000 square feet of Impervious Area installs one (1) rain garden which handles stormwater runoff flows from an asphalt parking lot with an area of 2,000 square feet (20% of the total Impervious Area on the Property). Therefore:

$50\% \text{ (Maximum Credit for Rain Garden)} \times 2,000 \text{ square feet (Impervious Area being treated)} / 10,000 \text{ square feet (Total Impervious Area on Property)} = 10\% \text{ total credit for the stormwater BMP for that Property.}$

**EXAMPLE 2:** A Property Owner installs rain gardens and dry wells which handle the stormwater runoff flows from 100% of the Impervious Area (e.g., 10,000 square feet) on the Property. Therefore:

$50\% \text{ (Maximum Credit for Rain Gardens and Dry Wells)} \times 10,000 \text{ square feet (Impervious Area being treated)} / 10,000 \text{ square feet (Total Impervious Area on Property)} = 50\% \text{ total credit for the stormwater BMPs for that Property.}$

**EXAMPLE 3:** A property 1,600 square feet of Impervious Area installs an infiltration trench which handles the stormwater runoff flows from 1,400 square feet of the Impervious Area on the property. Therefore:

$50\% \text{ (Maximum Credit for Infiltration Trench)} \times 1,400 \text{ square feet (Impervious Area being treated)} / 1,600 \text{ square feet (Total Impervious Area on Property)} = 43.8\% \text{ total credit for the stormwater BMP for that Property.}$

**EXAMPLE 4:** A Property with 4,500 square feet of Impervious Area installs one (1) rain garden which handles stormwater runoff flows from an asphalt parking lot with an area of 1,000 square feet (22.2% of the total Impervious Area on the Property), one (1) drywell to handle 600 square feet of roof drainage (13.3% of the total Impervious Area on the Property), and disconnects downspouts from 600 square feet of roof drainage (13.3% of the total Impervious Area on the Property). Therefore:

$50\% \text{ (Maximum Credit for Rain Garden)} \times 1,000 \text{ square feet (Impervious Area being treated)} / 4,500 \text{ square feet (Total Impervious Area on Property)} = 11.11\% \text{ total credit for the stormwater BMP for that Property.}$

$50\% \text{ (Maximum Credit for Dry Well)} \times 600 \text{ square feet (Impervious Area being treated)} / 4,500 \text{ square feet (Total Impervious Area on Property)} = 6.67\% \text{ total credit for the stormwater BMP for that Property.}$

$15\% \text{ (Maximum Credit for Downspout Disconnection)} \times 1,000 \text{ square feet (Impervious Area being treated)} / 4,500 \text{ square feet (Total Impervious Area on Property)} = 3.33\% \text{ total credit for the stormwater BMP for that Property.}$

TOTAL CREDIT = 11.11% + 6.67% + 3.33% = 21.11%

**EXAMPLE 5:** The owner of a Property with a home having 1,200 square feet of rooftop (Impervious Area) installs three (3) rain barrels that treat a total of 100 square feet/each and which slowly drain from full to empty onto lawn areas with surfaces greater than 20 square feet/each to allow infiltration within five (5) days. Each rain barrel provides a credit amount of \$2 towards the annual Stormwater Utility Fee. Therefore:

Three (3) rain barrels X \$2 each = \$6 total credit.

NOTE: In this example, each rain barrel treats 100 square feet of rooftop drainage area. Therefore, other stormwater BMPs may be used for this Property to treat up to the additional rooftop area of 900 square feet that is not treated by the three (3) rain barrels.

**EXAMPLE 6:** The owner of a large property with 80,000 square feet of Impervious Area installs a Wet Pond which handles stormwater runoff flows from an asphalt parking lot with an area of 60,000 square feet (75% of the Impervious Area on the property). Therefore:

25% (Maximum Credit for Wet Pond) X 60,000 square feet (Impervious Area being treated) / 80,000 square feet (Total Impervious Area on Property) = 18.8% total credit for the stormwater BMP for that Property.

**APPENDIX C**

**Stormwater Utility Fee Credit Application Form**



**Borough Use Only:** File Number \_\_\_\_\_ Date Received \_\_\_\_\_

Approvals: Authority Representative \_\_\_\_\_ Borough Engineer \_\_\_\_\_ Zoning Officer \_\_\_\_\_

## STORMWATER UTILITY FEE CREDIT APPLICATION

**Complete and return this form to:**

Fountain Hill Stormwater Authority  
 Borough Hall  
 941 Long Street  
 Fountain Hill, PA 18015  
 Phone: 610.867.0301; Fax: 610.867.7153  
 Website Address: <http://www.fountainhill.org/ms4>  
 Email: zoning@fhboro.org

**Date:** \_\_\_\_\_

**Type of Application (check all that apply):**

- New**
- Renewal**  
      No change to BMP(s)  
      Change to BMP(s)
- Change in Ownership**  
      No change to BMP(s)  
      Change to BMP(s)

### 1. PROPERTY OWNER INFORMATION

Owner's Name \_\_\_\_\_

Property Address \_\_\_\_\_

Owner's Mailing Address \_\_\_\_\_

Owner's Phone \_\_\_\_\_ Fax \_\_\_\_\_ Email \_\_\_\_\_

**Stormwater Utility Account Number** for Property \_\_\_\_\_

Total Impervious Area (s.f.) \_\_\_\_\_ (Impervious Area information can be found on the Stormwater Assessment Notice)

### 2. STORMWATER CREDIT CALCULATION

Percent Fee Reduction Equation:  $A \times B \div C = D$

Example (below):  $50\% \times 8,000 \text{ s.f.} \div 10,000 \text{ s.f.} = 40\% \text{ reduction}$

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>Credit Category/Best Management Practice (see Item 3 on next page)</b>	<b>Maximum Credit Available for Stormwater BMP (see Item 3 on next page)</b>	<b>Impervious Area on Property Treated by BMP (s.f.)</b>	<b>Total Impervious Area on Property (s.f.)</b>	<b>Percent Fee Reduction</b>
<i>Example: Volume Control/Green Infrastructure - Rain garden/ bioretention</i>	50%	8,000	10,000	40%
			+	
			+	
			+	
			+	
		<b>TOTAL % FEE REDUCTION =</b>		<b>%</b>
Number of Rain Barrels (\$2 credit/each):		<b>TOTAL COST REDUCTION AMOUNT FOR RAIN BARRELS =</b>		<b>\$</b>

### 3. CREDIT CATEGORIES AND MAXIMUM CREDIT AVAILABLE FOR BEST MANAGEMENT PRACTICES (BMPs)

Credit Category	Maximum Credit*	Tier Rating**	Best Management Practices (BMPs)
Peak Runoff Rate (Flood) Controls	25%	2	Constructed Wetland
		2	Wet Pond / Retention Basin
		2	Dry Extended Detention Basin
		2	Special Detention Areas (parking lots/roof)
Runoff Volume Controls/Green Infrastructure	50%	1	Pervious Pavement with Infiltration Bed
		1	Rain Garden / Bioretention
		1	Runoff Capture & Reuse – Rain Barrel***
		1	Dry Well / Seepage Pit
		2	Green Roof
		2	Infiltration Trench / Tree Infiltration Trench
		2	Infiltration Basin
		2	Subsurface Infiltration Bed
		2	Infiltration Berm & Retentive Grading
		2	Impervious Area Removal with Soil Restoration and Vegetation
		2	Deep Stormwater Injection Well
Water Quality Treatment	25%	2	Constructed Wetland
		2	Constructed Filter
		2	Vegetated Swale
		2	Vegetated Filter Strip
		2	Proprietary Water Quality Filters & Hydrodynamic Devices
		2	Tree Trench with Soil Restoration or Amendment
Non-Structural Controls	15%	1	Tree Canopy Cover
		1	Downspout Disconnection
NPDES Industrial Stormwater Permitted Sites	15%	2	Facilities with an active, fully-compliant PADEP NPDES Permit
<b>Maximum Credit Applied to Annual Stormwater Utility Fee</b>	<b>50%</b>		

\* Actual credit applied is based on percentage of Impervious Area being treated by each qualifying Best Management Practice (BMP).

\*\* Rain Barrels – Standard size rain barrels range from 45 to 55 gallons. A maximum of four (4) 55-gallon barrels per acre are allowable, with maximum treatment area of 100 square feet per rain barrel, and must fully and automatically drain within five (5) days and have a minimum discharge infiltration area of 20 square feet, or 5:1 minimum loading ratio, on the Property, per rain barrel. A credit of \$2 per standard size rain barrel shall be applied to the total annual Stormwater Utility Fee. Alternative size rain barrels must meet the same standards, with credit adjusted for actual treatment volume, based on a rate of \$2 for treatment of 45 gallons of stormwater runoff.

### 4. REQUIRED DOCUMENTATION

For approval (includes new, renewal, and/or change of ownership) of a Stormwater Utility Fee credit by the Authority, the Property Owner must submit the following supplemental materials based on the Tier Rating of the stormwater BMP(s) for which credit is being applied. In addition, Tier 2 BMPs require an Application Fee to be submitted.

Renewal credit applications and Change in Ownership credit applications only need to include supplemental documentation if there have been any changes to the stormwater BMP(s) on the Property. If previously approved stormwater BMPs are not changed, complete Renewal and Change in Ownership credit applications will be processed by the Authority within fifteen (15) days of receipt. If previously approved stormwater BMPs are changed in any way, Renewal and Change in Ownership credit applications will be processed by the Authority in accordance with the process and timeframes specified for New credit applications (see above).

Supplemental information to be provided for new or changed Tier 1 and 2 Stormwater BMPs, includes:

1. **Tier 1 Stormwater BMPs** – Requires submission of a completed Stormwater Utility Fee Credit Application Form and the following supplemental information:

- A legible sketch plan on 8 ½" x 11" paper, including:
  - Total lot area in square feet
  - Location and area of all existing Impervious Areas (see Definitions) (e.g., surface areas of buildings, patios, paved driveways, etc. where stormwater cannot normally infiltrate into the soil)
  - Location and description of the existing, qualifying Tier 1 Stormwater BMP(s)
  - Impervious Area in square feet being treated by the Tier 1 Stormwater BMP(s)
  - Calculation to verify the stormwater BMP(s) has capacity to meet the design criteria, if applicable
- Time-stamped photograph(s) of existing Tier 1 Stormwater BMP(s), if applicable
- Proposed Operation and Maintenance (O&M) Schedule detailing the Property Owner's proposed maintenance activities for the Tier 1 Stormwater BMP(s)
- Executed Right-of-Entry and Indemnification Agreements (see Appendix D)

2. **Tier 2 Stormwater BMPs** – Requires submission of a completed Stormwater Utility Fee Credit Application Form and the following supplemental information:

- Application review fee(s), as determined by Resolution
- Proposed or As-built Plans, at an appropriate scale, showing the site, overland flow paths, drainage flow arrows, stormwater facilities, and the surrounding area
- Maps delineating drainage areas and/or watersheds, indicating which impervious areas flow to the Tier 2 Stormwater BMP(s)
- Time-stamped photograph(s) of existing Tier 2 Stormwater BMP(s)
- Calculations to verify that the stormwater BMP(s) has capacity to meet the design criteria for the requested credit
- Proposed Operation and Maintenance (O&M) Schedule detailing Property Owner's proposed maintenance activities for the Tier 2 Stormwater BMP(s).
- Executed Right-of-Entry and Indemnification Agreements (see Appendix D)
- A copy of the NPDES Permit(s) for Industrial Stormwater from the PADEP, if applicable. The applicant must be able to demonstrate full compliance with the NPDES Permit(s).

*I, as Property Owner or Agent, hereby certify that the information contained in and attached to this application is true and accurate to the best of my knowledge and that the stormwater BMP(s) for which I seek credit are in good working order. I acknowledge that no person shall modify, remove, fill, landscape or alter any stormwater BMPs, facilities, areas, drainage areas (to stormwater BMPs) or structures without the prior written approval of the Fountain Hill Stormwater Authority. I understand that false information may result in a notice of violation and/or termination of Stormwater Utility Fee credits. I also authorize Authority representatives to enter my property, with no less than twenty-four hours prior notice, to investigate or ascertain the condition of the stormwater BMPs on my property.*

---

Property Owner's/Agent's Signature

Date

## **APPENDIX D**

### **Right-of-Entry and Indemnification Agreements**

**FOUNTAIN HILL STORMWATER AUTHORITY  
RIGHT-OF-ENTRY AGREEMENT**

I/We, \_\_\_\_\_, (the "Owner(s)") owner(s) of the real property commonly known as \_\_\_\_\_ (hereafter "Property"), in the Borough of Fountain Hill, Lehigh County, Pennsylvania, and in consideration of any approved applicable credit against Stormwater Utility Fees due for the Property payable to the Fountain Hill Stormwater Authority, Borough of Fountain Hill, Pennsylvania, do hereby grant and freely give without coercion the right of access and entry to said Property at reasonable times to the Authority, its employees, agents, representatives, contractors and subcontractors, for the purpose of performing necessary inspections of onsite stormwater management controls and site activities related to stormwater runoff management on the Property.

The undersigned hereby affirm/affirms that he/she/they is/are the owner(s) of the above-referenced property and has/have authority to enter into this Agreement and grant Right-of-Entry.

The undersigned agree/agrees and warrant/warrants to waive, and to hold harmless the Fountain Hill Stormwater Authority, its employees, agents, representatives, contractors and subcontractors from any and all claims or actions, legal or equitable, arising from, out of, or related to the inspection activities on the Property performed by the Fountain Hill Stormwater Authority, its employees, agents, representatives, contractors and subcontractors pursuant to this Right-of-Entry Agreement.

The Fountain Hill Stormwater Authority, in consideration of the rights granted to it herein, the sufficiency and receipt of which are hereby acknowledged, agrees to limit the inspection activities to visual inspections and review of relevant records necessary to verify stormwater credit eligibility.

I/We have not received, nor shall I/we receive, any compensation for this Right-of-Entry Agreement.

[Signatures to Follow]

[Signature Page to Right-of-Entry Agreement]

For the consideration and purposes set forth herein, I/we set my/our hand/hands this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

Owner(s): \_\_\_\_\_

Printed: \_\_\_\_\_

STATE OF PENNSYLVANIA )  
 ) SS:  
COUNTY OF LEHIGH )

Before me, the undersigned, a Notary Public in and for the said County and State, this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_, personally appeared \_\_\_\_\_, Owner/Owners and acknowledged the execution of the foregoing Right-of-Entry Agreement as his/her/their voluntary act and deed.

Notary Public \_\_\_\_\_  
My Commission Expires: \_\_\_\_\_,  
Resident of \_\_\_\_\_ County

Fountain Hill Stormwater Authority: \_\_\_\_\_  
Printed: \_\_\_\_\_  
Title: \_\_\_\_\_

STATE OF PENNSYLVANIA )  
 ) SS:  
COUNTY OF LEHIGH )

Before me, the undersigned, a Notary Public in and for the said County and State, \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_, personally appeared \_\_\_\_\_, Owner/Owners and acknowledged the execution of the foregoing Right-of-Entry Agreement as his/her/their voluntary act and deed.

Notary Public \_\_\_\_\_  
My Commission Expires: \_\_\_\_\_,  
Resident of \_\_\_\_\_ County

Fountain Hill Stormwater Authority: \_\_\_\_\_  
Printed: \_\_\_\_\_  
Title: \_\_\_\_\_

## INDEMNIFICATION AGREEMENT

In consideration for permission to construct or install a stormwater improvement/best management practice (BMP) to their property, located at \_\_\_\_\_  
(the "Property"), \_\_\_\_\_ ("Owner(s)") hereby agree to and acknowledge the following:

1. Owner(s) shall construct or install a stormwater improvement/BMP in substantial compliance with Resolution No. 19-2 and all subsequent amendments of the Fountain Hill Stormwater Authority, Borough of Fountain Hill, Pennsylvania (the "Authority") on their Property situated in the Borough of Fountain Hill, Lehigh County, Pennsylvania, to wit: See legal description(s) attached as Exhibit A.
2. After completion of the construction or installation by Owners and approval by the Authority, the stormwater improvement/BMP shall remain a privately owned and maintained stormwater improvement/BMP and shall not be accepted by the Authority and/or become a part of the maintenance program of the Authority. All maintenance, responsibility and liability of the stormwater improvement/BMP shall be and remain with the Owners, their personal representatives, heirs, grantees, successors, and assigns.
3. Owners, their personal representatives, heirs, grantees, successors, and assigns shall indemnify and hold harmless the Authority, its officers, agents, and employees from any and all claims, actions, causes of action, judgments, damages, losses, costs, and expenses (including attorney's fees) arising out of or resulting from the construction, installation, maintenance, or operation of the stormwater improvement/BMP.
4. This Agreement shall run with the Property and shall be binding upon Owners, their personal representatives, heirs, grantees, successors, and assigns so long as the stormwater improvement/BMP or any part of it shall be used by them. At such time as the stormwater improvement/BMP shall cease to be so used, this Agreement shall immediately terminate, and this instrument shall be of no further force and effect.
5. Owners represent and warrant that they are the owners in fee simple of the above-described Property, are lawfully seized thereof, and have the legal authority to execute this Agreement, and affirm that no unauthorized alterations of this document have taken place.

[Signatures to Follow]



# **APPENDIX E**

## **Annual Self-Inspection Report Form**



**Borough Use Only:** File Number \_\_\_\_\_ Date Received \_\_\_\_\_

Approvals: Authority Representative \_\_\_\_\_ Borough Engineer \_\_\_\_\_ Zoning Officer \_\_\_\_\_

## ANNUAL SELF-INSPECTION REPORT (to be submitted with all Renewal Applications)

**Complete and return this form to:**

Fountain Hill Stormwater Authority

Borough Hall

941 Long Street

Fountain Hill, PA 18015

Phone: 610.867.0301; Fax: 610.867.7153

Website Address: <http://www.fountainhill.org/ms4>

Email: zoning@fhboro.org

**Date:** \_\_\_\_\_

### 1. PROPERTY OWNER INFORMATION

Owner's Name \_\_\_\_\_

Property Address \_\_\_\_\_

Owner's Mailing Address \_\_\_\_\_

Owner's Phone \_\_\_\_\_ Fax \_\_\_\_\_ Email \_\_\_\_\_

**Stormwater Utility Account Number** for Property \_\_\_\_\_

### 2. STORMWATER INFORMATION (complete for each approved stormwater BMP)

#### TIER 1 BMPs

Stormwater BMP Type: \_\_\_\_\_

Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the BMP in good, functioning condition and performing as intended/designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has the BMP been modified in any way since original installation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was the BMP modified in any way during this past year?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was maintenance performed on the BMP during this past year? If so, please describe: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was sediment and/or debris removed from the BMP during this past year? If so, how were the materials disposed: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stormwater BMP Type: \_\_\_\_\_  
 Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the BMP in good, functioning condition and performing as intended/designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has the BMP been modified in any way since original installation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was the BMP modified in any way during this past year?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was maintenance performed on the BMP during this past year? If so, please describe: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was sediment and/or debris removed from the BMP during this past year? If so, how were the materials disposed: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stormwater BMP Type: \_\_\_\_\_  
 Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the BMP in good, functioning condition and performing as intended/designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has the BMP been modified in any way since original installation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was the BMP modified in any way during this past year?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was maintenance performed on the BMP during this past year? If so, please describe: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was sediment and/or debris removed from the BMP during this past year? If so, how were the materials disposed: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stormwater BMP Type: \_\_\_\_\_  
 Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the BMP in good, functioning condition and performing as intended/designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has the BMP been modified in any way since original installation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was the BMP modified in any way during this past year?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was maintenance performed on the BMP during this past year? If so, please describe: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was sediment and/or debris removed from the BMP during this past year? If so, how were the materials disposed: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**TIER 2 BMPs**

Stormwater BMP Type: \_\_\_\_\_

Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the primary outfall pipe/ditch clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the inflow pipes/ditches clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the water quality pool at the correct height (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are emergency overflow devices clear and functional (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP clear of sediment (with proper sediment disposal)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is vegetation being managed in a manner appropriate to the facility, as designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP working as originally intended, designed, and constructed/installed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stormwater BMP Type: \_\_\_\_\_

Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the primary outfall pipe/ditch clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the inflow pipes/ditches clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the water quality pool at the correct height (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are emergency overflow devices clear and functional (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP clear of sediment (with proper sediment disposal)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is vegetation being managed in a manner appropriate to the facility, as designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP working as originally intended, designed, and constructed/installed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stormwater BMP Type: \_\_\_\_\_

Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the primary outfall pipe/ditch clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the inflow pipes/ditches clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the water quality pool at the correct height (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are emergency overflow devices clear and functional (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP clear of sediment (with proper sediment disposal)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is vegetation being managed in a manner appropriate to the facility, as designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP working as originally intended, designed, and constructed/installed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stormwater BMP Type: \_\_\_\_\_

Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the primary outfall pipe/ditch clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the inflow pipes/ditches clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the water quality pool at the correct height (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are emergency overflow devices clear and functional (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP clear of sediment (with proper sediment disposal)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is vegetation being managed in a manner appropriate to the facility, as designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP working as originally intended, designed, and constructed/installed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stormwater BMP Type: \_\_\_\_\_  
Year Constructed/Installed: \_\_\_\_\_ Total Impervious Area Treated by Stormwater BMP (s.f.): \_\_\_\_\_

<b>General Condition:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Is the primary outfall pipe/ditch clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the inflow pipes/ditches clear and functioning?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the water quality pool at the correct height (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are water quality pool control weirs, pipes, etc. working properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are emergency overflow devices clear and functional (if present)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP clear of sediment (with proper sediment disposal)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is vegetation being managed in a manner appropriate to the facility, as designed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the stormwater BMP working as originally intended, designed, and constructed/installed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**CERTIFICATION**

*I, as Property Owner or Agent, hereby certify that the information contained in and attached to this Annual Self-Inspection Form is true and accurate to the best of my knowledge and that the stormwater BMP(s) for which I seek credit renewal are in good working order and functioning as originally intended, designed, and constructed. I acknowledge that no person shall modify, remove, fill, landscape or alter any stormwater BMPs, facilities, areas, drainage areas (to stormwater BMPs) or structures without the prior written approval of the Fountain Hill Stormwater Authority. I understand that false information may result in a notice of violation and/or termination of Stormwater Utility Fee credits. I also authorize Authority representatives to enter my property, with no less than twenty-four hours prior notice, to investigate or ascertain the condition of the stormwater BMPs on my property.*

\_\_\_\_\_ Date

*Property Owner's/Agent's Signature*

# **APPENDIX F**

## **Tree List – Tree Canopy Cover**

<b>Botanical Name</b>	<b>Common Name</b>	<b>Native</b>	<b>Drought Tolerance</b>	<b>Soil Drainage Tolerance</b>	<b>Soil Salt Tolerance</b>	<b>Salt Spray Tolerance</b>	<b>Soil pH</b>	<b>Pest Resistance</b>	<b>Shape</b>	<b>Mature Average Canopy Spread radius/area* (feet/square feet)</b>	<b>Area for Estimated Percentage Canopy Coverage of Impervious Area (square feet)</b>	<b>Mature Height (feet)</b>	<b>Growth Rate</b>
<i>Acer rubrum</i>	Red maple	Yes	Moderate	Extended flooding to well drained	Poor	Low	Acidic	Resistant	Round/oval	30 / 707	25% - 177 50% - 354 75% - 530 100% - 707	60-75	Fast
<i>Acer saccharum</i>	Sugar maple	Yes	Moderate	Drained to moderately well drained	Poor	Poor	Acidic to neutral	Somewhat sensitive	Round/oval	70 / 3,848	25% - 962 50% - 1,924 75% - 2,886 100% - 3,848	80-100	Moderate
<i>Aesculus x. carnea</i>	Red horsechestnut	Hybrid	Moderate	Moist to well drained	Low	Moderate	Acidic to alkaline	No serious pests	Upright/oval	35 / 962	25% - 241 50% - 481 75% - 722 100% - 962	60-80	Moderate
<i>Amelanchier arborea</i>	Downy serviceberry	Yes	Low	Moist to well drained	Low	Low	Acidic to neutral	No serious pests	Rounded	12.5 / 123	25% - 31 50% - 62 75% - 92 100% - 123	10-25	Slow
<i>Amelanchier grandiflora</i>	Serviceberry or juneberry	Hybrid	Low to Moderate	Well drained	Low	Low	Acidic to Neutral	No serious pests	Rounded	12.5 / 123	25% - 31 50% - 62 75% - 92 100% - 123	10-25	Moderate
<i>Betula nigra</i>	River birch	Yes	High	Extended flooding to moist	Low	Moderate	Acidic	No serious pests	Upright/Oval	35 / 962	25% - 241 50% - 481 75% - 722 100% - 962	40-60	Fast
<i>Carpinus caroliniana</i>	American hornbeam	Yes	Moderate	Moist to well drained	Low	Low	Acidic	No serious pests	Upright	25 / 490	25% - 123 50% - 245 75% - 368 100% - 490	20-30	Moderate
<i>Celtis occidentalis</i>	Eastern hackberry	Yes	Moderate	Occasionally wet to well drained	Moderate	Moderate	Acidic	No serious pests	Rounded	45 / 1,735	25% - 434 50% - 868 75% - 1,301 100% - 1,735	60-70	Fast
<i>Cercis canadensis</i>	Redbud	Yes	Moderate	Moist to well drained	Low	Low	Neutral to alkaline	No serious pests	Rounded	20 / 314	25% - 79 50% - 157 75% - 236 100% - 314	15-30	Moderate
<i>Crataegus crusgalli</i>	Thornless hawthorn	Yes	High	Occasionally wet to well drained	Moderate	High	Acidic to alkaline	Somewhat sensitive	Rounded	17.5 / 241	25% - 60 50% - 121 75% - 181 100% - 241	10-15	Moderate
<i>Gleditsia triacanthos</i>	Thornless honeylocust	Yes	High	Moist to well drained	High	High	Acidic to alkaline	No serious pests	Rounded	50 / 1,963	25% - 491 50% - 982 75% - 1,472 100% - 1,963	30-70	Fast
<i>Gymnocladus dioicus</i>	Kentucky coffeetree	No	High	Moist to well drained	Moderate	High	Acidic to alkaline	No serious pests	Upright to rounded	55 / 2,206	25% - 552 50% - 1,103 75% - 1,655 100% - 2,206	50-70	Fast

Botanical Name	Common Name	Native	Drought Tolerance	Soil Drainage Tolerance	Soil Salt Tolerance	Salt Spray Tolerance	Soil pH	Pest Resistance	Shape	Mature Average Canopy Spread radius/area* (feet/square feet)	Area for Estimated Percentage Canopy Coverage of Impervious Area (square feet)	Mature Height (feet)	Growth Rate
<i>Liquidambar styraciflua</i>	Sweetgum	Yes	Moderate	Extended flooding, well drained	Low	Moderate	Acidic to slightly alkaline	Resistant	Pyramidal/oval	42.5 / 1,419	25% - 355 50% - 710 75% - 1,064 100% - 1,419	60-75	Moderate
<i>Liriodendron tulipifera</i>	Tuliptree	Yes	Low	Moist to well drained	Low	Low	Acidic to neutral	No serious pests	Pyramidal/oval	42.5 / 1,419	25% - 355 50% - 710 75% - 1,064 100% - 1,419	70-90	Fast
<i>Malus spp.</i>	Crabapple	No	High	Moist to well drained	Low	Low	Acidic to alkaline	Somewhat sensitive	Rounded	22.5 / 398	25% - 100 50% - 199 75% - 299 100% - 398	20-25	Moderate
<i>Nyssa sylvatica</i>	Blackgum	No	Low	Extended flooding to well drained	Low	High	Acidic	No serious pests	Pyramidal/oval	30 / 707	25% - 177 50% - 354 75% - 530 100% - 707	65 to 75	Slow
<i>Platanus occidentalis</i>	American sycamore	Yes	Moderate	Extended flooding to well drained	Moderate	Moderate	Acidic to alkaline	Sensitive	Pyramidal/rounded	62.5 / 3,068	25% - 767 50% - 1,534 75% - 2,301 100% - 3,068	75-90	Fast
<i>Quercus bicolor</i>	Swamp white oak	Yes	High	Extended flooding to well drained	Moderate	Moderate	Acidic to slightly alkaline	Resistant	Upright oval/rounded	55 / 1,590	25% - 398 50% - 795 75% - 1,193 100% - 1,590	50-70	Moderate
<i>Quercus macrocarpa</i>	Bur oak	Yes	High	Moist to well drained	High	High	Acidic to alkaline	Resistant	Upright oval/spreading	50 / 1,963	25% - 491 50% - 982 75% - 1,472 100% - 1,963	60-70	Slow
<i>Quercus palustris</i>	Pin oak	Yes	High	Moist	Low	High	Acidic	Resistant	Upright pyramidal/oval	45 / 1,590	25% - 398 50% - 795 75% - 1,193 100% - 1,590	60-80	Fast
<i>Quercus rubra</i>	Northern red oak	Yes	High	Moist to well drained	High	Low	Acidic to slightly alkaline	Resistant	Rounded	70 / 3,848	25% - 962 50% - 1,924 75% - 2,886 100% - 3,848	50-60	Fast
<i>Tilia americana</i>	American linden	Yes	Moderate	Moist to moderately well drained	Low	Low	Slightly acidic to alkaline	No serious pests	Rounded	40 / 1,257	25% - 314 50% - 629 75% - 943 100% - 1,257	50-80	Moderate
<i>Ulmus americana</i>	American elm	Yes	Moderate	Extended flooding to well drained	High	Moderate	Acidic to alkaline	Resistant	Vase	60 / 2,827	25% - 707 50% - 1,414 75% - 2,120 100% - 2,827	70-90	Fast

\* For purpose of determining coverage of Impervious Area by the Mature Average Canopy Spread by species for each tree planting, the canopy shape is assumed to be round